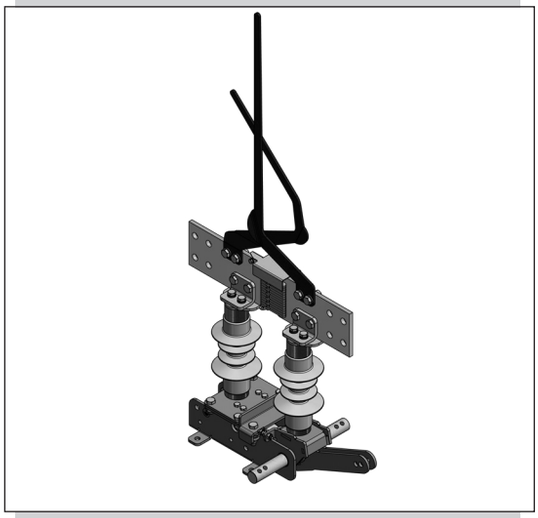
B
OL-DC

# Installation, operating and maintenance manual for DRIESCHER outdoor switching devices for overhead line railway applications OL-DC 3-3150-40

$U_n$ = 3 kV ( $U_{Ne}$ = 3,600 V)
$I_{Ne}$ = 3,150 A





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# Contents

# Introduction

Thank you for choosing one of our products. We hope it gives you many hours of successful and smooth operation.
The outdoor switching devices have been specially designed and manufactured to meet your requirements.
Do you have any questions you would like to ask us? We look forward to hearing from you – simply visit **www.driescher.de.**

## Information on this manual

### General information

This operating and maintenance manual contains all the information and descriptions required to operate the outdoor switching devices.

This document was created with the utmost care. Any suggestions or comments would be gratefully received.

To make everything as clear as possible, the description of the switching device or its components is accompanied by figures and schematic diagrams.

#### Use of symbols / Key

The following symbols are used in this manual in addition to the warning notices outlined in the *Safety* chapter:

**WARNING:** Warns of danger to people. Failure to comply with the warning indicated by this symbol will result in severe injuries.

**CAUTION:** Failure to comply with the warning indicated by this symbol could result in injuries.

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

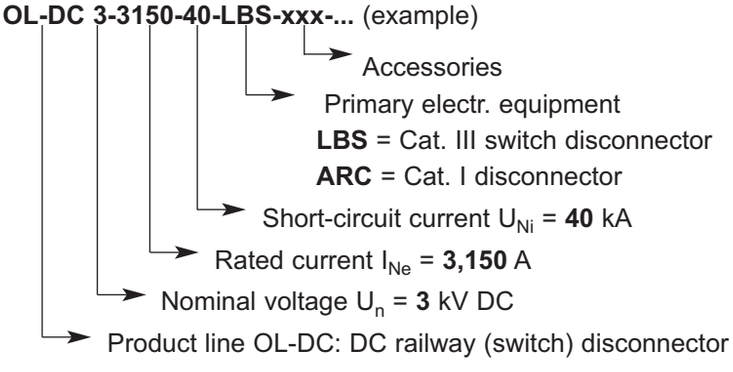
# 1 Product description

## 1.1 How the OL-DC product line is structured / Identifying the switching device version

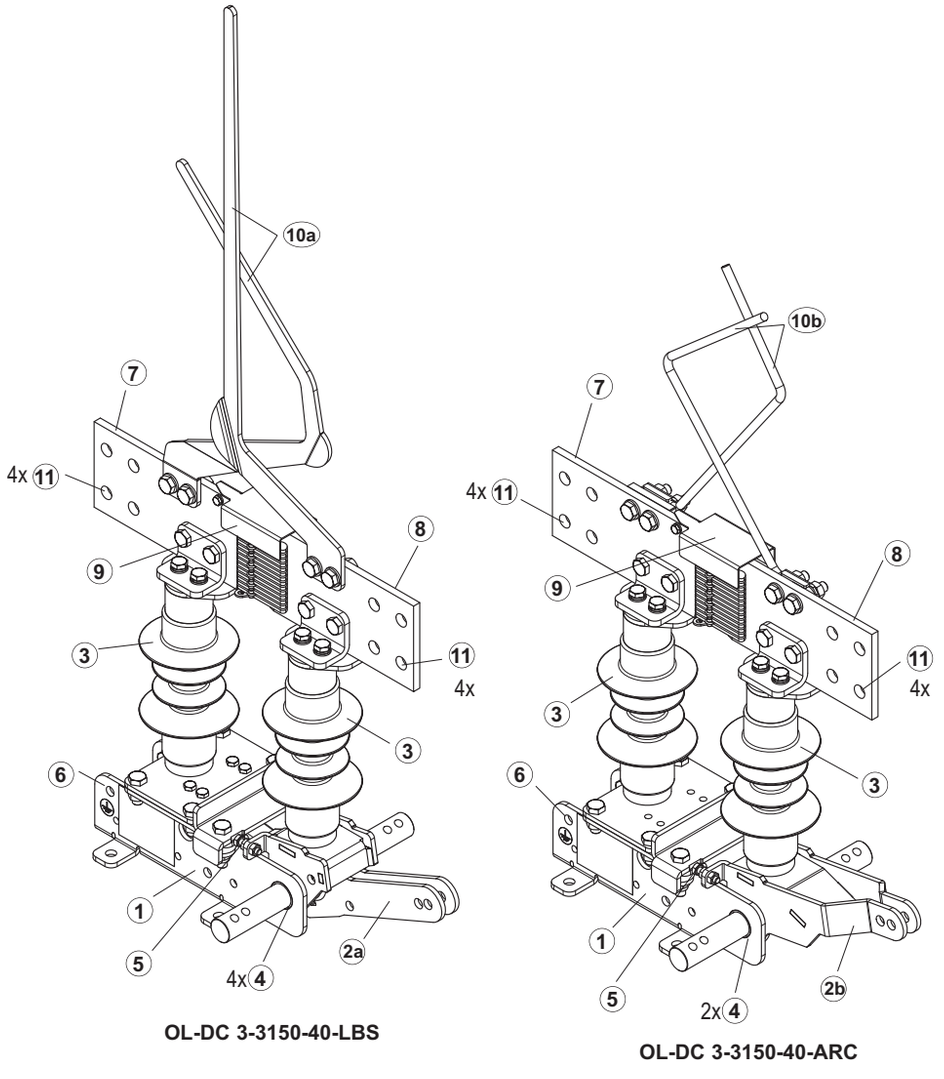
The products in the OL-DC line are available in different versions, each of which differs fundamentally from the others. For this reason, it is important to make sure that you have purchased the correct product and are familiar with the specific steps required for installation, operation and maintenance.

Switch disconnectors and disconnectors from the OL-DC product line are designed for use outdoors and meet the requirements of EN 50123-1 / EN 50123-4 / EN 62271-1. They can be actuated using a suitable motor drive. It is important to ensure the necessary throw of approx. 180 or, ideally, 200 mm for the switch required.

**Explanation of the type designation:**



## 1.2 Overview of the OL-DC product group

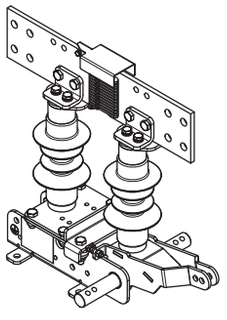



**OL-DC 3-3150-40-LBS**

**OL-DC 3-3150-40-ARC**

*Fig. 1: OL-DC versions*

1. Base frame
2a. Hinge for fast-switching mechanism
2b. Hinge for disconnector
3. Insulator
4. Bearing point
5. End stop for ON end position
6. Ground potential connection *(M12)*
7. Fixed part of main circuit with impact-type
8. contacts Moving part of main circuit
9. Protective cover for the contact system
10a. Arc quenching system
10b. Pre-arcing horns
11. Connection for flexible cable, *M16*



**OL-DC 3-3150-40-000**

**Version 000**
Identical to ARC
But without pre-arcing horns

# 2 Safety

## 2.1 Intended use / Guarantee

The outdoor switching devices are intended for use in the operating conditions set out in the *Technical data section*.

Any use other than what is outlined in this section is classed as an unintended use.
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 Dangers caused by the switching device

The possible danger sources of the switching device are outlined below. 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.

### 2.2.1 Danger due to fast-switching mechanism on the LBS version

**WARNING:** LBS switch disconnectors have a spring-preloaded fast-switching mechanism. Even slight rotations of the drive shaft have the potential to release this energy. Wherever possible, maintain a sufficient safety distance from the moving post insulator. If this cannot be done due to the need to handle the device, the switch disconnector must be moved into the closed position and secured against accidental switch-off using the transport lock (12).

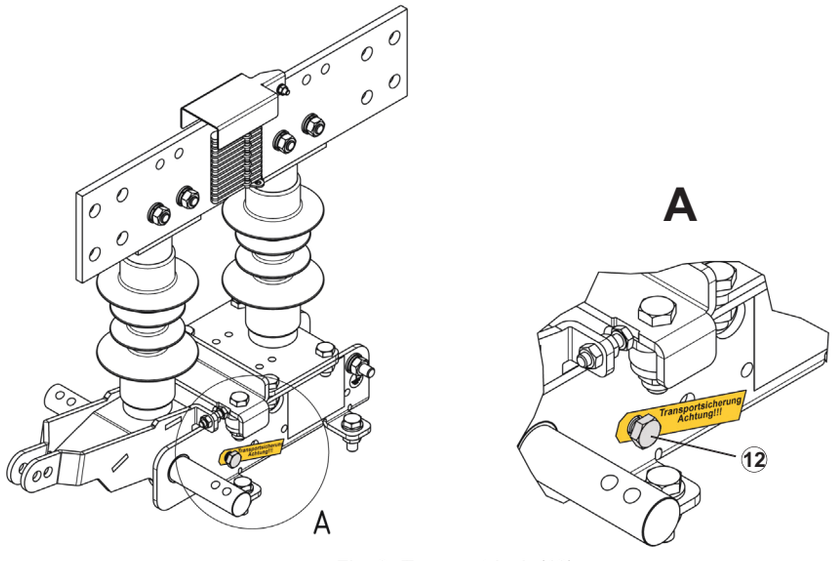



*Fig. 2: Transport lock (12)*

### 2.2.2 Danger due to moving parts

**WARNING:** The switching device has fast-moving components which may move with significant force, in some cases remotely operated (electrically and/or mechanically). No persons or objects must be present in the envelop or vacinity of those moving parts at any time. Serious harm to staff or material is to be expected.

Before starting work, it is important to ensure that there is no danger from moving parts.

During maintenance work, components moved electromechanically must be shut down by switching off the supply voltage

### 2.2.3 Danger from electricity

**WARNING:** When operating electrical switching devices, components in the immediate vicinity carry a dangerous level of voltage. Touching these parts poses a risk of personal injury or material damage.

Access to the danger zone around the switching device must only be granted to people with the necessary technical training, expertise and experience
to identify electrical dangers and take the necessary occupational safety measures.

Other people may only enter the danger zone when accompanied by the persons listed above.

## 2.3 Safety installations

Safety installations protect people and the product by ensuring that there is no risk of accidents or material damage due to moving parts and assemblies.

The owner must ensure that trained personnel

- check all safety installations regularly
- remove any problems on the safety installations immediately
- secure the switching device against being switched on if not all safety installations are present and working

## 2.4 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 on the switching device.

## 2.5 Personnel selection and necessary qualifications

Persons working with the switching devices must

- be at least 18 years of age.
- have the appropriate specialist knowledge for the respective activities.
- be familiar and comply with the applicable technical 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 switching device.

Personnel learning to use or being introduced to the device, or operating the device as part of training, may only work on the switching device when under the constant supervision of an experienced member of staff.

All work on the switching device may only be carried out by trained specialist personnel (DIN VDE 0105-100) and in compliance with all applicable rules specified in the accident prevention regulations (UVV).

# 3 Transport and Storage

All switching devices from the OL-DC product line are delivered secured on Euro pallets. Depending on the specific quantity ordered, up to six items may be bolted to a pallet. To protect against damage whilst transporting and storing the device, a disposable frame insert is attached to the pallet.
LBS switching devices have an additional safety device to protect against damage on the quenching system. This safety device must be detached **before commissioning**. When doing so, ensure that the transport lock *(12, see Fig. 2)* is inserted.
Upon receipt of the switching device(s), check the packaging for damage. If any damage is visible, report this to DRIESCHER immediately.

The normal transport and storage conditions for indoor switching devices are as follows:

a) The switching device must be transported in its closed switching position, i.e. ON. The switch must have been secured against accidental switch-off.

b) The switching device must be transported using suitable transport equipment.

c) It must be secured to protect it from slipping, bumps and impacts as well as dirt and contamination.

d) Whilst the device is in transit, the maximum temperature that it may be exposed to is 80°C on a sustained basis or 100°C temporarily.
The minimum permissible transportation temperature is -50°C.

e) The ambient air must not be contaminated with significant amounts of dust, smoke, corrosive and/or flammable gases, vapours or salts. In accordance with IEC TS 60815-1:2008, the site pollution severity (SPS) class is assumed to be “very light”.

f) There is no impact from solar radiation.

g) The following conditions apply for the humidity:
   a. The mean value of the relative humidity as measured over 24 hours does not exceed 95%;
   b. The mean value of the water vapour pressure as measured over 24 hours does not exceed 2.2 kPa;
   c. The mean value of the relative humidity as measured over a month does not exceed 90%;

h) The mean value of the water vapour pressure as measured over a month does not exceed 1.8 kPa.

If more stringent requirements apply, these must be fulfilled through the use of suitable additional measures rather than by the product.

# 4 Operating conditions

Outdoor switch disconnectors for DC railway applications are designed to be positioned outdoors on the railway line. The environmental conditions are assumed to be an atmosphere according to DIN EN ISO 12944-2.

*Long durability (C3 high):*
“Urban and industrial atmospheres, moderate sulphur dioxide pollution. Coastal areas with low salinity”

*Normal durability (C4 medium):*
“Industrial areas and coastal areas with moderate salinity”

Normal operating conditions for outdoor switching devices and switchgear:

a) The maximum ambient temperature is 40°C, with a mean value over 24 hours of no more than 35°C. The ambient temperature does not fall below -25°C.
*NOTE 1* – Sudden temperature fluctuations may occur, for example if a hot, sunny day is followed by sudden rainfall.

b) The maximum solar radiation is 1,000 W/m2.
*NOTE 2* - Details of the expected solar radiation values across the globe can be found in IEC 60721-2-4

c) The maximum altitude is 1,000 m above sea level.

d) The ambient air may be contaminated with dust, smoke, corrosive gases, vapours or salts. However, this level of contamination does not exceed the site pollution severity (SPS) class “medium” as set out in IEC TS 60815-1:2008.

e) The maximum thickness of a layer of ice is 10 mm.

f) The maximum wind speed is 34 m/s.
*NOTE 3* - The wind properties are defined in IEC 60721-2-2.

g) The mean values for the humidity as set out in 4.1.2 e) are allowed to be exceeded. Condensation or precipitation are permitted.
*NOTE 4* - The characteristic values for precipitation are defined in IEC 60721-2-2
*NOTE 5* - The conditions for humidity are always defined based on the interaction between relative humidity and other environmental parameters, in particular temperature and rapid temperature changes

h) Vibrations that are not caused by the switching device or switchgear or that are caused by earthquakes

do not exceed the effect of vibrations arising from the operation of the switching device itself.

# 5 Installation

## 5.1 5.1 Preparing the installation site

**ATTENTION:** The switching devices in the OL-DC product line are only designed to be installed horizontally.

**ATTENTION:** All OL-DC products must only be mounted on a level surface. Any twisting/distortion of the switch frame may impair its operation.

**ATTENTION:** The necessary minimum clearance from live objects and objects connected to ground potential must be ensured at the installation site.

**Incorrect installation may become apparent in the following ways:**

*Twisting/distortion of the switching device frame:*

- Hinge and moving post insulator do not move smoothly
- Device switches off too slowly
- Excessiv drive torque
- Poor contact made; misaligned main contact
- Misaligned pre-arcing horns
- Increased wear on the bearing points

*Misaligned/incorrect installation (more than 15° from horizontal):*

- For type LBS: device switches off too quickly or too slowly
- Very hard impact in the damping system *(16, see Fig. 11)*
- Rebound when device switches off
- Arc reignites when device switches off

## 5.2 Lifting the switching device

As far as possible, the switching devices must be transported on the designated transport devices. If the switching device is transported or installed by other means, the following transportation and lifting information must be observed.
The switching devices in the OL-DC product line do not have separate attachment or lifting points. The lifting bar must be attached to the main circuit using *M16* crane eyes.

**WARNING!** LBS switch disconnectors are only permitted to be lifted with the transport lock inserted.

The switching devices must be lifted smoothly and without knocks or impacts. The maximum acceleration whilst lifting the devices is 5 m/s² (0.5 g) on a sustained basis and 10 m/s² (1 g) temporarily.

**WARNING!** Do not use crane hooks or grippers on the main circuit, arc quenching system or post insulator as this may impair the device's functionality.

All switching devices in the OL-DC product line must only be lifted using suitable lifting equipment. We recommend the use of an adjustable crane lifting beam.

**ATTENTION!** Chains and hoisting slings must be guided in such a manner that there is no interference with any parts of the switch. Outwards, the maximum permitted tolerance is 5°.

**WARNING!** When transporting the devices, it must always be ensured that any transport slings or chains are far enough away from the horns. Bent or damaged horns may impair the device's functionality.

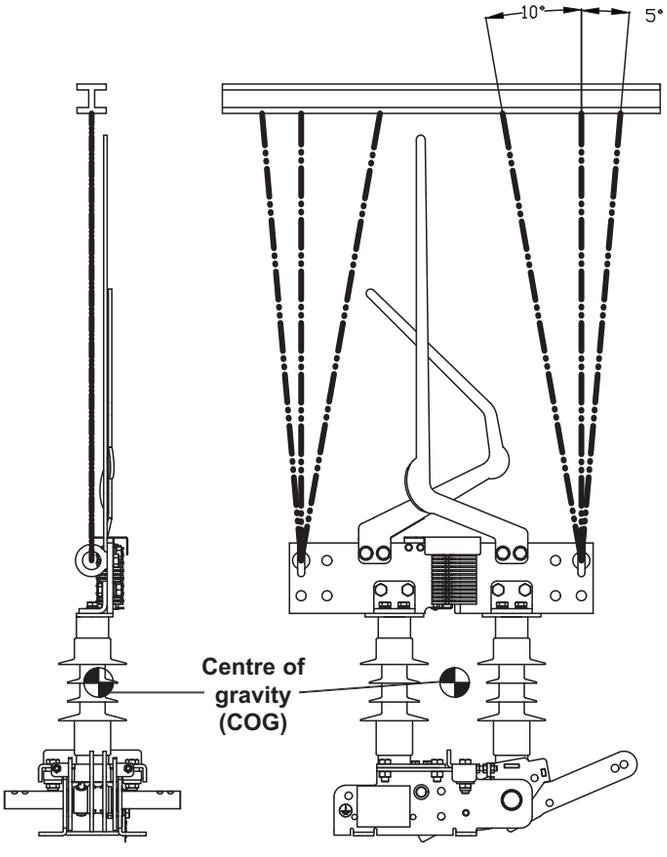



*Fig. 3: Lifting the switching device*

**WARNING!** The switching devices must not be lifted if additional components have been installed, as there is a risk of damage in such cases. Do not mount any shaft extensions, cross beams or brackets to the switching device before lifting it. The signalling switch attachments are an exception to this rule.

**ATTENTION!** If the switching device is being lifted by the frame rather than the main circuit, observe the centre of gravity. You may need additional lifting devices in this case, otherwise the switching device may become unstable.

## 5.3 Installation site

The devices are designed to be attached to masts. The devices must be attached high enough on the mast to negate the need for additional contact guards on the switch in the form of a barrier or enclosure. If the devices are attached in other locations (on the wall or racks), such a contact guard must be ensured on site.

The bounding boxes of the switching devices must be taken into account. In addition to the bounding boxes, the electrical safety distance defined in DIN EN 50123-1 Table 1 must be maintained. This is 98 mm for *3.6 kV*.

**Additionally, space for electric arcs must be kept clear above the switch disconnectors.**

**WARNING!** An electric arc always occurs with switch disconnectors, and may occur with disconnectors. For this reason, ensure that the switching devices are not used in potentially explosive areas.

**WARNING!** A sufficient safety distance must be maintained between the switching devices and flammable objects or substances.

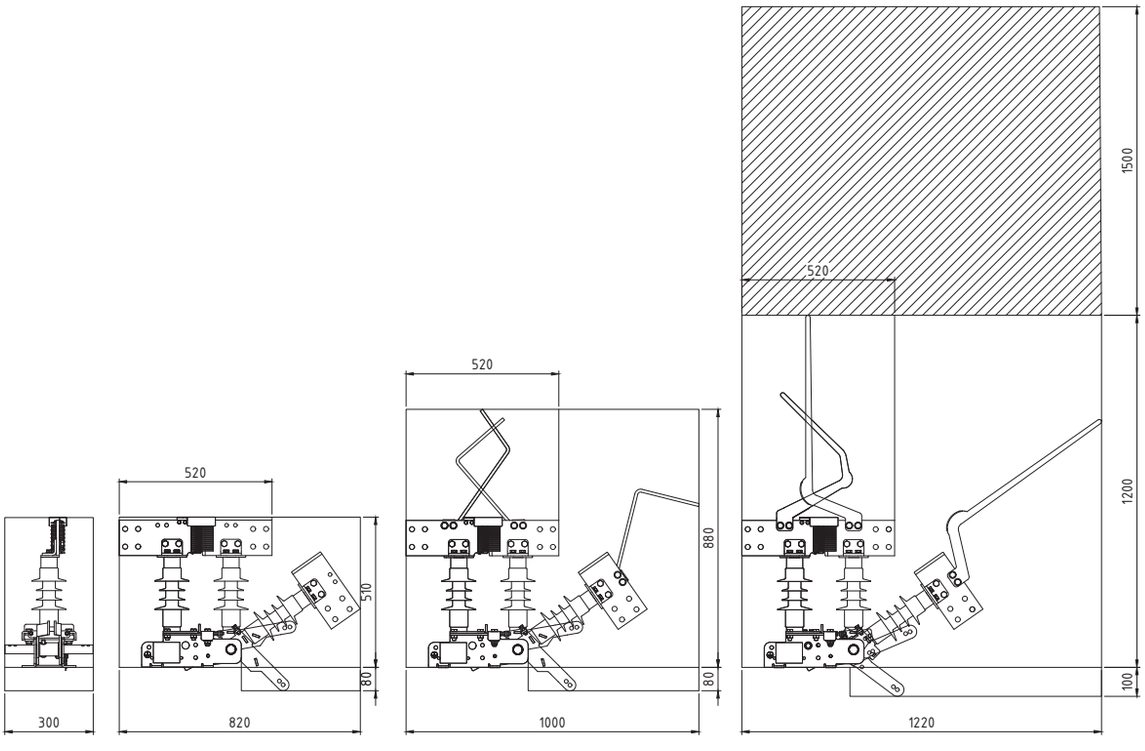



*Fig. 4: Bounding boxes*

## 5.4 Attaching the device at the installation site

The switching device must be attached using at least 4 x *M10* at the installation site. We recommend attaching the device using 4 x *M12* with a washer on the top of the fastening lugs, in order to protect the hot-dip galvanised surface from damage when the bolts are tightened. If these washers have a burr, it must face away from the switching device.

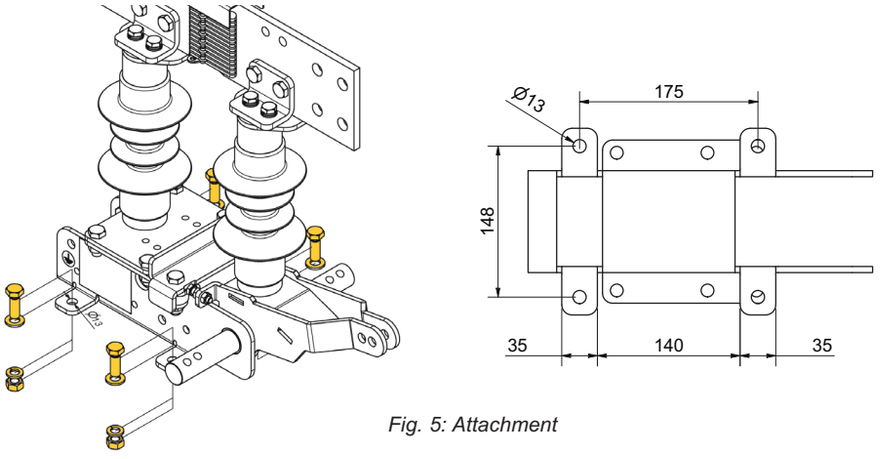



*Fig. 5: Attachment*

| *Recommended tightening torques for bolted connections without any oil or grease applied.*<br><br>*If lubricants are being used, the tightening torques must be determined independently.* | **Bolt** | **Tightening torque** |
|---|---|---|
| | M10-A2-70 | 45 Nm |
| | M12-A2-70 | 75 Nm |
| | M10-8.8 | 54 Nm |
| | M12-8.8 | 92 Nm |

**ATTENTION:** To ensure the device is installed correctly, we recommend either a level installation surface with a flatness tolerance of 0.5 mm or better which has been accurately aligned using a spirit level, or tightening two diagonal fastening points to the correct torque in the first instance. Any remaining air gaps can then be filled with spacers before tightening the remaining two bolted connections.

## 5.5 Establishing the ground potential

If desired or necessary, all versions of the OL-DC product line offer a connection for establishing a separate ground potential (6). An *M12* bolted connection is provided on both sides of the switching devices for this purpose.

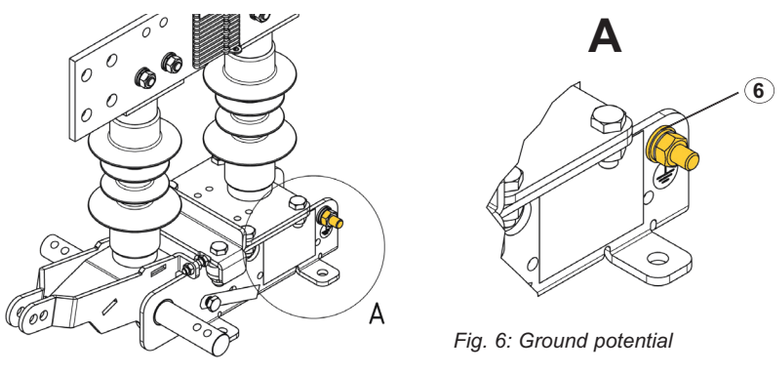



*Fig. 6: Ground potential*

## 5.6 Establishing the high-voltage connection

The various versions of the OL-DC product line can be connected in different ways. The fixed part (7) of the switching devices can be connected to the power supply using either a flexible cable or busbar. The moving part (8) must be connected using a flexible connection cable. The cable cross-section to be used depends on the load profile. We recommend connecting a 150 mm² cable with *M16* cable lug.

Connect all cables or bars to the connection contacts (11).
*(M12/8.8 hex bolt, 2, washers and nuts – stainless steel)*

**Tightening torque: 75 Nm.**

Depending on the rated short-circuit current, additional supports must be provided on the power supply lines. The data provided on the relevant switching device drawings is binding here. The switching device must not be subjected to additional impact loads from flapping cables.

**Recommended cable length: l = 870 mm**

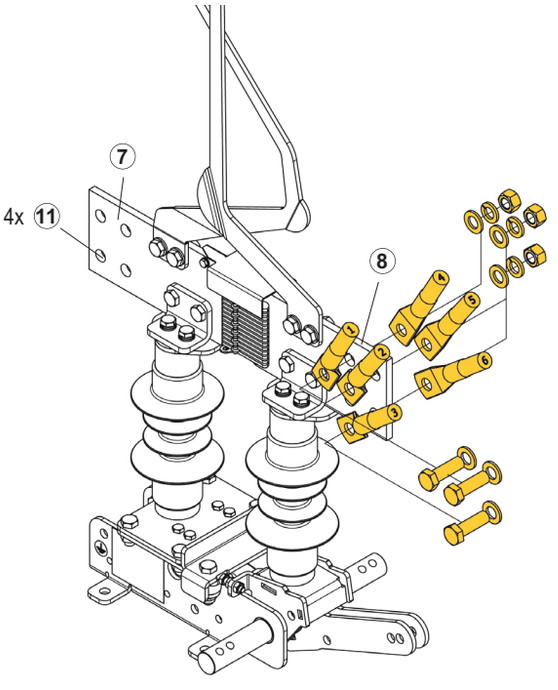
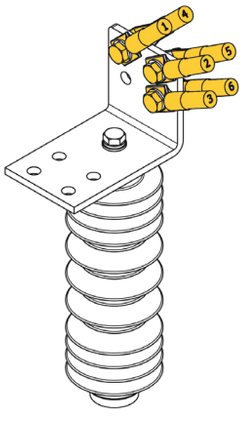



*Fig. 7: Establishing high-voltage connections*



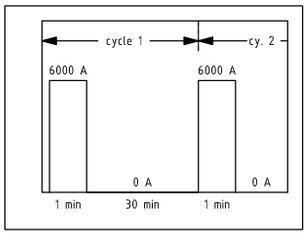
**Additional support by a post insulator at the side**

## Connection recommendation

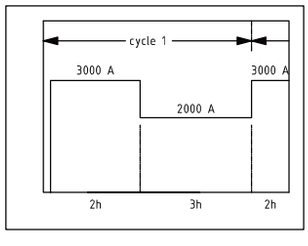
The switching devices in the OL-DC product line have been tested under the toughest conditions with hours under a constant load of 3,150 A and more.
However, as real-world usage conditions on the line involve significantly shorter current flow times and longer pauses, the switching devices can be connected much more economically with a considerably reduced cross-section.[1)]
The following connection recommendations from Table[2)] can be used.

| Current | Cycle | Cross-section | Example |
|---|---|---|---|
| *2.000 A* | Continuous | 600 mm² | 4 x 150 mm²<br>6 x 90 mm² |
| *2.500 A* | Continuous | 900 mm² | 6 x 150 mm² |
| *3.150 A* | Continuous | 1.200 mm² | 8 x 150 mm² |
| *1 min @ 6.000 A*<br>*30 min Pause* | Cycle A | 600 mm² | 4 x 150 mm²<br>6 x 90 mm² |
| *2 h @ 3.000 A*<br>*3 h @ 2.000 A* | Cycle B | 600 mm² | 4 x 150 mm²<br>6 x 90 mm² |
| *2 min @ 3.150A*<br>*5 min Pause* | Cycle C | 300 mm² | 2 x 150 mm² |

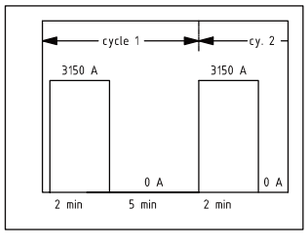
**Cycle A**
*Starting current / short-term overload*




**Cycle B**
*High load e.g. in stations*




**Cycle C**
*High frequency overhead contact line*




Cycle A and B in accordance with DIN EN 50329 load class VI for mainline railways

1) *The connections on the switchgear are not part of it. The line operator is responsible for correct configuration of the connections.*

2) *All figures determined under laboratory conditions. Sunlight, wind, snow, ice and rain can have a significant influence.*

We recommend additional support by a post insulator at the side (15) to provide improved, robust cable routing on the moving post insulator side (8). It can be mounted on both the left and right sides and should be located at least 500 mm away from the contact.
This ensures that the cable sag is optimised and the cable routing has only a minimal impact on the switching response. The cable is connected in the same way as the switching device itself

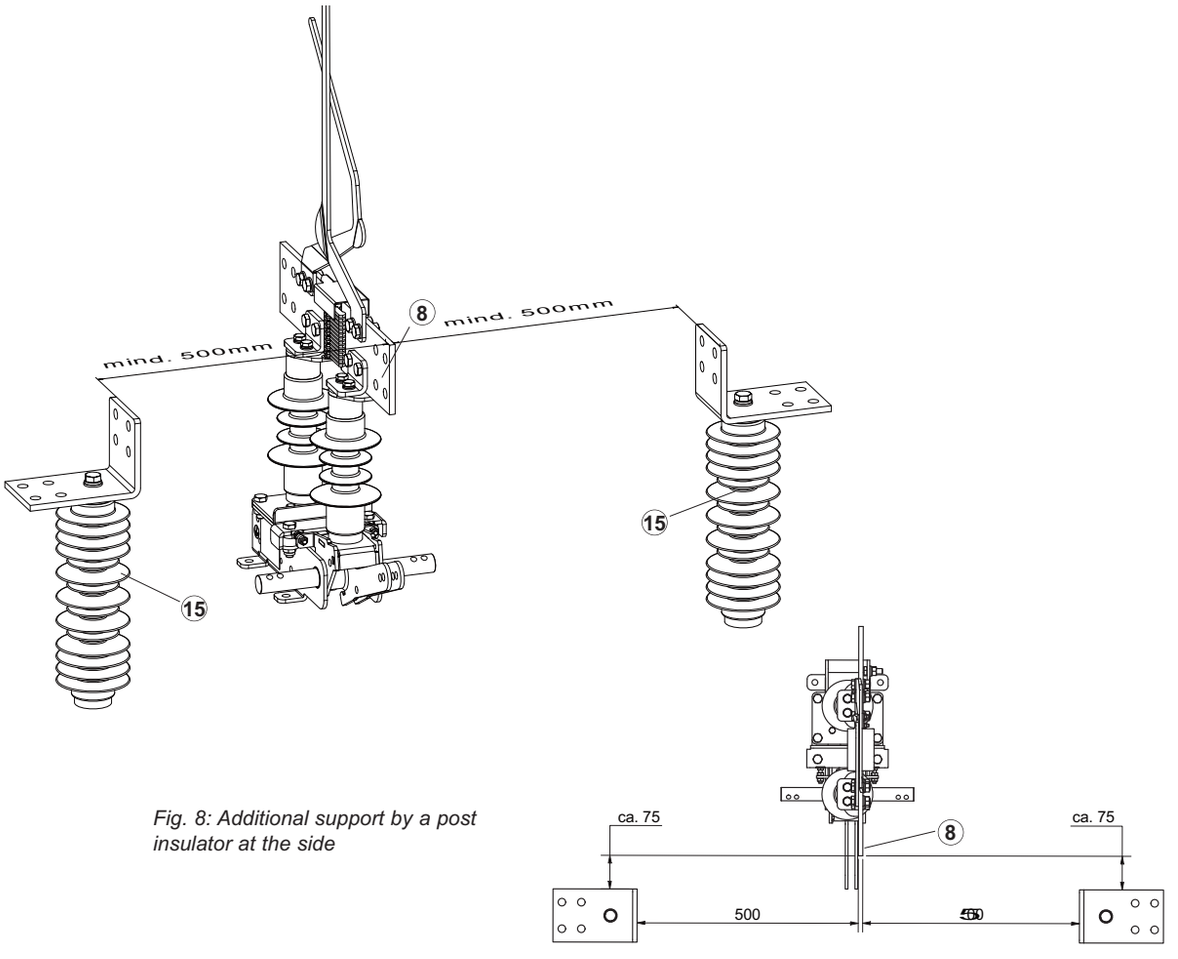



*Fig. 8: Additional support by a post insulator at the side*

## 5.7 Attaching the switch drive

**ATTENTION:** When working on the switching device, ensure that it has been secured against accidental switch-off. We recommend inserting the transport lock *(12, see Fig. 2)* if it is not already fitted from when the device was stored or transported.

The DRIESCHER 1-inch drive rod or the Flexball drive are suitable as the best possible drive concept for the OL-DC products.

### 5.7.1 Rod drive

To use the rod drive system, the clamping rod head *(13, item number 2-77571160)* must be connected to the switching device. Two mounting points are provided for this purpose, depending on the drive type and manufacturer. Two different throws are possible: 180 mm and 200 mm. We recommend the 200-mm position for most applications *(outer position, see Fig. 9)*.

**ATTENTION:** The joint bushing (14) is a critical part for the switching device to work. It is essential to install it as it enables the switching rod to be positioned at an incline and ensures the drive is free of play.

**ATTENTION:** The clamping rod head (13) and the hinge (2) of disconnectors as well as switch disconnectors are able to compensate inclined rod positions of up to ±7° between the rod axis and the horizontal (hinge axis).

The clamping rod head (13) must be secured using a bolt and locked in place with the enclosed splints. The splints must be bent on both sides to ensure they cannot be lost.

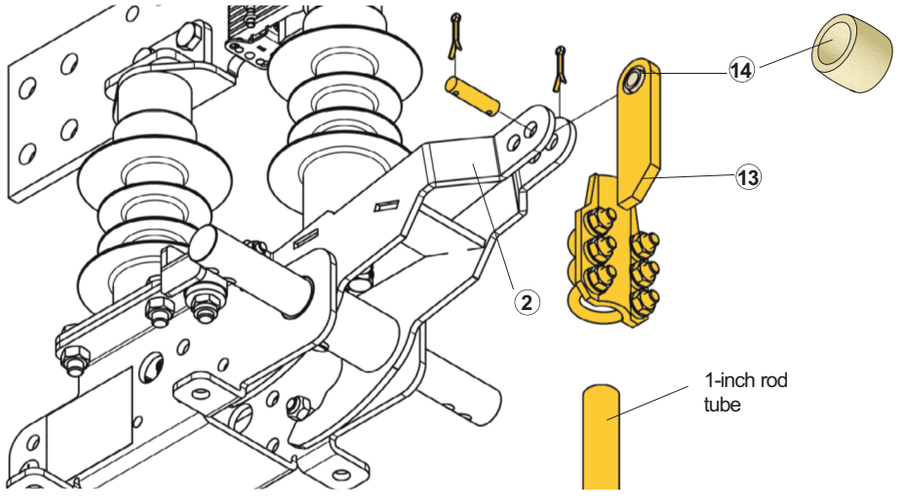



*Fig. 9: Mounting the clamping rod head*

### 5.7.2 Flexball drive

As an alternative to the traditional rod drive system, the products in the OL-DC line can also be driven by a Flexball. Two mounting points are provided for this purpose, depending on the drive type and manufacturer. Two different throws are possible: 180 mm and 200 mm. We recommend the 200-mm position for most applications *(outer position, see Fig. 10).*

**ATTENTION!** A separate end member is required to mount the Flexball *(see Fig. 10)*.

**WARNING!** There must be no angular misalignment between the Flexball end piece and the hinge axis. Any lateral misalignment between the hinge and Flexball must be compensated by the flexible part of the Flexball. Otherwise there is a risk of increased wear, either at the connection point to the Flexball or in the main bearing point.

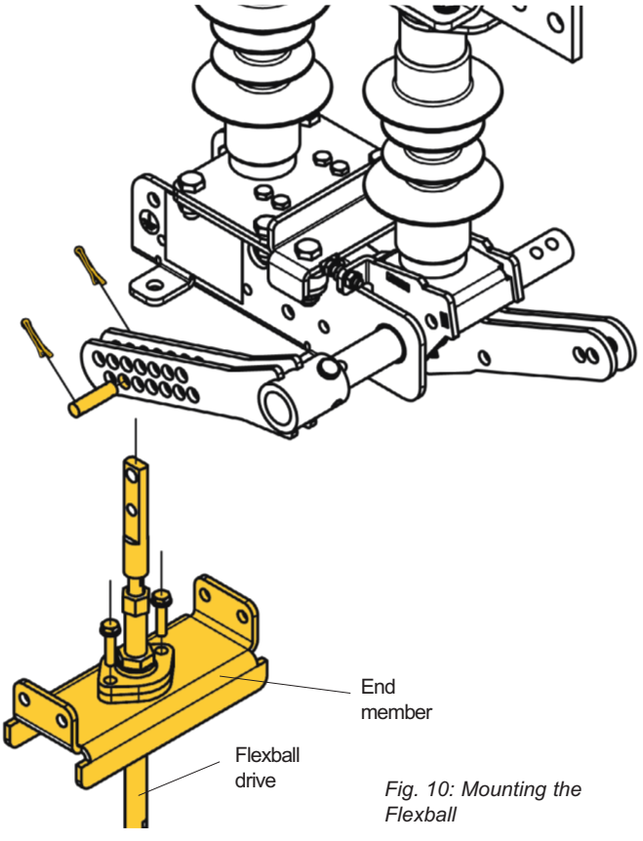



*Fig. 10: Mounting the Flexball*

## 5.8 Functional check

**ATTENTION:** Ensure that the transport lock *(12, see Fig. 2)* is removed before the first switching cycle takes place.

To correctly commission the device, 5 test switching operations must be performed with the device de-energised. Repeating the switching operations in this way is also intended to ensure that there is no drift.
We recommend carrying out the test switching operations manually, using the emergency hand mechanism if using a motor drive.

Check the following during the test switching operations:

- Moving part of main circuit (8) is inserted correctly into the centre of the contact system.
- The arc quenching system (10a) and pre-arcing horns (10b) must not catch on one another, rather they should slide by one another
- There must be no drift at the connection between the clamping rod head (13) and drive rod
- When switching on the device, the ON end stops (5) must not be set to “Block” or even prevent a complete switch-on.

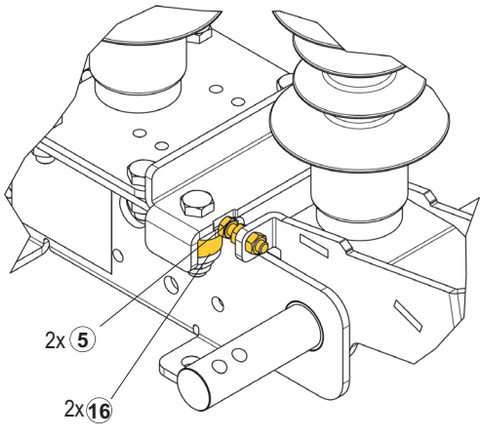



*Fig. 11: ON end stop and damping system*

**ATTENTION:** The emergency hand crank can fall down and cause injury. When the emergency hand crank is not pressed against the spring, it will fall down and could cause injury or material damage.

To avoid the risk of injury and material damage, remove the emergency hand crank each time after using it.

# 6 Mounting the equipment modules

## 6.1 Signalling or auxiliary switch attachments

The signalling or auxiliary switches (17) are supplied as a separate unit and can be attached on the left or right.
In order to install the auxiliary and signalling switches, the switching device must be moved into the closed position.

**WARNING!** Before performing work on the drive system, it is essential to secure LBS switch disconnectors against accidental switch-off using the transport lock *(12, see Fig. 2).*
In addition to the immediate danger arising from the switching device itself, there is also an acute risk of injury from components that are connected directly to the switching device, such as shaft extensions (19). Alongside the mechanical safeguards on the switching device, all drives also need to be secured to prevent them being actuated accidentally.

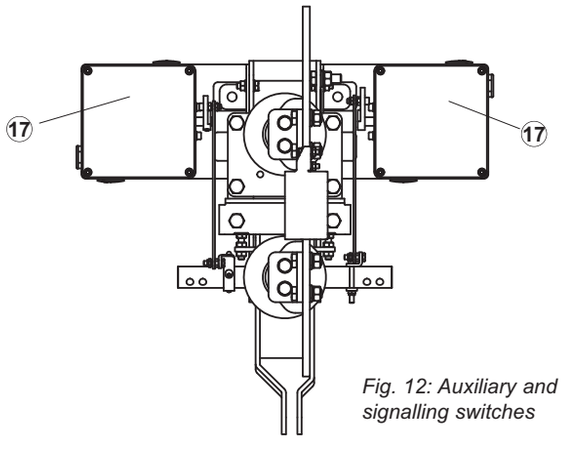



*Fig. 12: Auxiliary and signalling switches*

Push the entire unit onto the desired side and fasten it using the enclosed *M8* bolted connections (tightening torque of *20 Nm*, clean and free from oil and grease).

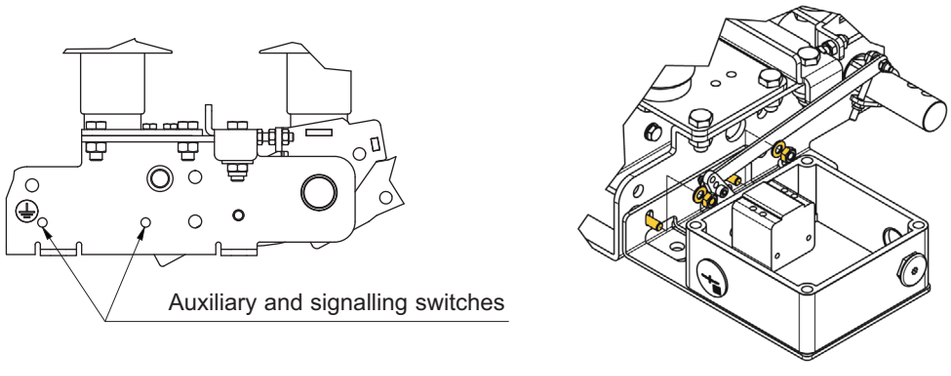



*Fig.13 : Attachment of auxiliary and signalling switches*

**ATTENTION!** When pushing it on, the connection to the drive shaft also needs to be pushed on at the same time. Pushing it on separately or at a later stage may damage the crank drive mechanism or the internal electric devices.

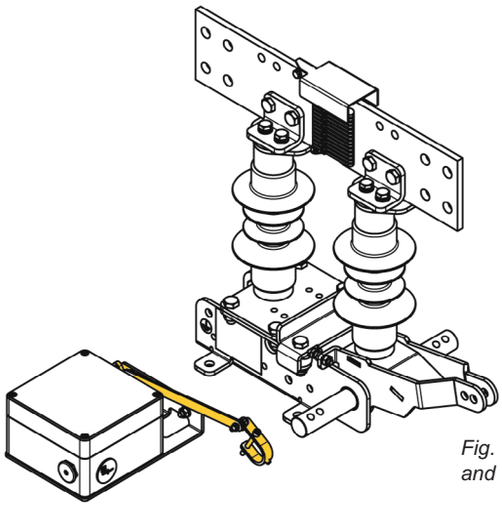


*Fig. 14: Adjusting the auxiliary and signalling switches*

To carry out adjustments, the device also needs to be in the closed position. To do this, move the crank drive mechanism (which is still released) by hand until you hear a clicking noise to indicate the switch-on. Then continue turning the crank by approx. 2° to 3°, but no more than 5°.
Clamp the crank in place using an *M6* bolt (tightening torque: 6 Nm) but do not tighten the *M6* threaded pin lock yet. Then check the switch-off position.
To do this, slowly open the switching device. We recommend actuating the disconnectors using the emergency hand actuator on the emergency hand drive. In the case of switch disconnectors, switch off the switch and simulate the switching movement by applying manual force. The switch-off is allowed to be indicated in the last 20% of the switching path.

**ATTENTION!** If the device cannot be switched off correctly, you are able to readjust the cams of the auxiliary/signalling switch.

Once correctly adjusted, now also tighten the *M6* threaded pin lock to 6 Nm.
Screw in the enclosed screwed cable glands at the desired points depending on your individual requirements and how easily these areas can be accessed.

**WARNING!** Check the screwed cable gland to ensure it is fitted and tightened correctly. If it is not fitted correctly, moisture may penetrate into the housing.

| | |
|---|---|
| Tightening torque for blank covers: | *2,5 Nm* |
| Installation of gland mainbody with locknut into housing: | *10 Nm* |
| Installation of compression nut onto gland mainbody | |
| gland operational ranges: | *7- 15 mm* |
| | *or 11- 21 mm* |

**WARNING!** Ensure that the correct operational range of the gland is used in conjunction to cable outer diameter. If it is exceeded or undershot, moisture may penetrate into the housing.

**ATTENTION!** The screwed cable glands used come with an integrated seal. A separate O-ring is not required.

**WARNING!** The housing cover must be evenly tightened to 4 Nm. We recommend working cross-wise when tightening the bolted connections. Incorrect assembly may enable water to penetrate through to the inside.

Check that the seal in the housing cover is correctly fitted. It must not be misaligned or damaged.

**ATTENTION!** When closing the housing, ensure that there is no water in the housing and remove any water that may be present.

**WARNING!** If the housing is closed on warm, humid days, condensation may occur when the temperature drops. Observe the prevailing climatic conditions on the day the housing is closed. It may be necessary to use a suitable drying agent such as silica gel.

## 6.2 Shaft extensions and side drive

To install a side drive actuator (18) with or without a shaft extension (19), the switching device must be moved into the closed position.

**WARNING!** Before performing work on the drive system, it is essential to secure LBS switch disconnectors against accidental switch-off using the transport lock *(12, see Fig. 2)*. In addition to the immediate danger arising from the switching device itself, there is also an acute risk of injury from components that are connected directly to the switching device, such as signalling or auxiliary switch attachments. Alongside the mechanical safeguards on the switching device, all drives also need to be secured to prevent them being actuated accidentally.

The side drive actuator is attached using a plug connection. We recommend first attaching the shaft loosely with the adapter and then using this as a guide to position the bearing block. A height-adjustable version of the bearing block is available, which can be adapted to suit any situation.

**WARNING!** When positioning the components, take care to ensure nothing is twisted/distorted as this could cause problems in the operation of the switching device.

Once the components have been positioned, the plug connections can be connected. All bolts must be fixed in place using a lock washer. If the corresponding tool for this is not available, it can be pushed on using a socket spanner socket with a suitable outer diameter.

**ATTENTION!** The lock washers must be pushed on perpendicular to the bolt. Do not use pliers, hammers or other tools that could crush the lock washers or that involve abrupt movements that could push the washers on at an angle.

**WARNING!** The lock washers can only be used once. If a bolted connection is undone again, a new lock washer must be used.

**ATTENTION!** The lock washer must be pushed on completely so that the bolt has no, or only minimal, play *(less than 1 mm)* in the hole.

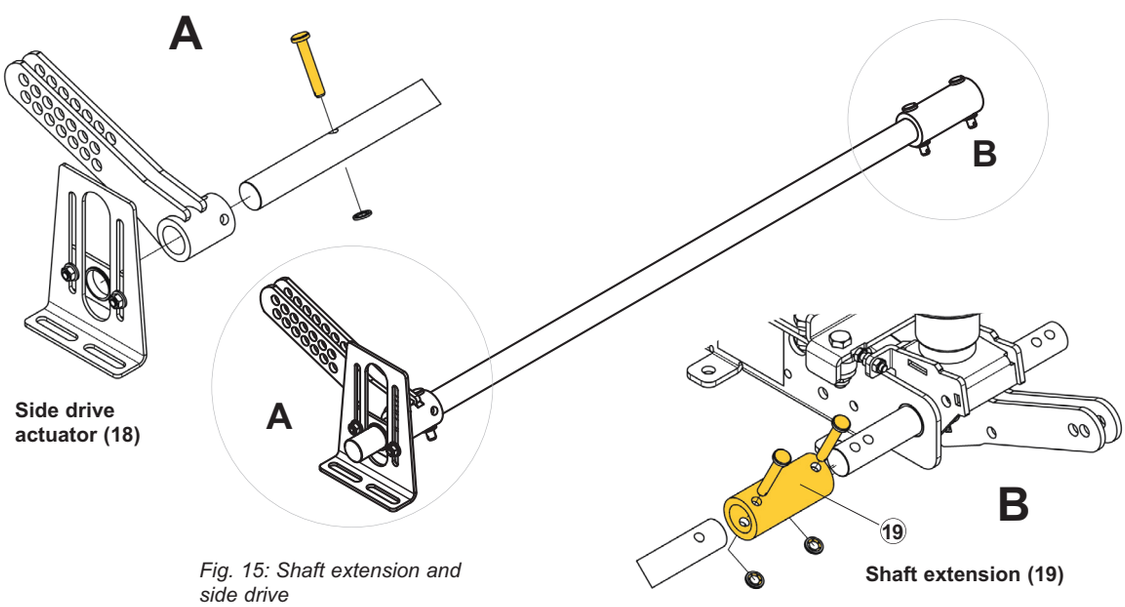



*Fig. 15: Shaft extension and side drive*

# 7 Operation

## 7.1 Work station

The owner must ensure that the work station complies with all valid regulations and has sufficient lighting.

## 7.2 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 or loose mounting parts are detected on the switching device, it may only be commissioned again after it has been repaired by an expert.
A check must be carried out to ensure that the *safety installations* are complete and functional prior to commissioning.

### 7.2.1 Commissioning

Once all the assembly work is complete and the functional check has been successfully passed, the switching device is ready for use.

### 7.2.2 Operation

A suitable hand drive mechanism can be used to operate the device. It is important to observe the necessary throw of approx. 200 mm for the relevant switching types.

### 7.2.3 Temporary decommissioning

The automatic switch function of the switching device can be decommissioned by switching off / disconnecting the supply voltage on the motor drive UM.

### 7.2.4 Decommissioning

The switching device can be decommissioned by disconnecting the supply voltage on the motor drive UM and all switch connections (switch cables and wires to the auxiliary switch).

# 8 Maintenance

## 8.1 Maintenance intervals

### 8.1.1 Annual

**Visual check, inspection**

- Remove soiling
- Check the wear on the contact surfaces of the moving part of the main circuit (8) and on the contact system.
  Contact surfaces must have a silver appearance; there must be no electric marks (visible copper).
- If the silver layers have worn down too much (visible copper), replace the contact components.
- Check that switch positions ON / OFF are reached completely.
- Check for visible and/or audible discharges over insulated sections.

### 8.1.2 If there are more than 50 switching cycles under full load (LBS only)

The arc quenching device on switch disconnectors is designed to handle 50 switching cycles under full load. If this number is exceeded, the quenching system must be replaced.
This work must be carried out by DRIESCHER specialist personnel as fine adjustments are required in this case to ensure the device works optimally.

### 8.1.3 Switching under load (000 and ARC)

If a type 000 or ARC disconnector is accidentally switched under load, inspect the switching device for damage caused by loss of material.
If fault patterns that impair the device's functionality are identified, decommission the switching device and have it repaired by DRIESCHER specialist personnel.

### 8.1.4 Every 1,000 switching cycles

According to DIN EN 50123, switch disconnectors for DC applications have a maximum switching capacity of 1,000 mechanical switching operations. If you would like to continue using the switching device beyond this limit, it must be inspected and checked for damage.
This work must be carried out by DRIESCHER specialist personnel as fine adjustments are required in this case to ensure the device works optimally.

### 8.1.5 After every short-circuit load

After being subjected to any short-circuit load, the switching device must always undergo a thorough inspection in order to check for damage and incorrect adjustment.

## 8.2 Visual check of main contact system

The switching device must be checked to identify any missing components and ensure it is adjusted correctly. Important adjustment parameters together with their correct and potential incorrect settings and the impacts thereof are outlined below. If a setting is out of tolerance, maintenance work must be performed on the mechanics of the switching device. It is essential to replace any damaged components and assemblies during this process.
This work must be carried out by DRIESCHER specialist personnel as fine adjustments are required in this case to ensure the device works optimally.

**WARNING!** Incorrectly adjusted, missing, loose or damaged components may impair the device's functionality and result in personal injury.

**ATTENTION!** The switching devices in the OL-DC product line are finely adjusted in the factory. In particular, work on fast-switching mechanisms or arc quenching devices of switch disconnectors must only be performed by DRIESCHER specialist personnel.

### 8.2.1 Correctly adjusted – side view

The moving part of the main circuit (8) is optimally inserted into the contact fingers. When in the end position, both main circuits are roughly parallel to one another. The moving part is symmetrical to the contact fingers. This setting provides the optimum current-carrying capacity and ensures minimal wear.

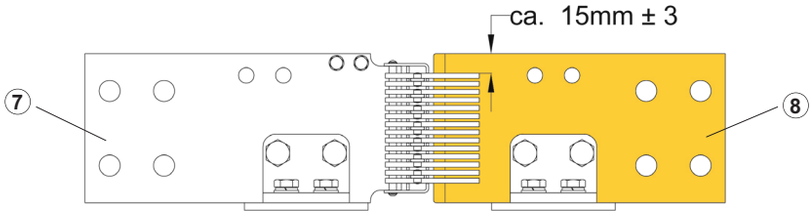



*Fig. 16: Contact setting around the horizontal axis*

### 8.2.2 Incorrectly adjusted – side view

If an incorrect, out-of-tolerance setting is identified, maintenance work must be performed on the mechanics of the switching device. The switching device must be checked for mechanical damage and the incorrect setting must be corrected immediately.

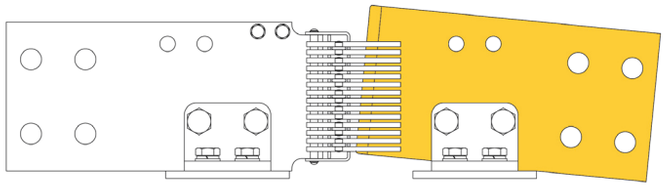


*Fig. 17: Incorrectly adjusted – side view – misaligned*

**Misaligned:** If both top edges are positioned more than 2° from one another. The current-carrying capacity is not immediately guaranteed when the device is switched on. If the two edges are too misaligned, the current-carrying capacity also cannot be guaranteed during operation. This fault pattern causes higher and uneven wear.

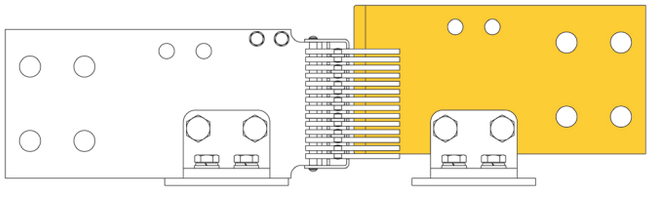


*Fig. 18: Incorrectly adjusted – side view – parallel misalignment*

**Parallel misalignment:** Parallel misalignment of more than approx. 3 mm between the two main circuits. The current-carrying capacity may be impaired if they are misaligned too much. This fault pattern causes higher wear.

### 8.2.3 Correctly adjusted – top view

When viewed from above, the main circuits are parallel to one another. It is inserted far enough. This setting provides the optimum current-carrying capacity and ensures minimal wear.

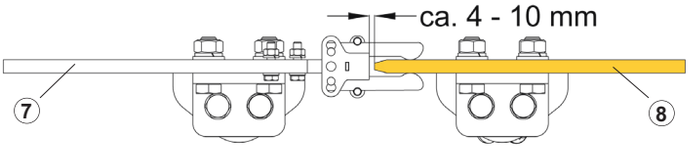



*Fig. 19: Contact setting around the vertical axis*

### 8.2.4 Incorrectly adjusted – top view

If an incorrect, out-of-tolerance setting is identified, maintenance work must be performed on the mechanics of the switching device. The switching device must be checked for mechanical damage and the incorrect setting must be corrected immediately.

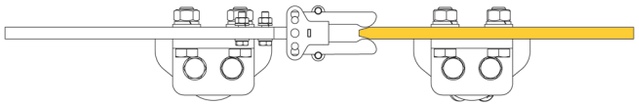


*Fig. 20: Incorrectly adjusted – not inserted far enough*

**Not inserted far enough:** No or significantly reduced current-carrying capacity. There is a risk of partial discharges or electric arcs, which could cause irreparable damage. Always ensure the main circuit is inserted far enough. The moving part of the main circuit (8) must spread the contact fingers completely apart and all fingers must make contact across their entire surface. The minimum insertion depth is 8 to 10 mm.

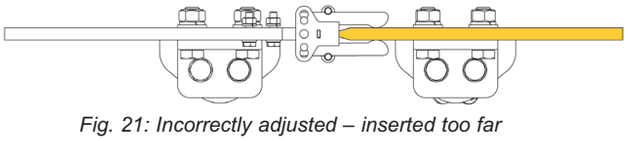


*Fig. 21: Incorrectly adjusted – inserted too far*

**Inserted too far:** The moving part of the main circuit is hitting the contact fingers. Mechanical damage may occur, which would impair either the device's functionality or the current-carrying capacity.

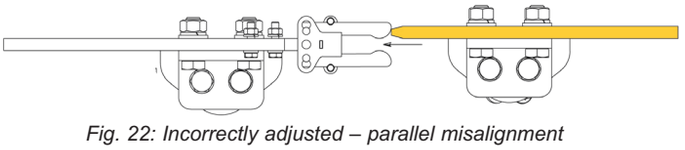


*Fig. 22: Incorrectly adjusted – parallel misalignment*

**Parallel misalignment:** If it exceeds approx. 1 to 2 mm from the centre position, this will impair the current-carrying capacity and the level of wear will increase disproportionately.

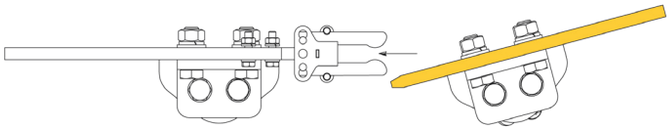


*Fig. 23: Incorrectly adjusted – angular misalignment*

**Angular misalignment:** The difference in alignment between the two axes should be less than approx. 2° to 3°. The current-carrying capacity is impaired and the level of wear increases disproportionately.

## 8.3 Visual check of the horns

### 8.3.1 LBS switch disconnector

When the device is switched on and off, the horns of the arc quenching device (10a) must make continuous contact until the main contact is completely closed or opened.
The horns of the arc quenching device should be checked for wear after 1,000 switching cycles – even if they were carried out whilst de-energised – and replaced if necessary.

**WARNING!** If the device is incorrectly adjusted, pre-ignition cannot take place on the designated horns; instead it takes place on the main contact system. The resulting damage could result in any or all of the following: reduced current-carrying capacity, increased wear and/or impaired function or premature failure.

The horns on the arc quenching device are a wearing part. They are designed to handle 50 switching operations under full load. If this limit is reached, the horns must be replaced.
Every switching operation, even under minor loads involving, an electric arc causes a small amount of material to be lost at the tips, which builds up over time. Make sure to check the horns for any loss of material, even if the maximum electric service life of 50 switching operations under full load has not been reached yet.
If the length has been shortened by more than 100 mm, these wearing parts must be replaced.

**WARNING!** If more material has been lost than is permitted, the switching device is no longer guaranteed to work properly.

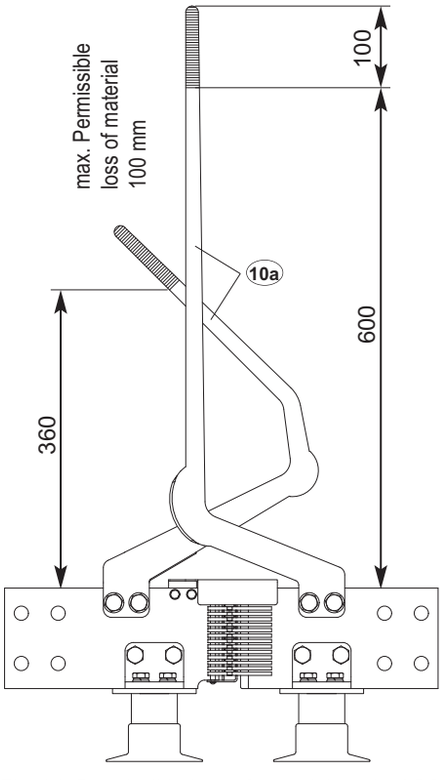



*Fig. 24: Permissible loss of material on the LBS*

### 8.3.2 ARC disconnector

When the device is switched on and off, the horns of the arc quenching device should make continuous contact until the main contact is completely closed.

**WARNING!** Disconnectors are only designed for currentless switching operations according to utilisation category I. If a disconnector is accidentally switched whilst under load, it must be inspected and repaired.

## 8.4 Cleaning

The switching devices should be cleaned as required in order to ensure they work optimally. This will reduce the level of wear, prolong their service life and ensure optimal insulation resistance.

**ATTENTION!** The devices should be cleaned while in the open position so as to provide the best possible access.

**WARNING!** The devices must always be completely de-energised (no current and voltage) when being cleaned, even if they are being cleaned using machines.

**WARNING!** The use of strong solvents or acidic cleaning agents is not permitted. Any cleaning agent residues must be rinsed away with clear water.

Once cleaning is complete, the lubrication points must be greased again. Please note the lubrication specifications for the contact system and bearing points in the *Lubrication* chapter.

**WARNING!** Do not direct a pressure washer at the bearing points (4). This could cause dirt to be pushed even deeper into the bearing points, causing excessive wear.

### 8.4.1 Contact system

The contact system itself as well as the main circuits have a silver coating. Silver tends to form a black film on the surface. This is not important for the switching device to work properly. These layers are just a few micrometres thick and are either rubbed off or penetrated during every switching operation, meaning the full current-carrying capacity is ensured at all times. There is normally no need to remove these layers entirely.
However, depending on how contaminated the ambient air is, dust, foreign particles and other substances will accumulate in the lubricant over time, which could increase the amount of abrasion during the switching operation. For this reason, clean the contact system at regular intervals. Please see the *Maintenance intervals* chapter for details.

Contact parts must be cleaned using **S.L.X. 500** *(see chapter 8.6)*.

### 8.4.2 Insulators

The insulators in the OL-DC product line are designed as composite post insulators. They have a surface made of silicone plastic, which must only be cleaned using suitable cleaning agents.
**Rivolta M.T.X. 60** *(see chapter 8.6)* is approved for this purpose. Once cleaned, the insulators must be wiped dry.

**WARNING!** The use of incorrect solvents and cleaning agents may impair the mechanical strength, weather resistance or insulation resistance.

### 8.4.3 Frame, hinge and drive mechanisms

All structural load-bearing parts have a hot-dip galvanised surface. Only non-abrasive cleaning agents or aids may be used for cleaning. Non-ionising surfactant-based cleaning agents (soapy water) are approved for hot-dip galvanised components. Any residue must be rinsed away with clear water.

**WARNING!** The use of abrasive cleaners, wire brushes or similar will remove the protective zinc layer, leading to premature corrosion.

**WARNING!** The use of cleaning agents containing acids or alcohol will remove the zinc layer. This fluid may accumulate in certain places, in particular in hard-to-reach areas or corners. The use of cleaning agents containing acids will cause premature corrosion.

## 8.5 Lubrication

To ensure a long service life and that the switching device works correctly, critical points on the device need to be lubricated at regular intervals. Please see the *Maintenance intervals* chapter for details.

### 8.5.1 Contact system

In order to lubricate the contact system, the switching device must be moved into the OFF position. Only **Barietta L55/1** *(see chapter 8.6)* is approved for lubricating the contact system. Apply a thin layer of lubricant at the relevant points as shown.

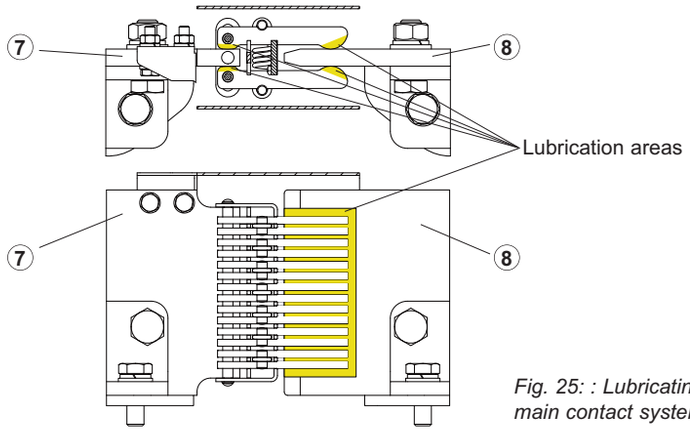



*Fig. 25: : Lubricating the main contact system*

**WARNING!** Applying too much, even outside the designated areas, will cause an increased build-up of dirt which could impair the device's functionality.

### 8.5.2 Bearing points

The bearing points (5) on the switching devices differ depending on whether it concerns the switch disconnector (LBS) or the disconnector (000 and ARC). Switch disconnectors have four bearing points.

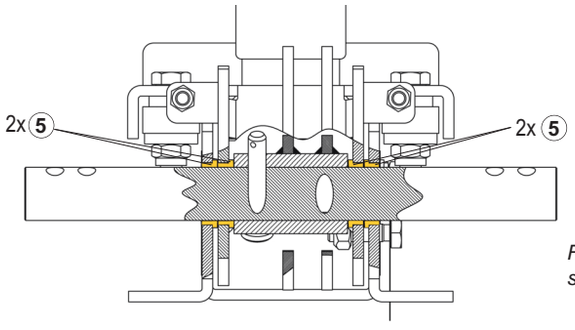



*Fig. 26: Four bearing points on the LBS switch disconnector (sectional view)*

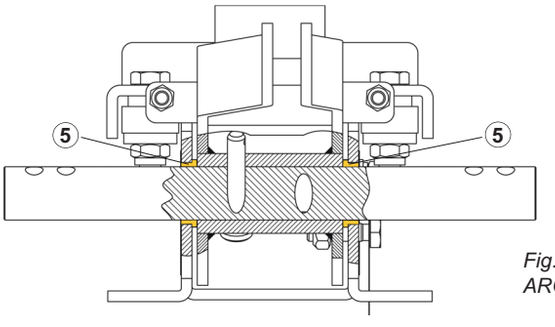



*Fig. 27: Two bearing points on the 000 and ARC disconnectors (sectional view)*

On both types of switching device, the bearing takes the form of steel on heavy-duty bronze, meaning only a minimal lubricating film is required.
The bearing points must be lubricated with **Rivolta S.D.K. 16 N** *(see chapter 8.6*).

Once lubricated, the switching device must be switched roughly five times when de-energised. Repeat the lubrication process if necessary until a sufficient lubricating film is provided in the bearing bushings.

**ATTENTION!** After lubricating the device, remove any excess grease in order to prevent a build-up of dirt, dust and other substances. To do this, wipe it away with a dry cloth.

## 8.6 Approved cleaning agents and lubricants

| Item number* | Lubrication designation/type | Manufacturer |
|---|---|---|
| 1-49007110 | Rivolta S.K.D. 16 N | Bremer & Leguil |
| 1-49009102 | S.L.X. 500 | Bremer & Leguil |
| 1-49009100 | Rivolta M.T.X. 60 forte | Bremer & Leguil |
| 1-49007010 | Barrierta L55/1 | Klüber Lubrication |
| 1-49007100 | Rivolta S.K.D. 4002 | Bremer & Leguil |

* At DRIESCHER

# 9 Technical data

| OL-DC 3-3150-40-... | | Disconnector -ARC | Switch disconnector -LBS |
|---|---|---|---|
| **Electrical specifications** | | | |
| *Nominal voltage [kV DC]* | $U_n$ | 3 | 3 |
| *Rated voltage [kV DC]* | $U_{Ne}$ | 3.6 | 3.6 |
| *Rated insulation voltage [kV DC]* | $U_{Nm}$ | 4.8 | 4.8 |
| *Overvoltage level* | *OV* | 4 | 4 |
| *Rated impulse withstand voltage [kV]*<br>*- Phase - phase / Phase - earth*<br>*- across the isolating distance* | $U_{Ni}$ | <br>40<br>48 | <br>40<br>48 |
| *Power frequency withstand voltage level [kV]*<br>*- Phase - phase / Phase - earth*<br>*- across the isolating distance* | $U_a$ | <br>18.5<br>22,2 | <br>18.5<br>22,2 |
| *Rated continuous current [A]* | $I_{Ne}$ | 3150 | 3150 |
| *Rated short-time withstand current [kA]* | $I_{Ncw}$ | 40@ ¼ s | 40@ ¼ s |
| *Short-circuit current [kA]* | $I_{ss}$ | 40 | 40 |
| *Rated short-circuit current [kA]* | $I_{Nss}$ | 57 | 57 |
| *Breaking capacity [A]* | | - | 3150 |
| *Making capacity [A]* | | - | 3150 |
| *Rated short-circuit making capacity [kA]* | | 40 | 40 |
| *Utilization category* | | I | III |
| **Isolator specifications** | | | |
| *Minimum gap phase - earth [mm]* | | 251 | 251 |
| *Minimum gap over isolating distance [mm]* | | 270 | 270 |
| *Creepage distance length, approx. [mm]* | | 394 | 394 |
| *Degree of pollution* | | PD4A | PD4A |
| **Mechanical specifications** | | | |
| *Dimensions*<br>*- Height, approx. [mm]*<br>*- Width [mm]*<br>*- Depth [mm]* | | <br>764<br>300<br>530 | <br>1193<br>300<br>530 |
| *Weight, approx.*[3] *[kg]* | | 27 | 28 |
| *Switching parameter*<br>*- Throw* [4] *[mm]*<br>*- Recommended drive torque, approx.*[5] *[Nm]*<br>*- Switching force, approx.* [6, 7]*[N]* | | <br>180 / 200<br>250<br>450 / 500 | <br>180 / 200<br>250<br>450 / 500 |
| *Number of poles* | | 1 | 1 |
| *Ice category* | | Class 10 | Class 10 |
| *Corrosion class DIN EN ISO 14713* | | C3 high | C3 high |
| *Temperature [°C]* | | -25 to +40 | -25 to +40 |
| *Max. wind speed [m/s]* | | 34 | 34 |

[3] *without add-on modules*

[4] *Multiple throw system for Driescher UM90, UMPlus and drives from other manufacturer*

[5] *When used with Driescher UM90, UMPlus*

[6] *Under normal conditions. The switching force may differ under icy conditions (serviceability verified up to 10 mm ice layer)*

[7] *Lower value applies to 200 mm distance, higher value to 180 mm distance*

# 10 Disposal

The switching device 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. 2002/96/EC (WEEE)

## Your Notes

## Service address

Our specialist personnel can be contacted by telephone in the event of faults or to answer any questions you may have with regard to 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**



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