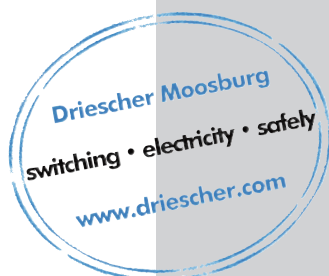


**Assembly, Operating and
Maintenance Instructions for
DRIESCHER - Air-Insulated
Medium-Voltage Switchgears**

- Type D 12 - 507519
Rated voltage 12 kV
Rated current 630 A
- Type D 24 - 601119
Rated voltage 24 kV
Rated current 630 A



D 24

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Table of Contents

• 3	Operating conditions, Technical description
• 4	Technical data, Inserting and replacing of h.v.h.b.c. fuses
• 5	H.v.h.b.c. fuse link, Motor drive (optional)
• 6	Shipping, Transport, Storage and weights
• 8	Installation switch panels
• 9	Bolting switch panels, Installation and connection of busbars
• 10	Mounting of arc rejection devices and side covers of the end panels, Removal of H27
• 11	Fixing of switch disconnect H 27
• 12	Earthing, Cable mounting and cable connection
• 13	Operation, Insulating protective barrier (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 D 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 - 5°C
(class "minus 5 Indoor")

Technical description

General

The air-insulated switch panels Type D 12 - 507519 (12 kV - panel dimensions WxDxH: 500 x 750 x 1900 mm) and D 24 - 601119 (24 kV - panel dimensions WxDxH: 600 x 1100 x 1900 mm) are suitable for all kind of indoor use.

In case of a voltage of 12 kV and 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 D 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 medium-voltage switch panels are metal-encapsulated. The side walls of the switch panels are of 2 mm thick steel plate. The switch panels are sealed at the back and can also be covered at the bottom, if requested.

All switch panels of type D 12 - 507519 are partitioned off from panel to panel, in the busbar area, by means of fibrous-glass reinforced plastic plates with lead-in openings.

Optional all switch panels of type D 24 - 601119 will be partitioned off from panel to panel.

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

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

Equipment

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

• Cable panel	Typ DK
• Transformer feeder panel	Typ DT
• Measuring panel	Typ DM
• Bus sectionalizer panel	Typ DÜ
• Riser panel	Typ DH

Approximately 250 mm high arc quenching devices are installed above the front and side covers.

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 and a set of voltage transformers as well.

The fuse switch disconnector Type SEA is mounted in the 12 kV transformer switch panel, in 24 kV transformer switch panels the fuse switch disconnector type SuT is mounted.

The optional interlocking of the equipment practically rules out any form of incorrect operation.

All built-in switchgear equipment 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 design of the air-insulated switch panels corresponds to the specifications of the EN 62271-200. The resistance to accidental arcs of the switch panels has been determined at 16 kA and 20 kA; 1 s, by and independent testing institute. The installed switchgear equipment is designed in compliance with EN 62271-1.

The degree of protection of the switch panels corresponds to IP 3X.

The switch disconnecter **H 27** (phases are arranged one behind the other) arranged on the right side wall makes a pole centre distance of $p = 155\text{ mm}$ with a panel separation of 500 mm possible. If the panel separation is 600 mm, the pole centre distance is $p = 275\text{ mm}$.

Technical data of the switch panels
acc. to EN 62271-200

Rated voltage	U_r	kV	12	24
Rated-(operating)-current	I_r	A	630	630
Rated lightning impulse withstand voltage	U_p	kV	75	125
Rated-power frequency withstand voltage	U_d	kV	28	50
Rated-short-time current	t_k	s	1	1
Rated frequency	f_r	Hz	50	50

Technical data of the switch disconnecter H 27
acc. to EN 60265-1

Rated voltage	U_r	kV	12	24	
Rated frequency	f_r	Hz	50	50	
Rated-(operating)-current	I_r	A	630	630	630
Rated-peak withstand current	I_p	kA	50 ¹⁾	40 ¹⁾	50 ¹⁾
Rated-short-time current	I_k	kA	20 ¹⁾	16 ¹⁾	20 ¹⁾
Rated-making current	I_{ma}	kA	50 ¹⁾	40 ¹⁾	40 ¹⁾
Rated-breaking current	I_1	A	630	630	630
Rated-loop breaking current	I_2	A	630	630	630
Rated-transformer off-load breaking current	I_3	A		10	
Rated-cable charging breaking current	I_{4a}	A	10	35	
Rated-earth fault off-load breaking current	I_{6a}	A	300	320	
Rated-cable charging breaking current below earth fault conditions	I_{6b}	A	18	178	
Rated-impulse withstand voltage	U_w	kV			
Conductor-Conductor / Conductor - Earth			75	125 ²⁾	
Open gap			85	145	
Rated-power frequency withstand voltage	U_d	kV			
Conductor-Conductor / Conductor - Earth			28	50	
Open gap			32	60	

1) These values also apply to earthing switches
2) 95 kV for clearance between phases $p = 170\text{ mm}$ without phase barrier

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)
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.

H.v.h.b.c. fuse link

H.v.h.b.c. fuses link for high-voltage Switch-fuse combination (Type H 27 SEA) acc. with EN 62271-105

Recommended protection for DRIESCHER h.v.h.b.c. fuses link Type **STA** for 12 kV and Type **SSK** for 24 kV from 100 A on

Rated- transformer- power [kVA]	Rated current of fuse in A			
	Rated voltage Ur			
	12 kV		24 kV	
	Inside caliper e = 290 -1 mm mind. (A)	max. (A)	Inside caliper e = 442 -1 mm mind. (A)	max. (A)
50	6,3	6,3	6,3	6,3
80	10	10	6,3	6,3
100	10	16	6,3	10
125	16	20	10	16
160	20	25	10	20
200	25	31,5	16	20
250	31,5	40	16	25
315	31,5	50	20	25
400	40	50	25	31,5
500	50	63	25	40
630	63		31,5	50
800	80, Type SSK and tripping delay		40	50
1000	100, Type SSK and tripping delay		50	63
1250	125, Type SSK and tripping delay		63	
1600	circuit-breaker		80	
2000			100, Type SSK and tripping delay	
2500			125, Type SSK and tripping delay	
3150			circuit-breaker	

Motor drive (optional)

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

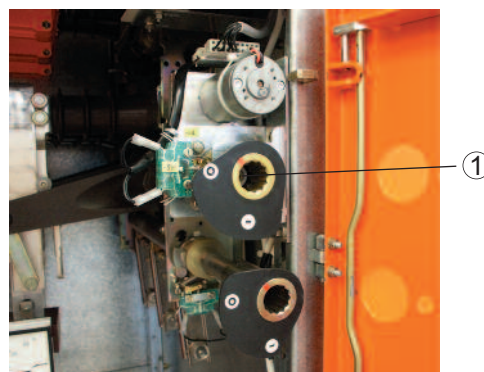
Torque 250 Nm

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
operation time	16 s	25 s	9 s	10 s	15 s

Torque 350 Nm

* =220V DC with bridge rectifier

Voltage supply	110 V DC	220 V DC	230 V AC*
max. current input	1,2 A	0,7 A	0,7 A
operation time	23 s	14 s	26 s



Examples for installed motor drives in a cable panel, on the right side with connection of the earthing switch

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*.

Weights

Type	Description	Weight approx. kg	Drawing-no.
DK 12 kV / 24 kV	Cable panel	175 / 200	HA3 - 094658 / HA3 - 67050
DT 12 kV / 24 kV	Transformer feeder panel	180 / 210	HA3 - 094659 / HA3 - 67050
DÜ 12 kV / 24 kV	Bus sectionalizer panel	180 / 200	- / HA3 - 67050
DM 12 kV / 24 kV	Measuring panel (bus bar)	200 / 250	- / HA3 - 67050
DM 12 kV / 24 kV	Measuring panel (cable bridge)	200 / 250	- / HA3 - 67050
DH 12 kV / 24 kV	Riser panel	120 / 150	- / HA3 - 67050

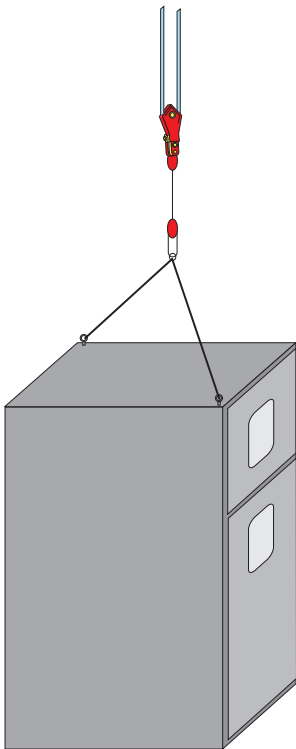
For transportation using a shovel loader it is necessary to insert pallets or square timber beneath, which are then taken up by the lifting arm as shown in *Fig. 4*.

Storage

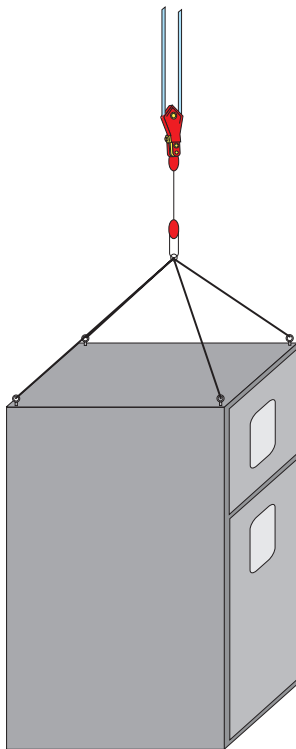
The switch panels must be appropriately stored in a dry, well-vented area and protected against contamination.



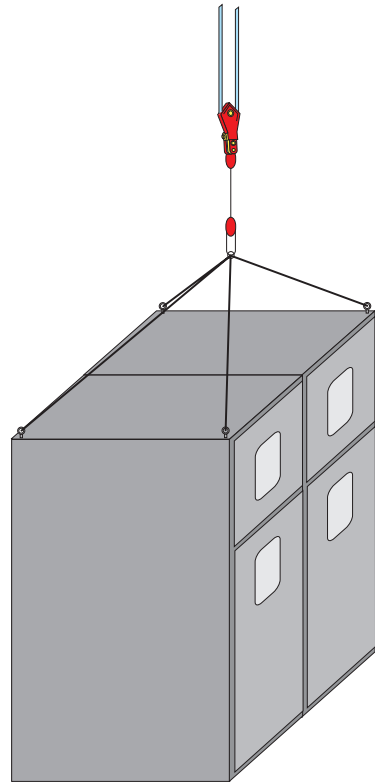
If panel combinations contain transformers, they have to be carried acc. to *Picture 2*.
The minimum distance (1 m) between top of panel and hook of crane (see *Picture 6*) is valid for all kind of transportation varieties.



Picture 1: Shipping of a single panel without transformers



Picture 2: Shipping of a single panel with circuit-breaker or transformers



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

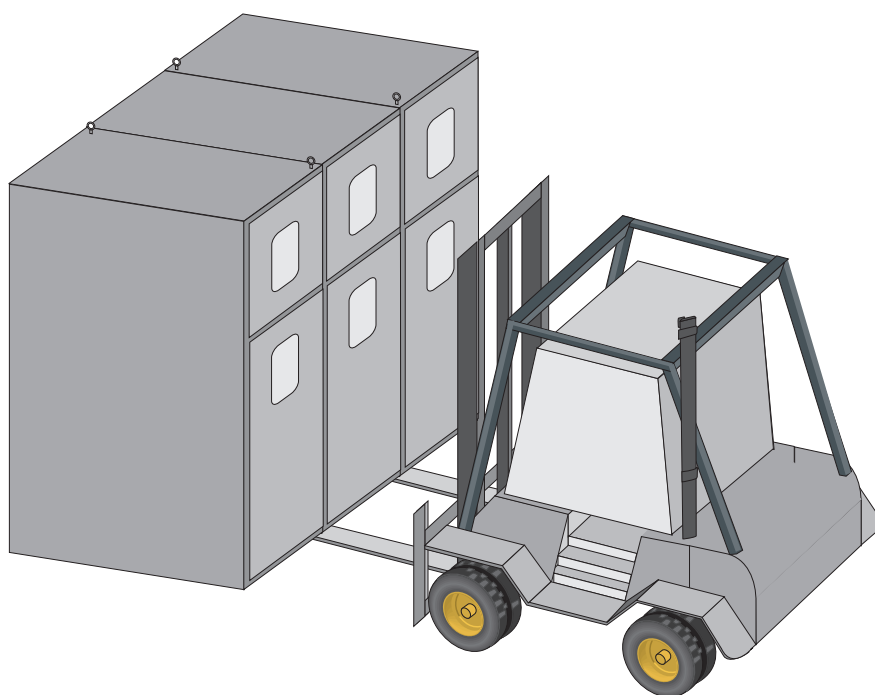
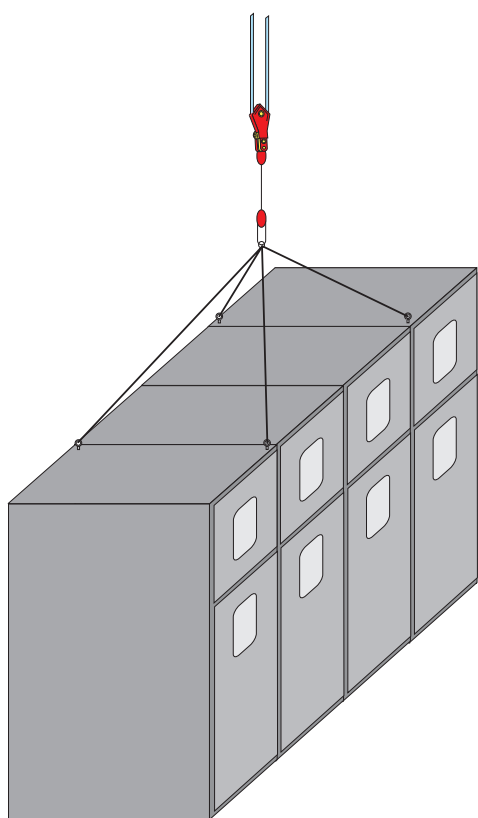
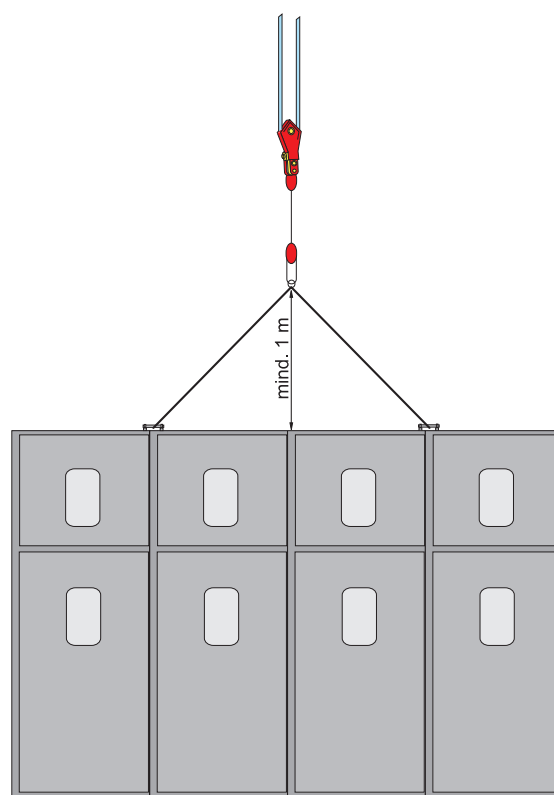


Bild 4: Loading an shipping unit using shovel loader (lifting arms take up panel end)



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



Picture 6: Shipping unit like picture 5 in front view with bridging bolt

Floor properties

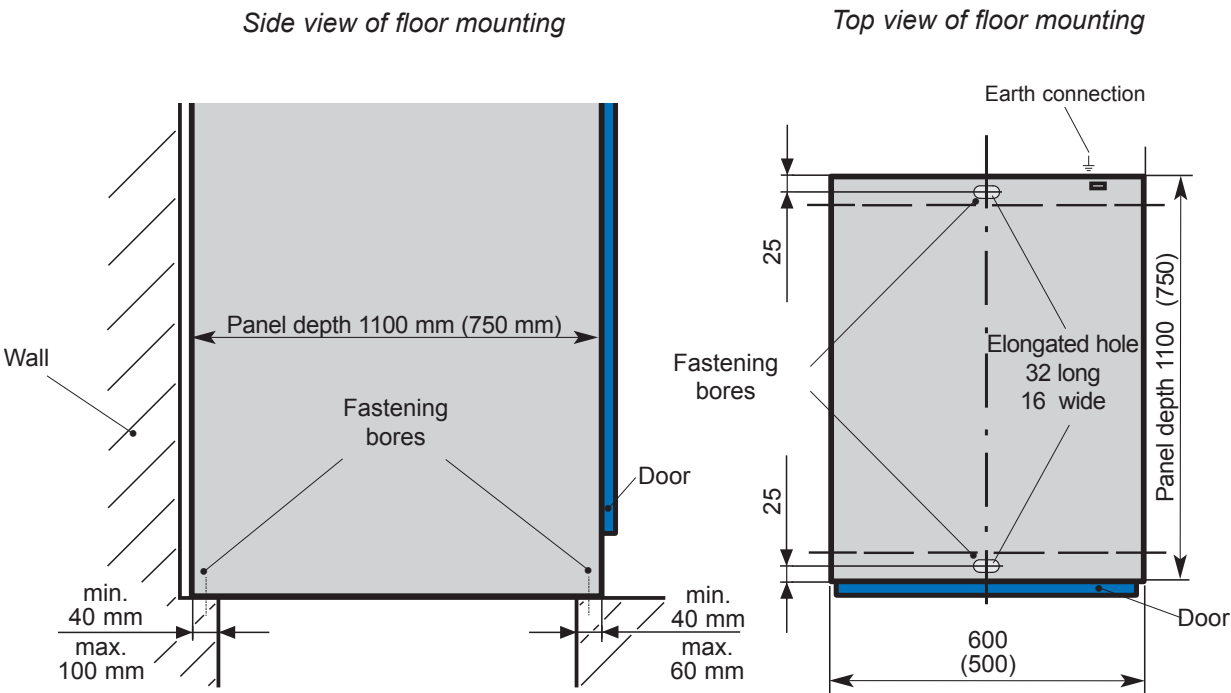
A level floor is sufficient.
Compensate any irregularities by metal strips. Make sure to avoid any distortion of the panels and the panel doors!

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.

Floor openings

These are shown in *Picture 7*.
The openings can also be continuous along the length of the switchgear.
The measures in brackets are valid for Type D12 - 507519.



Picture 7: Floor opening

Bolting switch panels together

Bolting of the panels

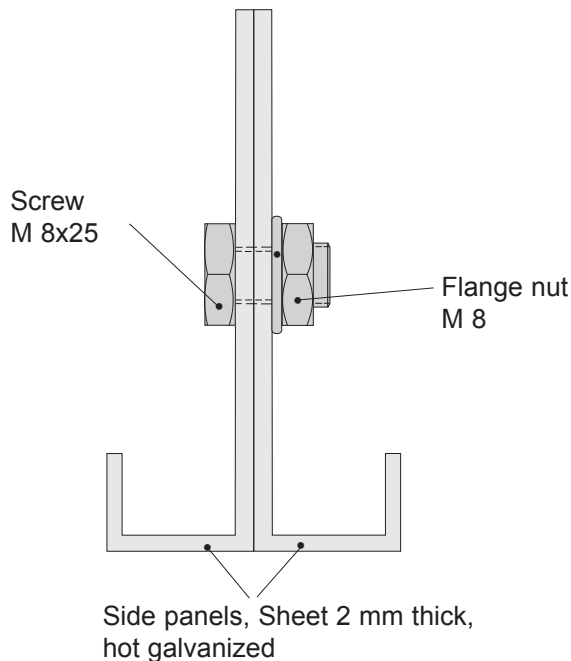
The housings are bolted at the front and rear with hexagonal screws M8 x 20 ISO 4017 and nuts ISO 4032.

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

Terminating element

For the terminating element of a switchgear the end panels lateral are bolted to a sheet steel end plate (2 mm thick).

Fixing see *picture 10*.



Picture 9: Bolting of the panels

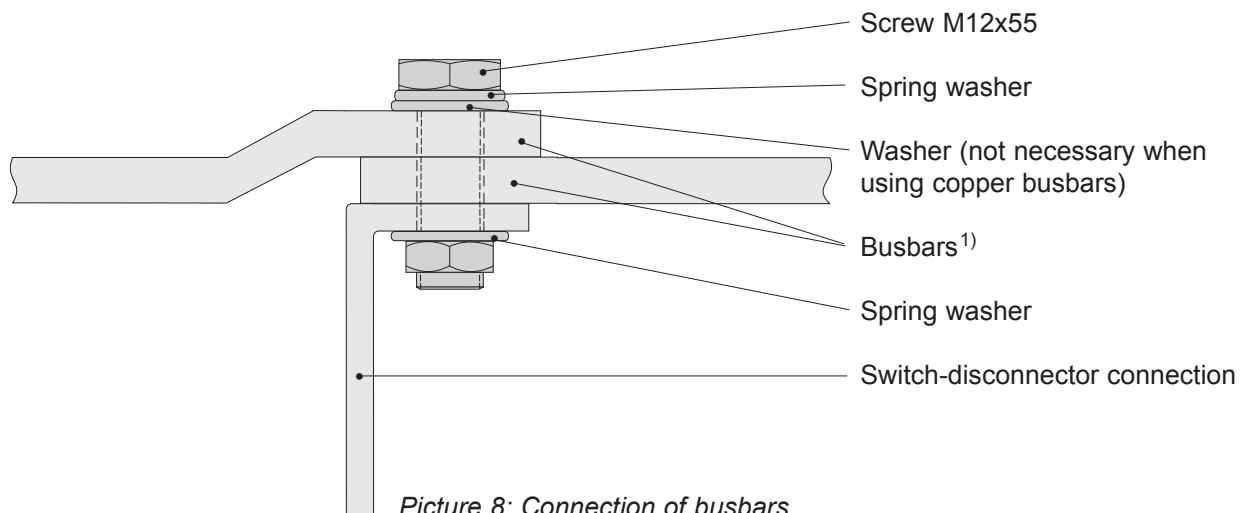
Installation and connection of busbars

As shown in *Picture 8* the panels are linked from panel to panel and bolted to the upper connection fitting.

Do **not distort** the arcing chambers, otherwise the central striking of the switching blades in the arcing chambers is no longer guaranteed.

Hold the connecting bolts in place with a second wrench when tightening the nuts (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.



¹⁾ Busbars and discharge rails are optionally provided in copper or aluminium.

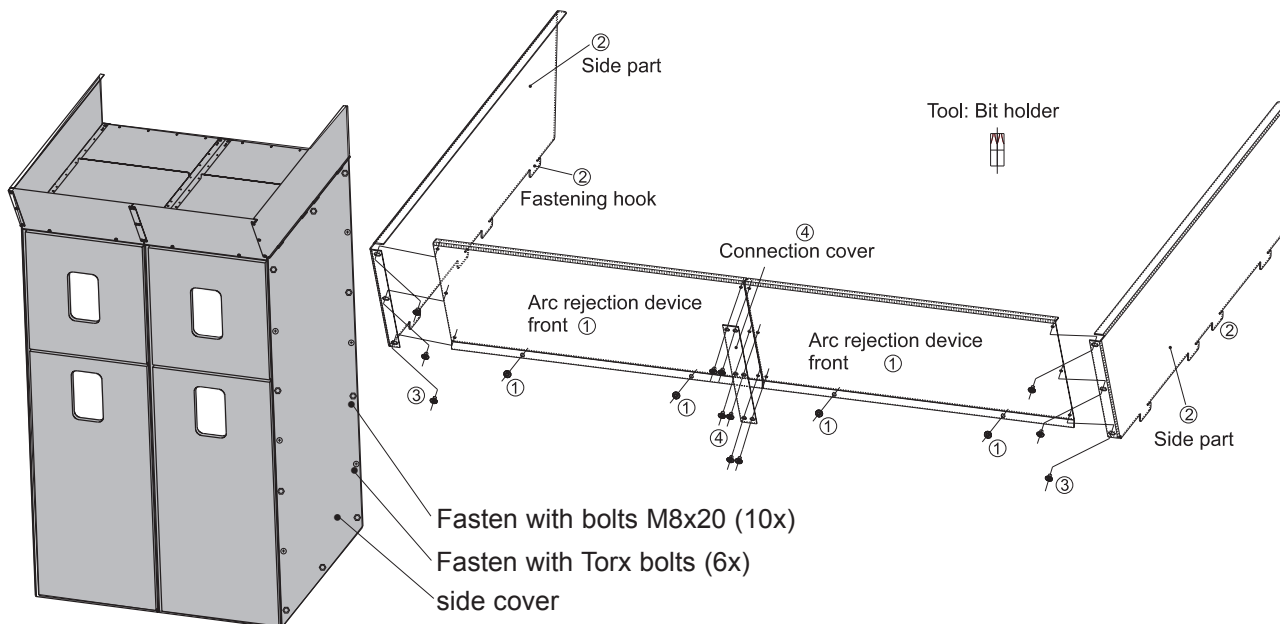
Mounting of arc rejection devices and side covers of the end panels

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).



Picture 10: Mounting of arc rejection and side covers

Mounting and Removal of the switch disconnecter H 27

Mounting switch disconnecter 24 kV (see picture 11)

When mounting the switch disconnecter is inserted into the guide rail of the side wall (2) with the guide bolts (1) which are fixed to the frame.

The switch has to be moved to the limit stop under the holding steel plate (3).

Then the switch is fixed on the front side with two nuts

M12 and contact washers with torsion protection by means of the screws M12 coming through from the back (page 9, pos. 4a and b).

After that, the upper connecting contacts are connected to the bus bars (picture 9) and the cable connection is fixed (picture 12). Finally, the plug-in flap which is under the front cover, is mounted

Removal switch disconnecter 24 kV (see picture 11)

When removing the switch disconnecter (close earthing switch!) remove bus bar connection (picture 8) and cable fixing (picture 12) at first. Demount plug-in flap (5) which is mounted between the field frames on

the side, then loosen the nuts of the pressed-in screws (4) above and below.

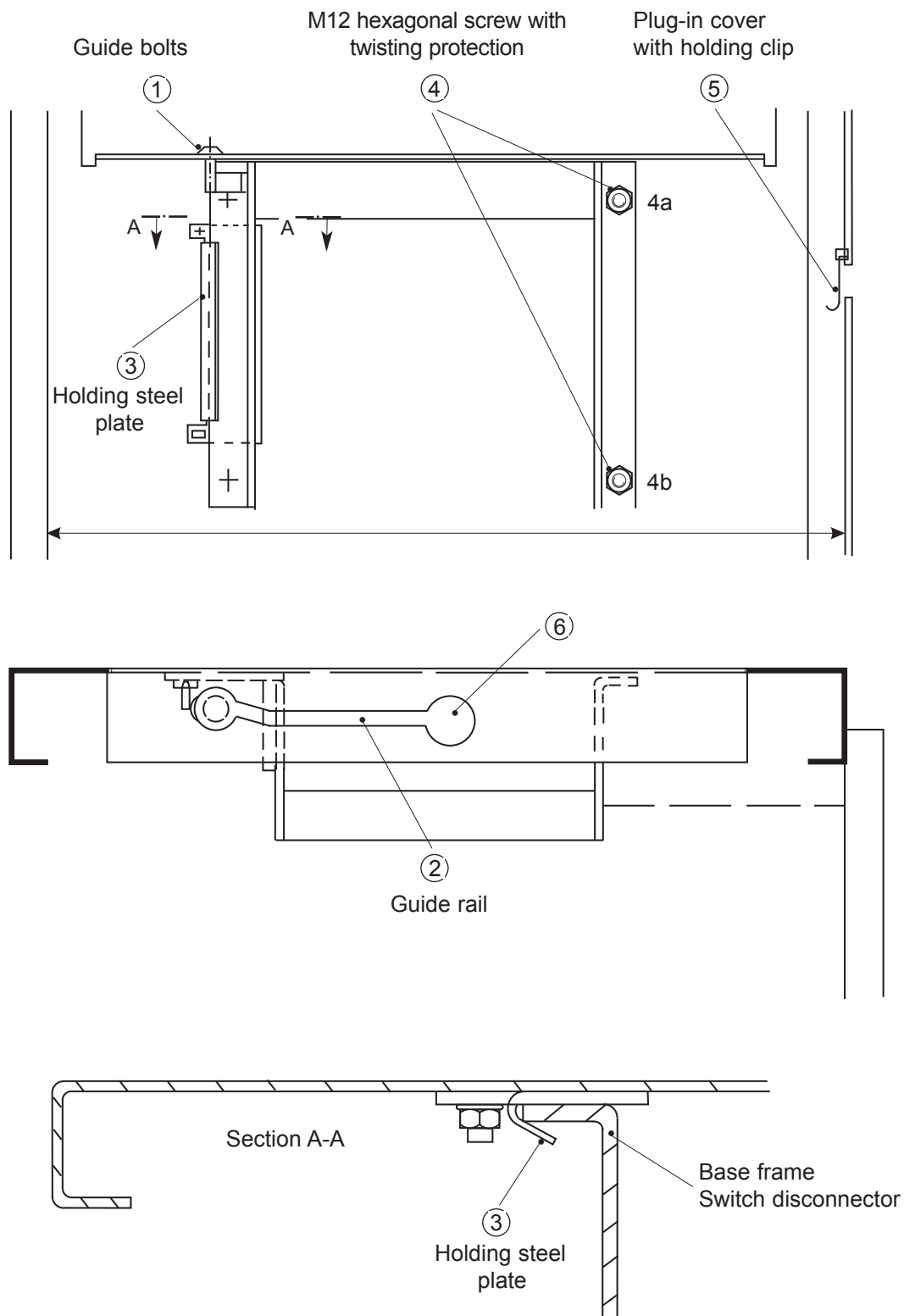
Now, the switch can be removed in the guide rail up to the bore hole (6) and then be taken out.

Mounting switch disconnecter 12 kV

When mounting a 12 kV switch disconnecter please take care that a space plate (3 mm) for each fixing screw of the frame to reinforce the torsion protection is enclosed. Please also notice that there is no guide rail (2) existing at type D 12 – 507519. The

switch disconnecter H 27 EK is fixed with 4 (resp. 6 at type H 27 SEA) special flat head screws M10 x 25 as well as washers and nuts on the right side wall.

Fixing of switch disconnecter H 27 EK, EA and SuT 24 kV



Picture 11: Fixing of the switches
Type H27 EK, EA and SuT 24 kV

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 marked earthing connector bracket for M12 or M16 bolts in each panel. Satisfactory earthing of the entire system is provided by using hot-galvanized sheeting and with the bolting of the individual panels.

Earthing the cable

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

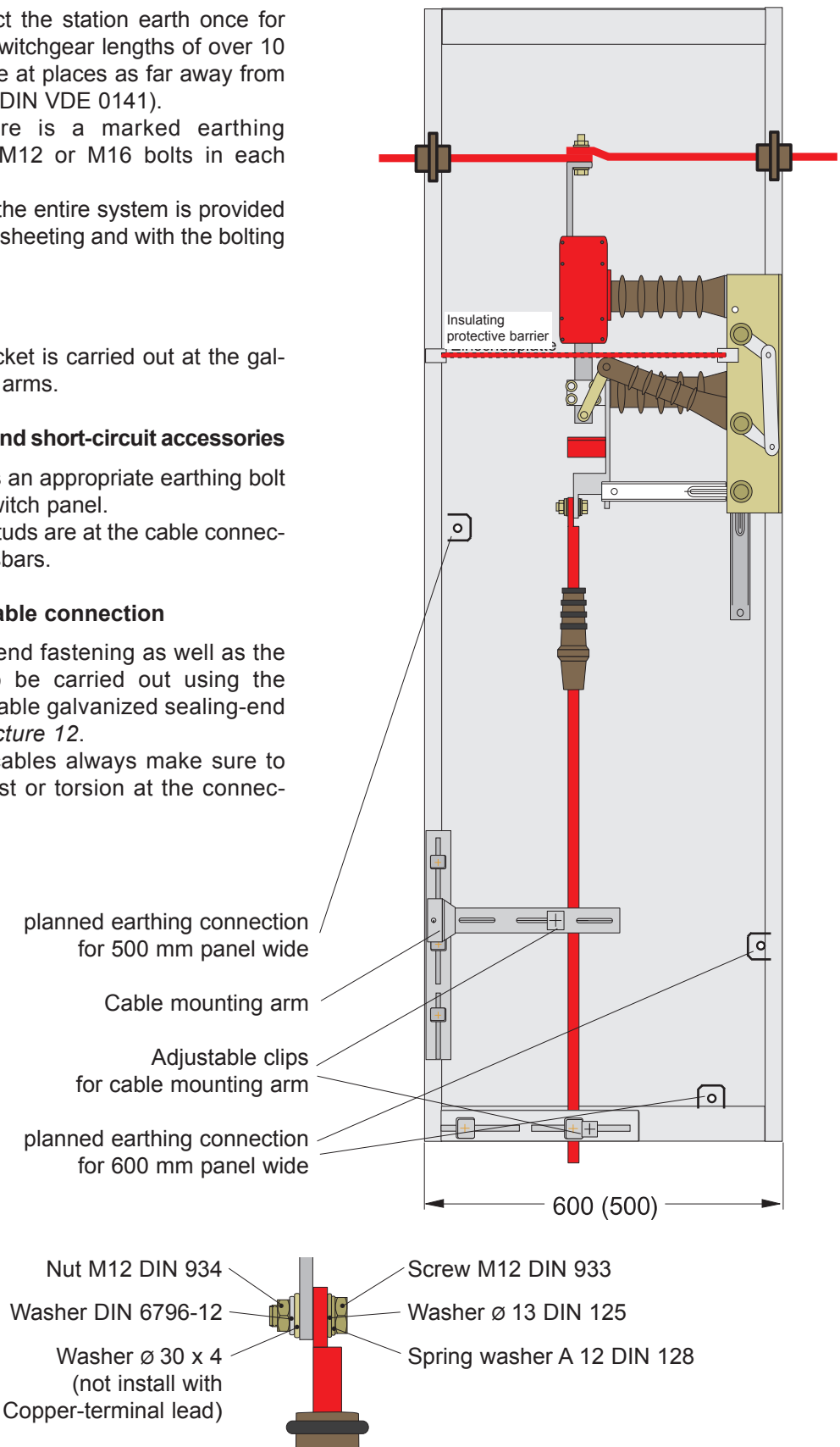
Earthing with earthing and short-circuit accessories

For this purpose there is an appropriate earthing bolt on the housing of the switch panel. The spherical terminal studs are at the cable connection points or on the busbars.

Cable fastening and cable connection

The cable and sealing-end fastening as well as the cable connection 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.

Example: Type DK with switch disconnecter H 27 EK



Picture 12: Cable connection

Operation

The position of the switch disconnecter can be seen through the inspection windows *picture 13* 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!

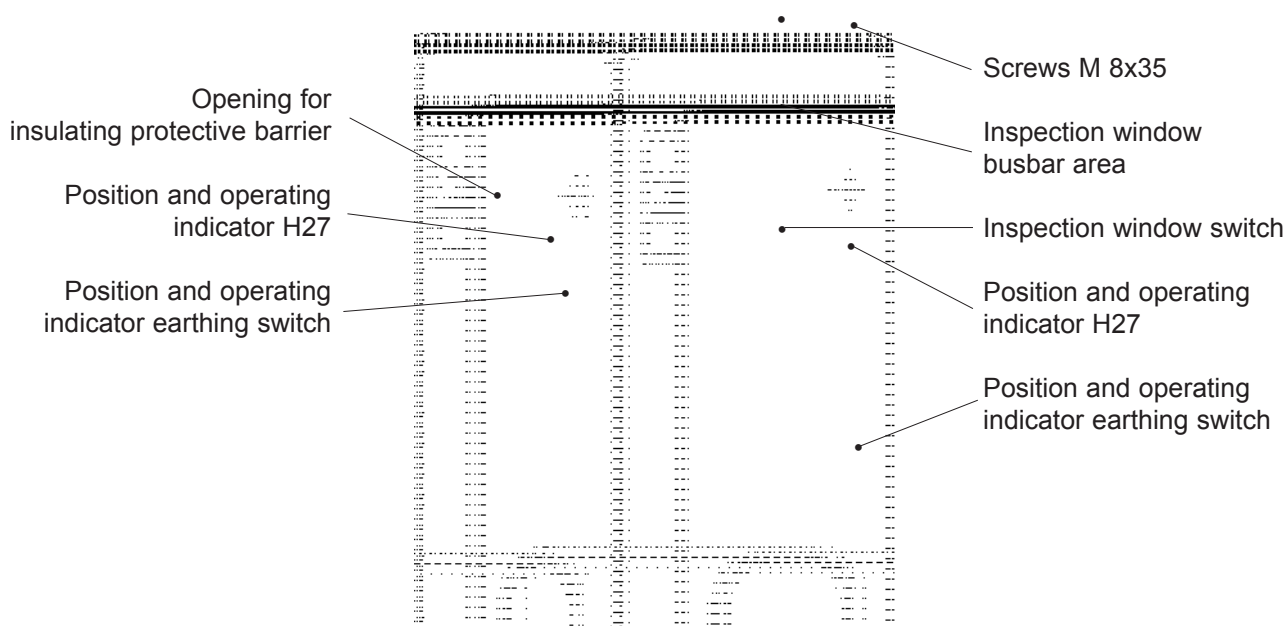
The switches can be operated acc. to the operating direction noticed in the actuating labelling when the panel door is closed.

During breaking operation of the fused switch disconnecter type H 27 SuT with trip free release inserted in the transformer panel, it has to be taken into consideration that the operating lever is turned 90° to the left 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.



Picture 13: Operation

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 disconnecter, when it has to be worked in the panel and the switchgear

cannot be put completely into the dead status (see *Picture 13*).

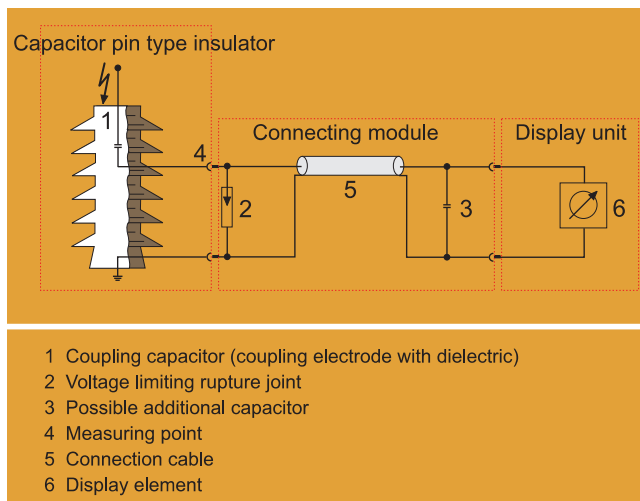
After closing the panel door the barrier can be removed through pulling at the pulling hole.

If there is not enough space (aisle < 1000 mm) an inflected insulating barrier can be delivered.

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.



Picture: D-panel with capacitive interface and short-circuit indicator

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

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 BGV A3 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

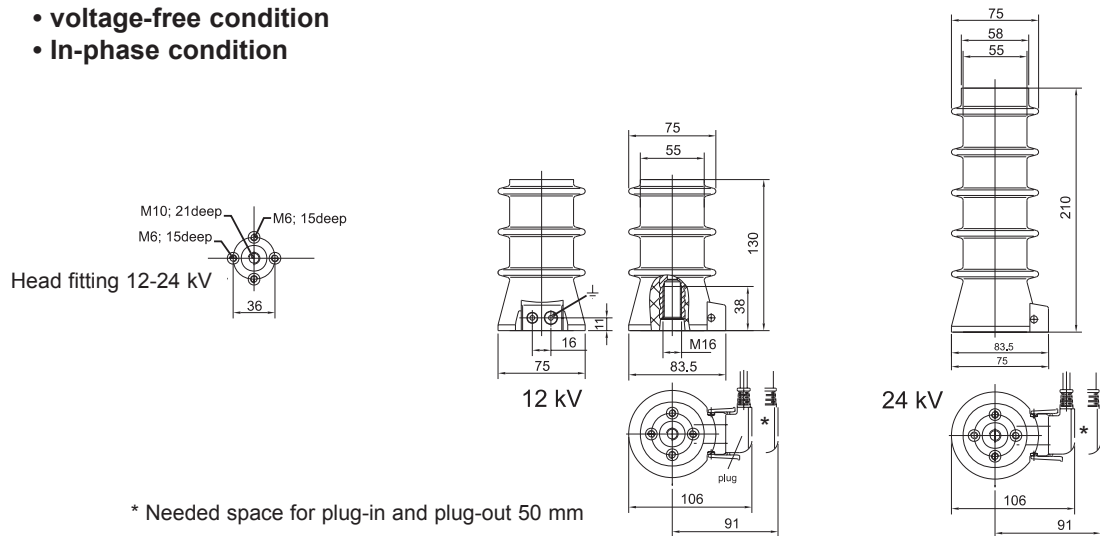
- a corresponding instruction for short-circuit indicator is enclosed in delivery.

Capazitive 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



Rated Voltage in kV	Coupling capacity in pF	Creeping distance in mm	Number of screens	Weight in kg	Drawing-no.	Part-no.
12	20	175	3	0,9	SI3-108504	2-45165983
24	15	275	5	1,3	SI3-108505	2-45165984

Coupling parts DEHncap



Rated voltage in kV Dehncap/M-HR	Distance between sockets in mm	Length of connecting cable in mm	Additional capacity in pF	Response threshold in kV	Weight ca. kg	Part-no.
12	19	4000	207	1,6	0,8	2-33601010
12...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. 10 years (BGV A3), 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.

switching • electricity • safely

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

**ELEKTROTECHNISCHE WERKE
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