

Contact line: Design. Overhead contact line disconnect switches

1 Purpose and scope

Overhead contact line disconnect switches are disconnectors or switch disconnectors used to segment or disconnect parts of the overhead contact line system when work is being carried out on or near the overhead contact line system. Disconnect switches may also be fitted with earthing blades that earth the part of the overhead contact line system that has been disconnected.

1.1 Location of disconnect switches

Disconnect switches must be used at all points of connection to the overhead contact line system. Connection points to the overhead contact line system may be found at:

- feeder stations
- switching posts
- zone limit switches
- train pre-heating transformers
- auxiliary power transformers

In addition, disconnect switches must be used wherever bridging feeders, reinforcing feeders and current supply lines are connected to the overhead contact line, as well as locations where, for practical reasons, it must be possible to segment the overhead contact line system.

Disconnect switches may be either manually-operated models or models that are remote-controlled via a motor drive mechanism. Manually-operated disconnect switches may only be installed:

- on sidings on which the overhead contact line system is normally disconnected
- on loading and unloading sidings
- on tracks on which rolling stock is stabled
- for auxiliary power transformers
- for preheating equipment for trains

Remote-controlled disconnect switches must be used to segment overhead contact lines on main tracks and in major station areas. Disconnect switches that are used to segment the overhead contact line system on main tracks should be in the form of switch disconnectors. Normally, disconnect switches are installed in overhead contact line masts or switch masts. Where it is necessary for practical reasons, disconnect switches may also be installed in separate cabins. Requirements for the construction of buildings/cabins for disconnect switches are the same as for zone limit switch installations [Banestrømforsyning/Prosjektering/Sonegrensebryter](#).

1.2 Earthing switch

Earthing blades may also be fitted to disconnect switches. The switch then becomes known as an earthing switch. Earthing switches are used on loading sidings, in locomotive sheds and other similar locations where personnel need to work in close proximity to the overhead contact line system.

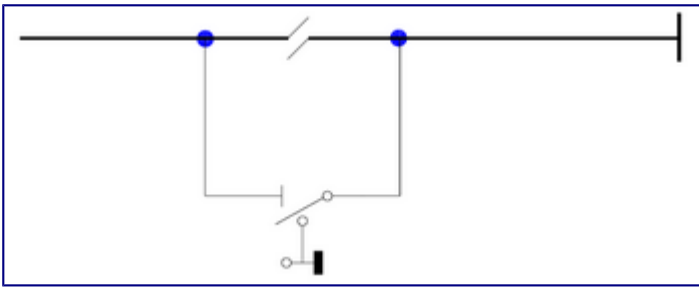


Figure 1: Earthing switches at loading sidings

For locomotive sheds in which the overhead contact line system continues into the shed, an insulated section must be installed in front of the shed, as shown on Figure 2.

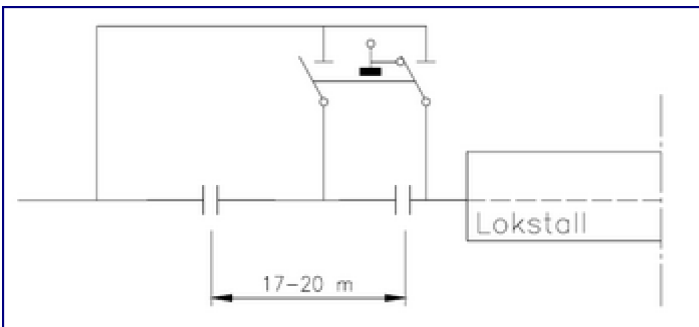


Figure 2: Overhead contact line system at locomotive sheds in which the overhead contact line system continues into the shed

2 Technical requirements

The insulation level for disconnect switches must be in accordance with [Felles elektro/Prosjektering](#)

[og bygging/Isolasjonskoordinering og overspenningsbeskyttelse.](#)

- Single-phase disconnecter with (if fitted) earthing device

Size: 850 A

Operating frequency: 16 2/3/50 Hz

Highest operating frequency: 36 kV phase-phase

Maximum short-circuit current: 20 kA

Insulators: Requirements stipulated in [Kontaktledning/Prosjektering/Isolatorer](#)

Norms: [EN 50152-1]

- or switch disconnecter

Switch capacity: 1,250 A

Operating frequency: 16 2/3/50 Hz

Highest operating frequency: 36 kV phase-phase

Maximum short-circuit current: 20 kA

Insulators: Requirements stipulated in [Kontaktledning/Prosjektering/Isolatorer](#)

Norms: [EN 50152-1]

Motor drive mechanism

Power supply: single phase 230 V ± 10 %

Motor current: 5 A

Operating temperature: -40°C to 50°C

Vertical travel of operating arm: 120 mm

Minimum connection power of arm (IN): 1,275 N

Minimum connection power of arm (OUT): 735 N

Disconnectors and switch disconnectors must be designed for the minimum short-circuit current (one second) specified in [Felles elektro/Prosjektering og bygging/Jording.](#)

In train formation yards and sites which have a documented low operating current, lower capacity switches may be used.

All equipment installed must be constructed so as to be able to function satisfactorily in all prevailing local weather conditions. If the equipment cannot tolerate the anticipated weather conditions, measures must be taken to reduce the impact of the weather to a level that enables the equipment to function.

The power supply to the motor drive mechanism must be provided in accordance with [Felles elektro/Prosjektering og bygging.](#)

3 Functional requirements

General functional requirements:

- It must be possible to fit the switches to standard masts.
- The drive pulse must be based on signals of a duration of less than 10 seconds.
- There must be a minimum of two potential-free auxiliary contacts or changeover contacts, and the motor must have inbuilt end stop switches.
- Remote-controlled disconnect switches must have inbuilt setting indicators for setting indications that satisfy [FSE].
- It must be possible to lock the motor drive mechanism in three different settings: remote-controlled, hand-operated ('in') and hand-operated ('out'). It must be possible to secure (lock)

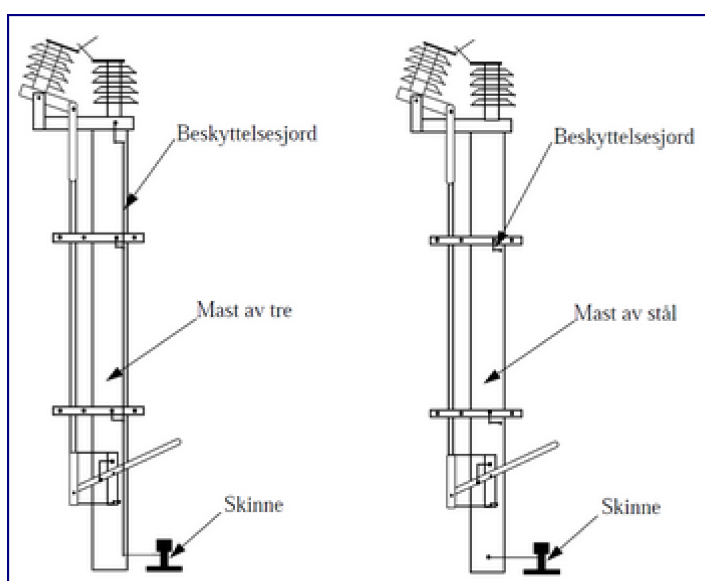
the motor drive mechanism with a standard padlock. For emergency operation, the motor drive mechanism must be fitted with a hand crank.

- It must be possible to lock hand-operated disconnect switches with standard padlocks, in two positions: 'out' and 'in'.
- It must be possible for a person to operate the disconnect switch in a normal, upright position, facing the rails.

4 Earthing

The disconnect switches must be earthed in accordance with the requirements specified in [FEF].

For a selection of types of protective earth, refer to section regarding requirements for earthing conductors and equalising connections in [Felles elektro/Prosjektering og bygging/Jording](#).



Figur 3: Earthing of disconnect switches

Earthing switches (disconnect switches with earthing blades), must have two separate earth connections to the track, connected to different sets of rails. Within station areas or other locations where only one set of rails is continuous, the two earthing connections must be connected to the same set of rails. Both earth wires must be routed all the way to the earthing switch, where one is connected to the bracket/fixing plate and the other at/beside the earthing blade (not shown in the figure). The isolating rod and operating handle must have equalising connections. Refer also to [Felles elektro/Prosjektering og bygging/Jording](#).

If the disconnect switch is located in a cabin, the installation must be earthed as a zone limit switch installation [Banestrømforsyning/Prosjektering/Sonegrensebryter](#)

5 Labelling

The installation must be labelled in accordance with [NEK 321] and [NEK 322]. All disconnect switches must be labelled with an identification number. The number may be obtained from the installation's operations manager.