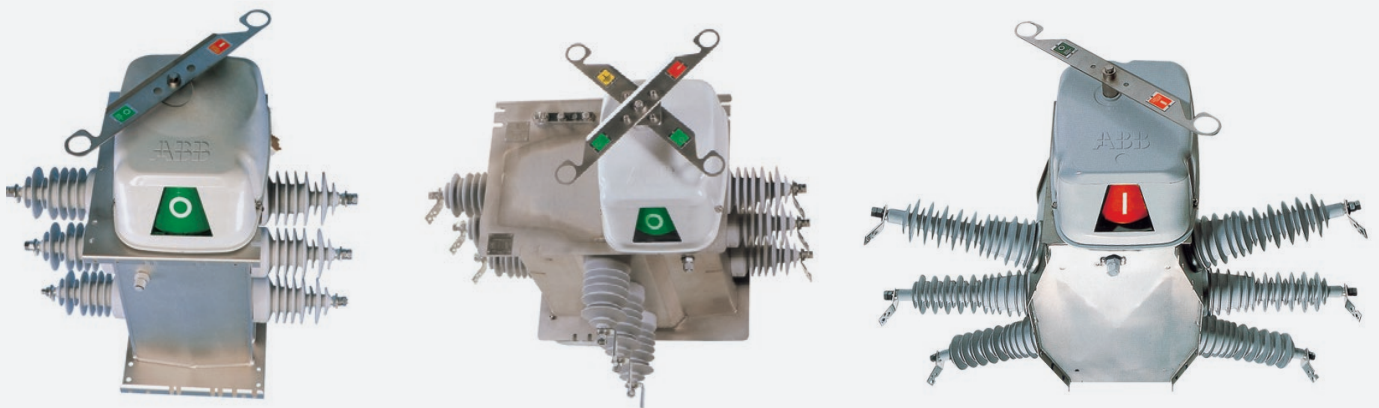


PRODUCT MANUAL

Sectos pole mounted load break switch

Types NXA_, NXB_, NXBD_, NXBS_



- Sectos pole mounted load break switch

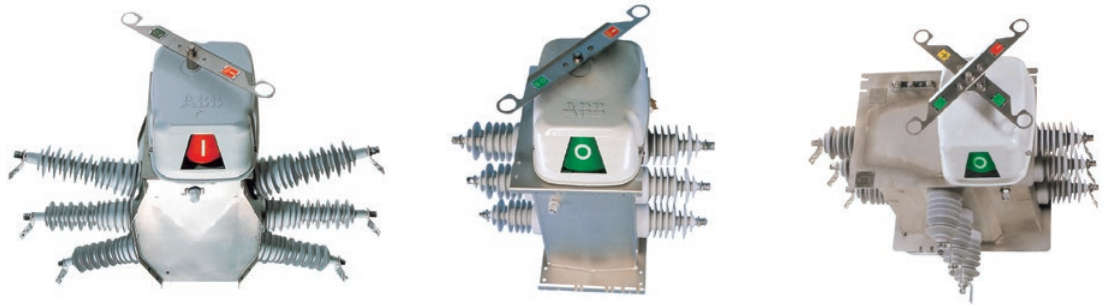
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01. Introduction

Nomenclature

Product family name "Sectos" is used, when the clause is applicable to all NXA_, NXB_, NXBD_, and NXBS_ types. The more specific type markings are given, when the clause is applicable to limited types only.



02. Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only qualified persons who are familiar with this equipment should install, operate, and service it.

A qualified person is one who has these skills:

- Is thoroughly familiar with these instructions
- High and low-voltage safe operating practices and procedures
- Energize, de-energize, disconnect, and ground power distribution equipment
- Using special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment
- Safety regulations concerning the use of lifting equipment, climbing and working at electric poles

This manual may contain four types of hazard statements:



Danger:

Indicates the most serious and immediate hazards which, if not avoided, will likely result in death or serious injury.



Warning:

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution:

Indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury or product or property damage.



Notice: Indicates a potentially hazardous situation which, if not avoided, may result in product or property damage only.

General safety instructions

The following general safety-alert statements apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

Some of these precautions may differ from company operating procedures and rules. Where a discrepancy exists, users should follow their company operating procedures and rules. Danger: Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all national and locally approved safety procedures when working around high and low voltage lines and equipment.



Danger:

Dangerous voltages can occur on the connectors even though the auxiliary voltage is disconnected.



Danger:

The frame of the device has to be carefully earthed.



Warning:

Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury, and equipment damage.



Warning:

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage.



Caution:

Power distribution equipment must be selected for the specific application. The application must be within the ratings given in the nameplate and this publication.

**Warning:**

The equipment must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install, or maintain this equipment can result in death, severe personal injury, and equipment damage.

**Notice:**

Breaking the sealing tape will result in loss of warranty, and a proper function of the product is no longer guaranteed.

**Warning:**

These warning do not cover every conceivable way in which service (whether or not recommended by ABB) may be done or possible hazardous consequence of each conceivable way, nor could ABB investigate all such ways. Anyone using service procedures or tools, whether or not recommended by ABB, must satisfy himself thoroughly that neither personal safety nor equipment safety will be jeopardized by the service method or tools selected.

03. General description

Sectos is a SF₆-insulated, pole mounted load breaking switch family for demanding environments. It has excellent load breaking and fault making capacity and satisfies the isolation requirements specified for disconnections. The earthed metal tank prevents all possible leakage currents across an open switch.

Sectos NXA is designed up to 38 kV rated voltages.

Sectos NXB is designed up to 24 kV rated voltages. The unique feature of this type is integrated earthing switch option.

Sectos NXBD is a 3-way load breaking switch using NXB components. Two independent load breaking switch in one enclosure with the third tapped way can be used for easy and reliable line branching in overhead, cable or mixed networks.

NXBS is a single-phase load breaking switch.

3.1 Connections

It is possible to connect Sectos to an overhead line directly, or to a cable network with a cable connector (applied for interface DIN47636 400-series or EN50181 type C).

3.2 Basic switch configurations

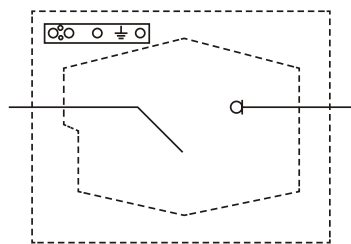
3.2.1 Load breaking switch (LBS)

The standard type is a 2-position load breaking switch with a manually operated spring mechanism.

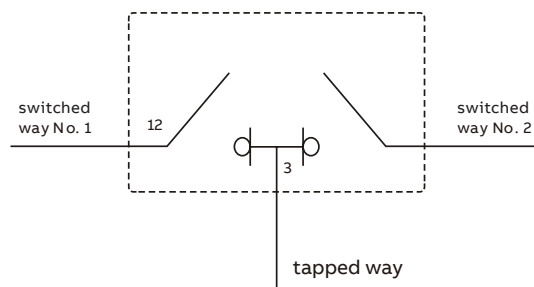
3.2.2 Load breaking switch with integrated earthing switch

All NXB_ types are also available with an integrated earthing switch for safe and reliable earthing of the downstream line. This version is called a 3-position switch to differentiate from the standard 2-position switch.

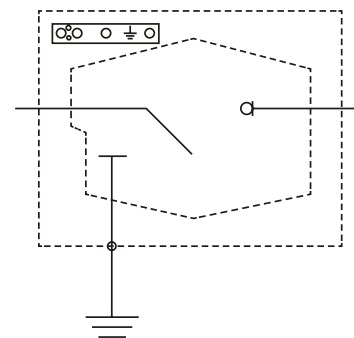
3.2.3 Three-way load breaking switch



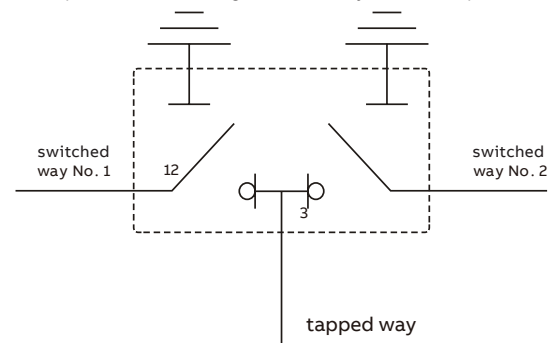
3.2.1 Two-position switch (types NXA_A_, NXB_A_, NXBS_A_)
All these types have also an integrated motor option (types NXA_AM, NXB_AM_, NXBS_AM_).



3.2.3.a two-position 3-way switch types NXBD_A_



3.2.2 Three-position switch (types NXB_C_, NXBS_C_, NXB_CM_, NXBS_CM_) The motor option is applicable for both close and open operation. The earthing function is only for manual operation.



3.2.3.b Three-position 3-way switch types NXBD_C_

3.3 Installation

NXA and NXB can be mounted horizontally below or above the conductors.

NXBD can be mounted horizontally below the conductors.

3.4 Operation

Manual operation:

Sectos can be operated manually by an insulated hook-stick or by a separate manual operating device with operating rods (2-position switches only).

The 3-way switch has two independent operating mechanisms, one in each end numbered 1 and 2.

Motor operating device:

Sectos switches can be supplied with an integrated motor drive for remote control of closing and opening operations. The integrated motor drive needs no mechanical adjustments on site. One control cable for each switch is required. See guide 34 UEMC45_. The earthing switch operation shall always be done manually for safety reasons.

3.5 Lock options

IEC publication for disconnectors states that temporary mechanical locking requirement is not mandatory in the case of disconnectors or earthing switches that are operated by means of a hook-stick (IEC 62271-102:2018 Ch.6.104.1). If the local safety codes require mechanical interlocking, against this international standard, there are three alternative solution.

3.5.1 Manual locking device for hook-stick operated switches

Sectos switches can be mechanically locked in any position. The motor control circuit is automatically disabled in the locked position. This option cannot be fitted with the double spring mechanism.

3.5.2 A separate manual operating device

The manual operating device with padlocking option is normally mounted at the root of the pole and the movement is transmitted by means of operating rods. This option is valid for 2-position switches without motor.

3.5.3 A separate motor operating device

All 2-position switches can be operated by a separate motor operating device UEMC50_. The device can be padlocked and operated manually by means of a hand crank.

3.6 Position indication

The large position indicator symbols and reflective colours are easily visible even at night by using a flashlight. The reliable indication of the device fulfils the design and testing requirements of IEC 62271-102 and the French standard NF C64-140(1990).

3.7 Gas monitoring

The Sectos withstands the rated voltage even if the gas density has reduced, but operation of the switch might result in a hazardous situation. To guarantee safe operation under all circumstances, a gas monitoring device is recommended.

The gas pressure inside the closed tank fluctuates with temperature. The Sectos ratings are not affected by these normal pressure changes. An ideal gas monitoring system is based to gas density rather than pressure. Three alternative means are provided.

Gas density switch is recommended for motor operated load breaking switch. The alarm contact can be connected to a remote control system and used to prevent motor operation. The change-over type alarm contact also provides for an alarm function in case of wiring failures. The standard gas density switch is temperature compensated and is independent of the ambient atmospheric pressure.

The alarm contacts of NXBD are wired through the control cable of switch No.1.

Low gas locking mechanism is an optional accessory for NXB_ and installed at the factory. If the leakage rate changes and the pressure falls, the locking mechanism prevents the operation and a red alarm text "Gas low" is shown in front of the position indicator. This mechanism is especially suited to manually operated Sectos switches, when electrical alarm functions are not practical. An auxiliary contact is provided for possible remote indication. If the low pressure mechanism has operated, the gas pressure has to be increased to the normal level before the Sectos can be operated.

**Notice:**

The locking mechanism operation is based on the pressure difference between the switch tank and the ambient air. Different temperatures and atmospheric pressures give different operation points. The system is not recommended if the lowest ambient temperature may fall below minus 10°C or the altitude exceeds 1,000 meters.

Density Gauge NXAP3 is a temperature compensated manometer type device. It is mounted on the filling valve and can be used together with the density switch for local indication or separately with manually operated Sectos switches. Normal density is indicated in the green zone and low density in the red zone.

3.8 Surge arresters

Surge arresters are necessary to guarantee correct insulation coordination on overhead lines.

3.9 Current transformers

Remote controlled Sectos switches can be used for load monitoring, overcurrent and earth fault alarm. Optional current transformers may be mounted on the bushings. Retrofitting is also possible.

3.10 Capacitor Voltage Divider (CVD)

Capacitor Voltage Divider is integrated in the bushings. The typical configuration includes 3 or 6 voltage sensors and provide versatile information of the network condition.

3.11 Voltage transformers

VTs are often needed for auxiliary power supply and sometimes for voltage measurements. The VTs should be mounted according to the manufacturer's instructions.

3.12 Corrosion protection

The tank is made of stainless steel AISI 304. The welding is finished to have equal corrosion resistance as a new sheet surface. Polyurethane painting is available as an option for extremely corrosive ambient. The mechanism housing is made of a painted corrosion resistant aluminum alloy. The IPX7 housing together with desiccants protects the electrical components of motor operated units so that an anti condensation heater is not necessary in normal conditions.

The solvent painting system is an option for extreme corrosion environment, which is fully compliance with the requirements of standard ISO 12944-9:2018, based on atmospheric corrosivity categories CX IN standard ISO 12944-2:2017.

04. Technical specification

4.1 Types NXB_, NXBD_, and NXBS_1

Technical specification of the Sectos is shown in table 1. Sectos NXB_ load breaking switch complies with the IEC 62271-103: 2011, GB/T 3804-2017 requirements for General purpose switches in

electrical endurance class E3 ($I_k=12.5\text{kA}$) and E2 ($I_k=20\text{kA}$) and mechanical endurance class M2 and requirements of EATS 41-27. The breaking tests under earth fault conditions enable use also in isolated or resonant earthed neutral systems.

Table 1

| | | NXB_12_ | NXB_24C_ |
|---|-----------|----------------|----------|
| Insulation level | | | |
| Rated voltage | kV | 12 | 24 |
| Power frequency withstand voltage, 50Hz | | | |
| - to earth and between phases | kV | 42 | 50 |
| - across the isolating distance | kV | 48 | 60 |
| Lightning impulse withstand voltage | | | |
| - to earth and between phases | kV | 75 | 125 |
| - across the isolating distance | kV | 85 | 145 |
| Current ratings | | | |
| Rated normal current | A | 630 | 630 |
| Mainly active load breaking current | A | 630 | 630 |
| Number of breaking operations CO (TDload2) | n | 400 | 400 |
| Line-charging breaking current | A | 1.5 | 1.5 |
| Cable-charging breaking current | A | 50 | 50 |
| Earth fault breaking current | A | 50 | 50 |
| Cable- and line-charging breaking current under earthing faults | A | 28 | 28 |
| Short-circuit ratings | | | |
| Short-time withstand current, I_k (4s) | kA/s | 20 | 20 |
| Peak withstand current | kA | 50 | 50 |
| Short-circuit making current | kA | 50 | 50 |
| Number of making operations | | | |
| - main switch 50kA (CL E3) | n | 5 | 5 |
| - main switch 31.5kA (CL E3) | n | 10 | 10 |
| - earthing switch 50kA (CL E2) | n | 3 | 3 |
| - earthing switch 31.5kA (CL E3) | n | 5 | 5 |
| Creepage distance | | | |
| - Silicone insulators | mm | 620 | |
| Ambient air temperature limits | | -40°C...+60°C* | |
| Mechanical endurance (number of close-open operations) | | | |
| - main switch | n | 5000 | |
| - earthing switch | n | 2000 | |
| Filling pressure (+20°C) | bar (abs) | 1.4-1.5 | |
| Alarm pressure (+20°C) | | | |
| - density switch | bar (abs) | 1.2 | |
| - density gauge | bar (abs) | 1.2 | |
| -lock-out mechanism | bar (abs) | 1.1 | |
| Minimum functional pressure (+20°C) | bar (abs) | 1.1 | |

| | | |
|---|----|----------|
| SF ₆ gas quantity | | |
| NXB_ | kg | 0.6 |
| NXBD_ | kg | 1.0 |
| NXBS_ | kg | 0.2 |
| Weight | | |
| NXB_ (with/without silicone insulator) | kg | 82/71 |
| NXBD_ (with silicon insulators) | kg | 144 |
| NXBS_ | kg | 38 |
| Resistance of the main circuit: | | |
| - With integrated earthing switch (for 3-position switch) | μΩ | max. 400 |
| - NXB_C_ (silicon bushings) | μΩ | max. 75 |
| - NXB_E_ (cable connector interface) | μΩ | max. 70 |
| - NXB_R_ (epoxy bushings) | μΩ | max. 95 |
| - NXBD_C_ between 1-3 and 2-3 | μΩ | max. 80 |
| - NXBD_C_ between 1-2 | μΩ | max. 97 |
| - NXBD_E_ between 1-3 and 2-3 | μΩ | max. 72 |
| - NXBD_E_ between 1 -2 | μΩ | max. 92 |
| - NXBS_C_ (silicon bushings) | μΩ | max. 75 |
| - NXBS_E_ (cable connector interface) | μΩ | max. 70 |
| Degree of protection of the operating device box. | | IP67 |

* CVD: -25°C~+60°C



Notice:

The rated voltage is the max. phase-to-phase voltage of a 3-phase system. The single phase switch NXBS has been tested as a part of a three phase system. It is not applicable to systems where the stresses are higher.

4.2 Types NXA_

Technical specification of the Sectos is shown in table 2. NXA36_load breaking switch complies with the IEC 60265-1 (1998) requirements for general purpose switches in electrical endurance

class E2 (Ik=12.5kA, In=630A) and E3 (Ik=12.5kA, In=400A) and mechanical endurance class M2. The breaking tests under earth fault conditions enable use also in isolated or resonant earthed neutral systems.

Table 1

| NXA_ | | |
|--|-----------|---------------|
| Insulation level | | |
| Rated voltage | kV | 36 |
| Power frequency withstand voltage, 50Hz | | |
| - to earth and between phases | kV | 70 |
| - across the isolating distance | kV | 80 |
| Lightning impulse withstand voltage | | |
| - to earth and between phases | kV | 170 |
| - across the isolating distance | kV | 195 |
| Current ratings | | |
| Rated normal current | A | 630 |
| Mainly active load breaking current | A | 630/400 |
| Number of breaking operations CO (TDload2) | n | 100/400 |
| Closed loop breaking current | A | 630 |
| Line-charging breaking current | A | 2 |
| Cable-charging breaking current | A | 40 |
| Earth fault breaking current | A | 175 |
| Cable charging breaking current | | |
| Under earth fault conditions | A | 80 |
| No-load transformer breaking current | A | 20 |
| Single capacitor bank breaking current | A | 175 |
| Short-circuit ratings | | |
| Short-time withstand current, Ik (3s) | kA/s | 12.5 |
| Peak withstand current | kA | 31.5 |
| Short-circuit making current | kA | 31.5 |
| Creepage distance | mm | 1440 |
| Ambient air temperature limits | | -40°C...+60°C |
| Mechanical endurance (number of close-open operations) | n | 5000 |
| Filling pressure (+20°C) | bar (abs) | 1.8-1.9 |
| Alarm pressure (+20°C) | | |
| - density switch | bar (abs) | 1.65 |
| - density gauge | bar (abs) | 1.6 |
| - lock-out mechanism | bar (abs) | No applicable |
| Minimum functional pressure (+20°C) | bar (abs) | 1.6 |
| SF ₆ gas quantity | kg | 0.8 |
| Weight with plug-in insulators | kg | 117 |
| Resistance of the main circuit | | 0 |
| - with plug-in insulators | μΩ | max.123 |
| Degree of protection of the operating device box | | IP67 |

05. Receipt/inspection/storage

After the packing material has been removed, the Sectos should be checked for possible damage caused by rough handling during transportation. At the same time check that all parts contained in the packing list have been delivered. If the Sectos is delivered with a density switch or gauge, the gas pressure should also be checked, see chapter 10.1.

The Sectos should be stored in a dry area, if it is not installed immediately.

**Notice 1:**

Do not use the bushing insulators for lifting purposes. Excessive mechanical stresses may increase gas leakage risks.

**Notice 2:**

Avoid contact with "black iron". The iron contamination may damage the corrosion resistant surface of the stainless steel.

**Notice 3:**

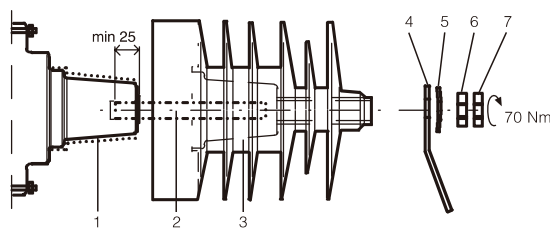
Because Sectos is filled with SF₆-gas, all bolts and nuts for fixing the components which are a part of the sealed tank should not be loosed, tightened or removed. The spring mechanism housing should also be kept closed to avoid moisture ingress.

06. Installation

6.1 Installation of the plug-in insulators

The plug-in insulators are factory mounted in the standard delivery. This chapter is valid for retrofitting and special deliveries.

Sectos is delivered either with integrated cast resin SF₆/air bushings or an interface for series 400 cable connectors. This interface can be equipped with detachable plug-in type silicone rubber insulators for connection to overhead lines. Silicone is a flexible, hydrophobic and unbreakable material with excellent electrical properties. Installation of the plug-in insulators is shown in figure 6.1.1.



6.1.1. Installation of the plug-in insulators

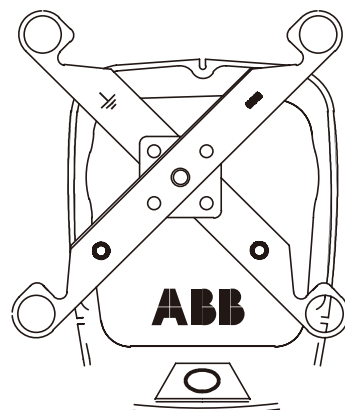
1. Ensure that the conical surfaces between the bushing (1) and the plug-in parts (3) are clean and fault free. If needed, clean the surfaces with a damp cloth, drying thoroughly afterwards.
2. With rubber gloves on, apply an even and thin layer of special paste P8 0n the conical surface of the bushing (1).
3. Turn the long M16 stud (2) by hand to the bottom of the hole in the bushing part.

6.2 Installation of the hook-stick lever

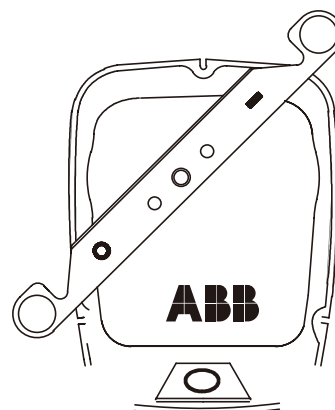
Install the hook-stick lever before lifting the switch up on the pole. See figure 3. Note the position of the instruction plates when the switch is in the open position. If a 3-position switch is mounted below the crossarm, separate spacer plates (NXBZ59) should be used to give clearance for the rotating lever.

4. Hold the thick part of the plug-in insulator (3) and push it by hand as far as possible so that terminal (4), spring washer (5) and nut (6) can be fitted manually.
5. The plug-in insulator is finally set by tightening the M16 nut (6) to a torque of 70Nm. Prevent torsion stresses by holding the terminal (4). Lock the assembly with counter nut (7).

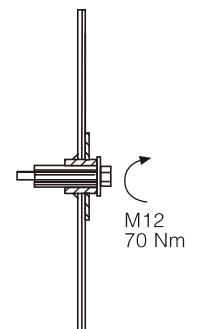
A cable lug with a 16-17mm hole can be mounted direct on the silicon insulator without a terminal bar. The hole shall be 12-13mm respectively for epoxy insulator.



3-position lever (NXBZ 16)



2-position lever (NXBZ 58)



6.2.1. Installation of the hook-stick lever

6.3 Installation of the gas density gauge

The gas density gauge is factory mounted in the standard delivery. This chapter is valid for retrofitting and special deliveries.



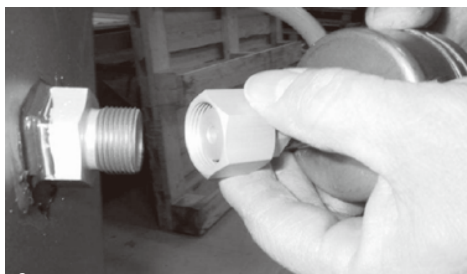
Danger:

Local safely codes must be followed, if the gauge shall be mounted in a switch, which is already mounted on a high voltage line.



1. Open the filling valve plug.
Prevent rotation of the valve stem.

There is a quick-closing valve preventing gas release when the protective plug is open.



2. Remove the yellow protective cup of the density gauge.

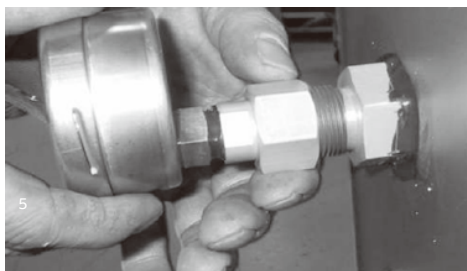
Check the sealing surface, remove possible metal chips or dust by blasting.



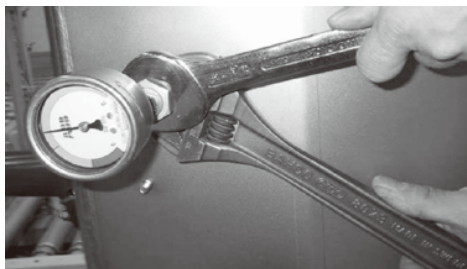
3. Push the tightening nut in forward position and insert the gauge into the valve.

The O-ring sealing prevents gas release before the gauge pushes the quick-closing valve open.

Some gas may be released and the sealing may be damaged, if the nut is in backward position and the gauge is not in line with the valve.



4. Let the tightening nut pull the gauge into the final position.



5. Tighten the nut softly, about 15...20Nm prevent rotation of the valve stem.

The tightness cannot be improved by a heavy torque. But the nut does not withstand heavy torque. The gauge in this photo shows the normal filling pressure 1.5 bar abs at 20°C.

The gauge is temperature compensated and the reading is same at a normal operating temperatures.

All ratings of NXB are guaranteed if the pressure is between 1.1 and 1.5 bar abs (20°C).

6.4 Installation on the crossarm

6.4.1 Lifting

Above the crossarm

Fix the two lifting hooks diagonally to opposite corners of the switch in order to get a balance.

Below the crossarm

Fix the two lifting hooks to the other side of the switch. Although this position is partly unbalanced, this way is easier to lift and fix the switch below the crossarm. Hold the switch in a balanced position when commencing the lifting so that the insulators do not touch the ground.

Fix the clamps loosely to the crossarm so that they can be moved by hand. Lift the Sectos below the crossarm. Turn it to a upright position and put one of the fixing clamps in the grooves of the switch and tighten. One clamp keeps the switch in the upright position so that the other clamp can be mounted easily, see figure 6.4.1.

Tighten the fixing clamps ($M=50Nm$) and remove the lifting belt. The fastening can be ensured by double nuts.

Notice:



The switch must not be lifted or moved from the insulators. This may cause excessive stress on the insulators and damage the bushings.

Caution:

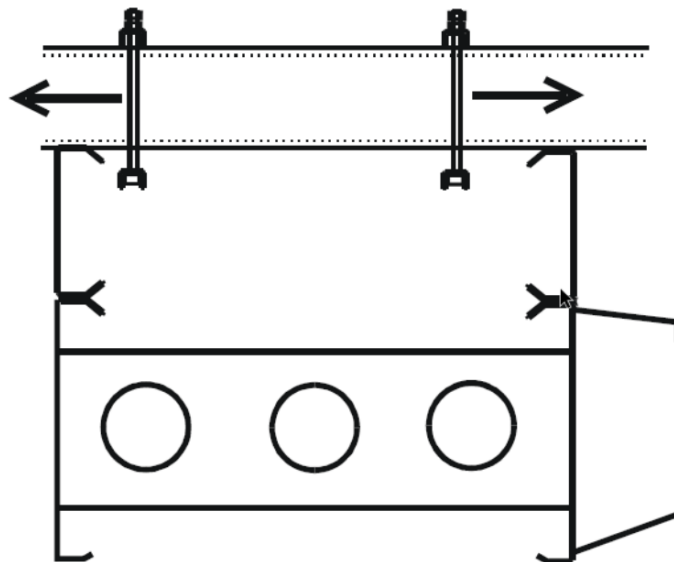


Manual lifting is not recommended because of safety reasons.

Warning:



Follow local safety codes concerning lifting work, lifting equipment and working at high places.



6.4.1. Fixing to the crossarm

6.4.2 Installation below the crossarm (standard mounting practice)

Spacer plates are required, if a 3-position switch with a hook stick lever is mounted below the crossarm, see Fig. 6.4.2. The spacer plate is standard for NXBD_types.

6.4.3 Installation above the crossarm (option)

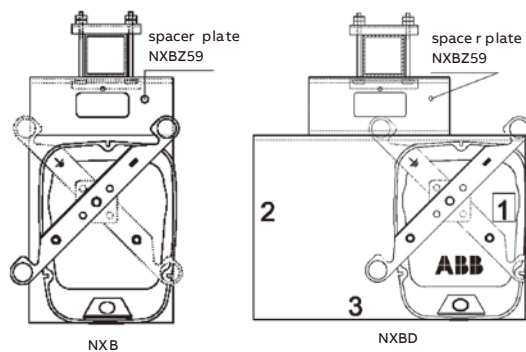
The switch can be mounted asymmetrically on the crossarm to make the position indicator more visible, see Fig. 6.4.3. special mounting bracket set NXAM4 (80...100mm) or NXAM5 (100...160mm) is required for NXA_types, see Fig. 6.4.4.

NXBD cannot be mounted above the crossarm because of the position of the tapped way.

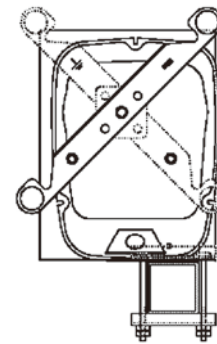
6.4.4 Installation direct on the pole (option for hook-stick operated NXB_switches)

NXB can be mounted direct on the pole using special mounting brackets, see Fig. 6.4.5

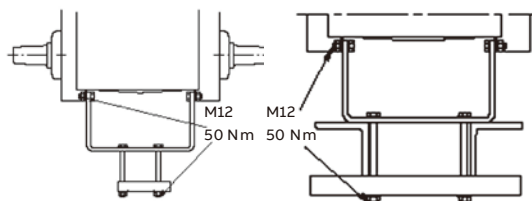
- NXBZ204 for circular poles $\Phi 180...250\text{mm}$
- NXBZ239 for rectangular poles max $\Phi 330\text{mm}$



6.4.2. Installation below crossarm



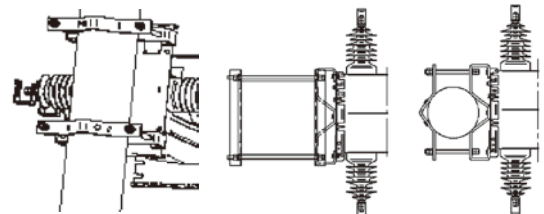
6.4.3 Installation of NXB above crossarm



6.4.4 Installation of NXA above rectangular and double L-crossarm

NXAM4 for 80...100mm rectangular crossarms
NXAM5 for 100...160mm rectangular crossarms

Mounting brackets NXBM11 for double L-crossarm



6.4.5 Installation of NXB direct on the pole (34NXB30)

6.5 Installation of the surge arresters



Notice:

Surge arresters are necessary to guarantee correct insulation coordination on overhead lines.

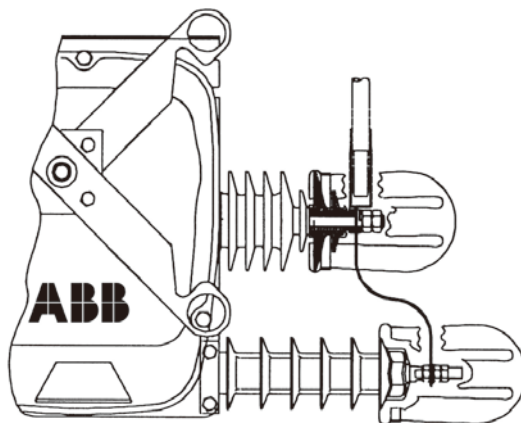
The rated discharge current should be 10 kA peak. The rated voltage should be selected according to the instructions of the manufacturer. The neutral earthing conditions and the maximum duration of earth fault should be noted.

The surge arresters should be mounted on both sides, if the switch may be in open position for long periods (normally open point disconnectors). The preferable position is in parallel with the switch bushings mounted on a metal frame below the bushings (Fig. 6.5.1 for NXB_ and NXBD_types).

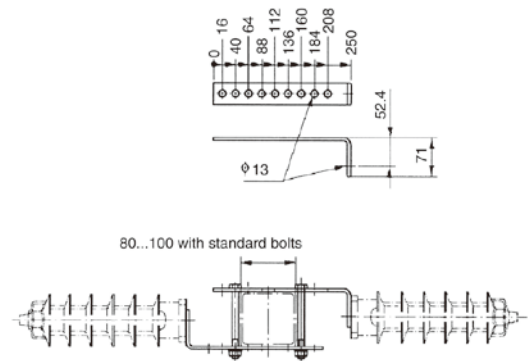
An alternative position is on the line crossarm. The cable distance from the switch bushings to the surge arresters should not exceed 5 m. Also the earthing connection between the line crossarm and switch frame should be as short as possible. A set of fixing parts for arresters is available as an optional accessory.

If a short screened cable is used to connect the switch to the overhead line, the arresters shall be mounted at the switch terminals.

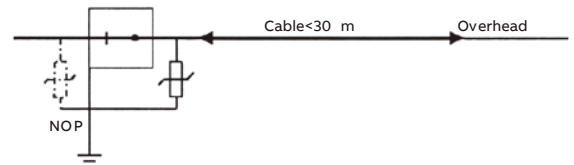
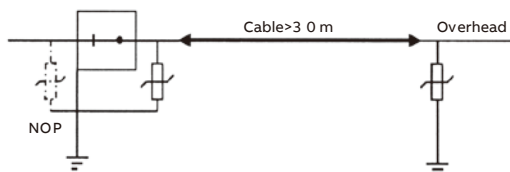
If the cable length is over 30m, arresters shall be mounted at both ends.



6.5.1 Installation of surge arresters with bird caps below the bushings of NXB using NXBZ81/3 and optional bird caps



6.5.2 Installation of surge arresters on the crossarm using NXAM3/6 (135NXA7)



6.5.3 Application of surge arresters

6.6 Installation of current transformers



Caution:

The secondary of the CT must always be short-circuited. The primary current may induce dangerous voltages on the open secondary.

NXA_types

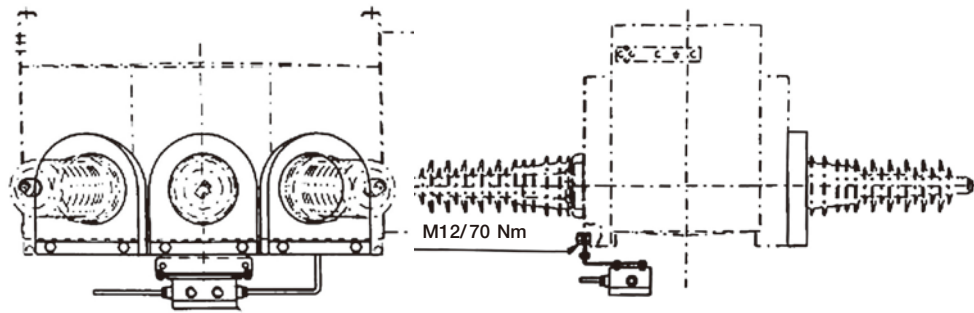
Normally the CTs are factory mounted. The CTs can be mounted direct on the holes in the tank below the bushings using two M12 bolts (Fig. 6.6.1).

NXB_types

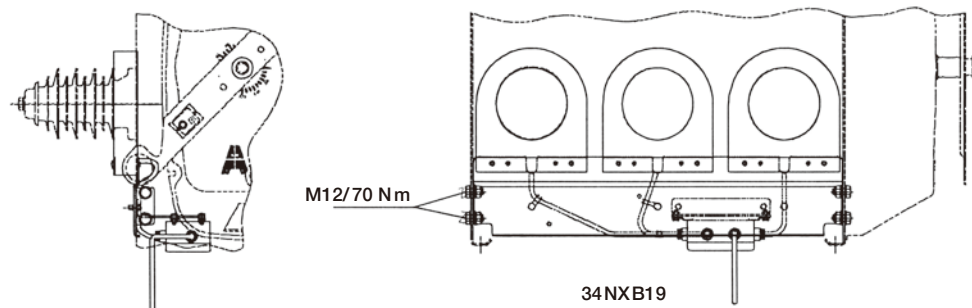
Current transformers can be mounted on one side of the switch using a separate mounting plate see Fig.6.6.2.

NXBD_types

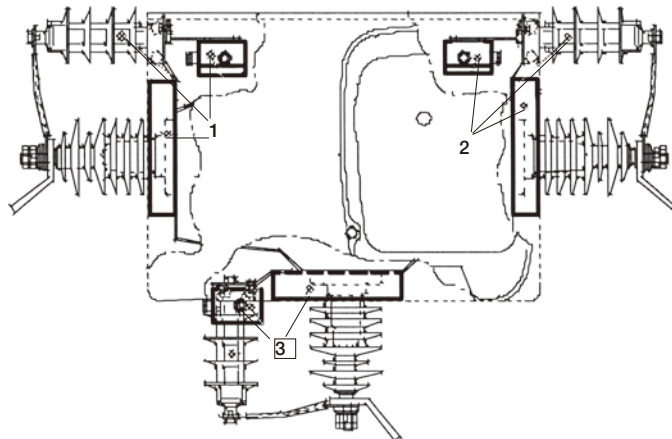
Current transformers and the connection box can be mounted on each way of the switch using a separate mounting plate. See Fig.6.6.3 the detailed drawing enclosed.



6.1.1 CT assembly on NXA



6.6.2 CT assembly on NXB (NXBZKOKU072G4/3)



6.6.3 Alternative mounting position for surge arresters and CTs on NXBD

6.7 Installation of the sensors

The integrated voltage sensors are always factory mounted. Only the downlead cable has to be fixed on the pole and connected to the sensor inputs of the electronic control device and the supply voltage terminals. More information is included in the delivery of sensor type switches.

6.8 Line connections

The mounting practice of jumper wires has an important role on the performance of the pole mounted substation. Sufficient clearances are required to guarantee dielectric and short-circuit performance in normal and stormy conditions. For the same reason the unsupported length should not normally exceed 2.5m. Secondly the jumpers shall not cause a continuous cantilever stress on the bushings. Insufficient conductor area may cause overheating of bushings. Loose connectors may also cause overheating and a wrong combination of materials corrosion.

6.8.1 Bare cables

Local regulations concerning minimum clearances must be adhered to. The minimum phase to phase clearance at the terminal bars and connectors is 200mm for NXB and 310mm for NXA (type tested). For other parts apply the following min.

clearances, if local regulations don't require more:

| | | | | | |
|----------------|----|-----|------|-----|-----|
| Rated voltage: | kV | 12 | 17.5 | 24 | 36 |
| Min clearance: | mm | 120 | 160 | 220 | 320 |


Note also the distance to auxiliary and earthing cables. Reserve a sufficient margin for the effect of wind and short circuit forces.

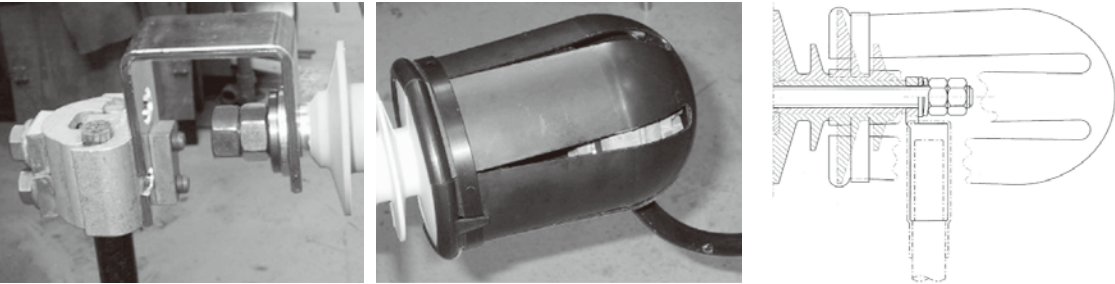
Use correct connector type, material, and working methods for the cable size and material to be used.

More detailed instructions in enclosure 1.

6.8.2 Insulated cables with bird caps

Recommended for all bare and insulated overhead lines to minimize short-circuit risk due to animals close to the switch, where clearances are small. A separate instruction is delivered with the accessories.

**Danger:** Concerning personal safety distances the equipment with covered conductors and bird caps shall be handled as that with bare conductors.



6.8.1 Alternative line connections with bird caps: a) and b) with OJUZZL4/3 connectors and NXBZ200 terminal bars c) with cable clamps

NXA_types:

The diameter of the insulator sheds is smaller than in NXB_types. See Fig6.8.2. Two opposite clips of the bird caps are shortened so that overlapping is possible (1). Bend these clips inwards and compress the shield around the first major shed (2). Bind the cap with the plastic bandage (3). Cut off the excess length.

The bird cap assembly can be modified for different cable clamps and terminal bars. A suitable hole can be cut for different cable diameters. Cable clamps can also be connected direct as show in Fig. 6.8.1 c.

6.8.3 Cable connectors for screened cables

Use outdoor type cable connectors for EN 50181 type C interface (DIN 47636 400 series). Follow the instructions from the manufacturer. Cut, bend and support the cable so that it does not stress the bushings.

6.9 Auxiliary circuits and control cable

Remove the protective cover of the auxiliary circuit connector to avoid short-circuit risks. Note the clearances and fix the control cable by outdoor type fasteners.

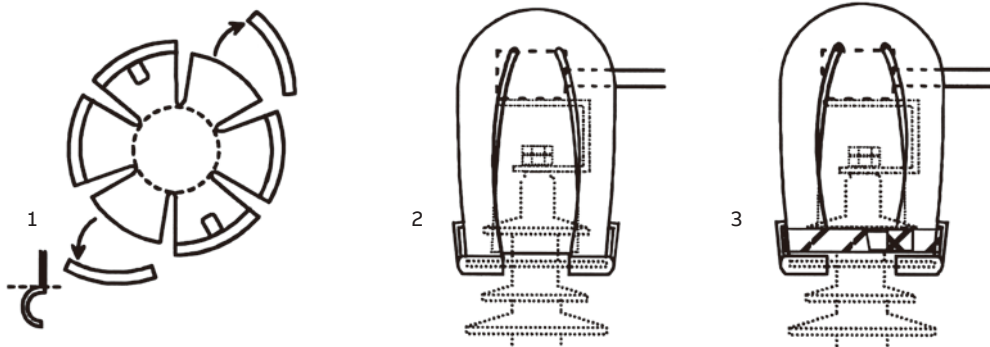
The circuit diagrams are different depending on the switch configuration and special requirements.

6.10 Installation of NXBS_single phase load breaking switch

The single phase NXBS is "a piece of NXB". Thus the instructions for NXB are mostly valid for NXBS. The application of the single phase switch is often different from three phase switches and the mounting practices should be studied case by case.

**Note:**

The following 3-phase accessories cannot be mounted on the 1-phase units: combined mounting plate for CT and surge arrester, combined current and voltage sensors, fixing brackets.




6.8.2 Installation of the bird caps, NXA_with OJUZLL_connectors and NXBZ200 terminal bars




07. Earthing

7.1 Switch frame

 **Danger:**
The frame of the switch should always be earthed accordance with the local safety regulations.

The maximum duration and amplitude of fault current should be noted when selecting the minimum earthing conductor area. Note also the earthing resistance, corrosion protection, and mechanical protection and insulation of the lower part. Both the disconnecting and earthing functions of the switch are ineffective if the frame is not earthed.


 **Danger:**
In addition the line insulator crossarm shall be earthed, if the switch is mounted on a separate crossarm.

See enclosures 2 and 3 for general arrangements.

The standard terminal clamp type OJUZZLI can be used for 16...63mm² copper conductors or the optional type OJUZZL 3 for 16...70mm² aluminum conductors. Alternatively any cable lug for an M12 bolt can be connected to the tin plated earthing terminal at the end of the switch.

The switch can also be earthed by earthing the crossarm for example with the earthing terminal NPTMS 8.

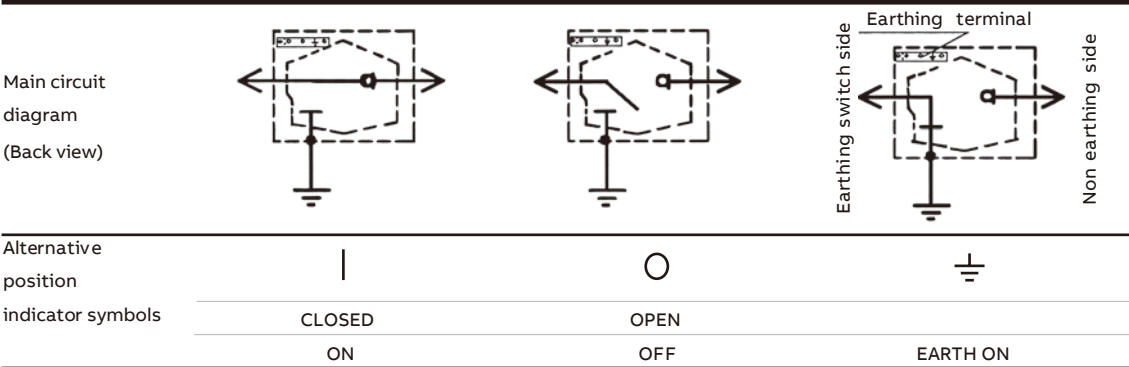
7.2 Integrated earthing switch NXB_ and NXBS_ types:

 **Danger:**
Ensure that the integrated earthing switch earths the correct side of the switch.

The earthing switch on the downstream side provides natural interlocking between the main switch and earthing switch in a radial network. The earthing switch side can be identified from the earthing terminal, see the drawing below.

The earthing direction should be marked clearly for the operator for example by fixing this symbol under the switch. This symbol (NXBZ182) is included in the standard 3-position switch delivery.

NXBD_ types:
Both switched ways (1) and (2) can be earthed independently. The tapped way (3) is floating, when both switches are in open or earthed position. The switch and earthing switch functions are described in the drawing below.



7.1 Identification Of the earthing switch side



7.2 The earthing direction symbol

7.3 Auxiliary circuits

The auxiliary system may be different from case to case. The earthing and protection of each specific system should be planned carefully for safety and protection reasons. As a minimum the following general rules should be followed:

All systems:

Notice: The shield of CT and control cable shall be earthed both ends to protect the control electronics.

Notice: The frames of all components of the pole mounted station should be connected to the common earth (switch, VT, control equipment).

Danger: The primary of connected between two phases voltage transformer shall be not between phase and earth. Single pole VTs between phase and earth should not be used for safety reasons. The secondary shall be earthed to the frame or to the control cabinet earth.

Isolated or resonant earthed neutral systems:

The earth fault voltages should be limited to fulfil local safety regulations concerning combined earthing of low and high voltage systems. The operator should not be exposed to dangerous earthing voltages and these voltages should not be conducted to low voltage circuits.

Earthed and low-ohm earthed neutral systems:

The earth fault voltages cannot normally be limited to a safe level.

Danger: All components, connected to the high voltage earth, (control cabinet, local I/O push buttons, possible manual operating elements) should be mounted so high, that they cannot be reached from conductive earth level. An insulating ladder or platform should be used.

Alternatively an earth mat below the control box may be used to limit touch voltages. The risk of potential step voltages should be analyzed in this case. See the enclosed drawing 31 NXB23.

Notice: The auxiliary supply should be taken from a transformer on the same pole, or other source, neutral connected to the common earth (solar or wind energy) . The pole mounted station should not be connected to a public low voltage or telephone network.

7.4 Surge arresters

The earthing cable should be as straight as possible and steep curves should be avoided. Minimum area 16mm² Cu. A common earthing cable with the switch and control cabinet is recommended. The cable between the surge arresters and switch frame should be as short as possible, if the arresters are not mounted direct on the switch frame. See also the drawing of Enclosure 3.

| | | | | | | | | | | | | |
|--|---------------------------------|--|---------------------------------|--|---------------------------------|--|---------------------------------|--|---------------------------------|--|---------------------------------|--|
| Main circuit diagram (Back view) | | | | | | | | | | | | |
| | 1 | | 2 | | 1 | | 2 | | 1 | | 2 | |
| | Position indicator symbols | | Position indicator symbols | | Position indicator symbols | | Position indicator symbols | | Position indicator symbols | | Position indicator symbols | |
| | Alternative position symbols | | Alternative position symbols | | Alternative position symbols | | Alternative position symbols | | Alternative position symbols | | Alternative position symbols | |

08. Energising

Before energising the Sectos make sure that:

The gas pressure is checked using the gas density monitoring contact or density gauge (Ch.10.1).

The functioning of operating devices and position indicators is correct.

Ensure that the line section to be earthed by the 3-position switch is correct and clearly marked for the operator (See 7.2).

Ensure that the position of the switched ways and the tapped way is correct in the network configuration.

The line and earthing cables are connected and the clearances are sufficient.

The auxiliary circuits (if any) are connected. The cover of the auxiliary connector is fixed or removed, a hanging cover may reduce the clearances.

The lightning overvoltages are limited below the withstand level of the Sectos.

Ensure that conducting parts, which may be exposed to dangerous earth fault voltages during faults, cannot be touched from ground level.

09. Operation

2-position switches, manual hook stick operation

Closing

Turn the operating shaft about 90° clockwise by pulling from the right-side end of the hook stick lever by one continuous movement. The contact speed is independent of the operation speed. The switch is fully closed, when the position indicator shows closed position.

Opening

Turn the operating shaft about 90° anticlockwise by pulling from the left-side end of the hook stick lever by one continuous movement. The switch is fully open, when the position indicator shows open position.

3-position switches, manual hook stick operation.

Earthing

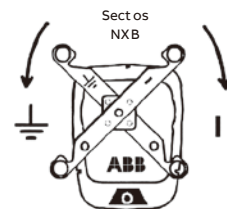
The switch shall be opened before it can be earthed. See instruction for 2-position switches. See also Ch.II for safety aspects.

Turn the operating shaft about 90° anticlockwise by pulling from the left-side end of the hook stick lever by one continuous movement. The switch is fully in earthed position, when the position indicator shows earth position.

Remove earthing

Turn the operating shaft about 90° clockwise by pulling from the right-side end of the hook stick lever by one continuous movement. The earthing is removed, when the position indicator shows open position.

Closing and opening: See instruction for 2-position switches



This instruction plate YKLP 71 1 7 is included in the standard delivery of 3-position switches. It should be fixed at the root of the pole.

Motor operation

Closing and opening

The switch is closed by pushing the "Close" push-button and opened by pushing the "Open" push-button in the control box. The switch goes always to the end position independent of the length of the control impulse.

Earthing of 3-position switches

For safety reasons the earth can be connected and removed only by manual operation. See instruction for manual operation above.

10. Maintenance

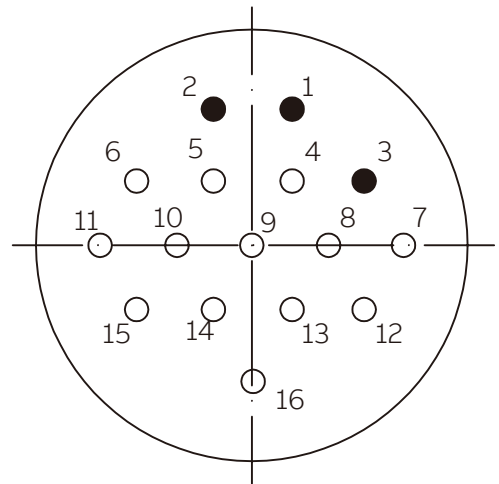
Sectos is maintenance free for the expected service life of the switch. The mechanism is protected by a hermetically sealed housing and no greasing is required. The mechanism housing should not be opened to avoid moisture ingress and reassembling failures. If the housing has to be opened, the desiccants should be replaced with new ones.

10.1 Gas monitoring and refilling

The leakage rate has been measured at the factory and the gas refilling is not normally needed for the expected lifetime of the switch. The low pressure alarm can be connected to a remote control system. The gas pressure of the manually operated Sectos switches should be checked at least every fifth year by the density gauge.

For motor operated Sectos, use the density gauge. Alternatively the gas pressure can be checked with an ohmmeter or a test lamp from terminals 1, 2 and 3 in the multiple plugin connector. (switch 1 in case of NXBD_types). A closed contact between 1-3 signified that pressure is normal. If 1-3 is open and 2-3 is closed,

gas pressure is too low. In that case the gas pressure has to be checked with a manometer through the filling valve (type DIL O/BG3-408/R5) placed on the bottom of the Sectos. The manometer or refilling device should be equipped with DILO manometer fitting G1/43-408/R20. The ABB type with manometer and 6 mm hose adapter is NXAP4.



10.1 Multiple plug-in connector

11. Operation safety

11.1 Normal operation

Pole mounted Sectos switches are safe to operate even in the most abnormal situations. However the operation is not allowed if there is any doubt about the correct SF₆ pressure (chapter 10.1).

Follow the local safety instructions if you are going to work close to the line behind the switch. The common rules are:

1. Open the switch and ensure the open position from the position indicator.
2. Prevent unintended closing following the local safety regulations; for example by warning shields, optional locking device, or manual operating device with padlocking facility.
3. Ensure that the line is dead with an accepted voltage testing device.
4. Connect the line to the earth using the integrated earthing switch or a portable equipment for earthing, IEC 61230:2008. Ensure that the correct line section is earthed by the integrated earthing switch. Ensure that the condition of the frame earthing circuit is good by measuring the earthing resistance regularly.



Danger:

The tapped way (3) of NXBD_ can be earthed only by a portable equipment.

5. The secondary of the optional CT must be short-circuited, if the secondary load is removed while the primary line is live.

11.2 Live line working



Danger:

It is possible to mount a new switch or replace an old one under live line conditions. Because the safety codes are different in different countries and many utilities have drawn their own application guides, which are not bound the switch type or manufacturer, ABB does not present any additional instructions.

11.3 SF₆-gas

Pure SF₆-gas is a nontoxic, non-flammable, heavy insert insulating cooling gas of high dielectric strength and thermal stability.

The Sectos uses SF₆-gas as an insulation and arc quenching medium. Arcing in SF₆ switchgear decomposes a small amount of the gas. Part of these decomposition products may be toxic. Under normal operating conditions these products are only present in small quantities and for limited periods of time, within the switch enclosure before they are absorbed by a filter. During normal operation of the Sectos the operator does not need any special protection.

11.4 Actions in case of internal arc fault

Internal arc fault is possible only in exceptional cases, such as improper surge protection, total loss of gas or non-specified switching duties. In normal operation there is no risk.

Following actions should be noted, if the switch is damaged by internal arc fault:

- The switch shall be disconnected from the line before the voltage is connected to the line
- The tank is hot and some internal insulating materials may be burning. The cooling process may be fastened by using a CO₂ extinguishing equipment from a truck lift
- Normal electrical safety instructions shall also be followed

Toxic powder is not scattered outside and there is no risk of switch explosion because of the structure and materials of the switch-disconnector. The damaged switch shall be handled as described in the following chapter.

11.5 Recommended procedure for disposal of the Sectos

Sectos includes valuable materials for recycling: stainless steel, copper, aluminum, steel, and SF₆-gas.

Small amounts of SF₆ decomposition products may have been formed during the breaking operations. These are largely eliminated by the absorbent inside the tank. However, some precautions are recommended to ensure safe handling of these materials, especially after exceptional internal arc faults. Local regulations if any should be followed. The recycling/disposal can be sub-contracted to ABB or to a specialised company. Alternatively the user can follow the procedure below.

During the procedure, care should be taken to avoid contact of decomposition powders and cleaning fluids with skin or eyes. Compressed air should not be used for removing powders.

1. SF₆-gas can be removed from the switch using a vacuum pump and a compressor to transfer to bottle suitable for this gas. When the gas is pumped off allow dry air flow into the evacuated tank. The gas manufacturers are prepared to receive used SF₆-gas for recycling.
2. The tank should be cut open outdoors or in a well ventilated room. Cutting methods based to high temperature (>500°C) should not be used to avoid formation decomposition products.

The absorbent should be taken away to be neutralized. A suitable method is immersing in a solution of 1.1 kg sodium carbonate (Na₂CO₃) in 100 l water for 24 hours. Contact with skin and eyes should be avoided, especially if higher concentrations are used.

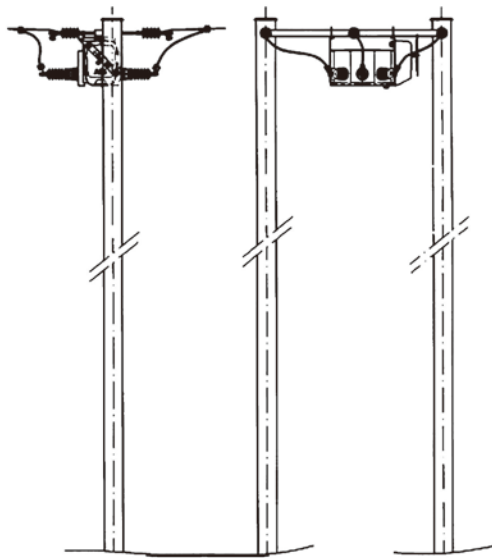
3. All other parts of the switch can be handled as normal metallic or plastic waste. It is recommended that the possible decomposition powder if any be removed using a vacuum cleaner or by rinsing with clean water. The vacuum cleaner bags should be neutralized with same procedure as the absorbent.

For more information see IEC 62271-4:2013: "High-voltage switchgear and controlgear - Part 4: Handling procedures for sulphur hexafluoride (SF₆) and its mixtures", Chapter 6: "Dismantling of SF₆ electric power equipment at the end-of-life".

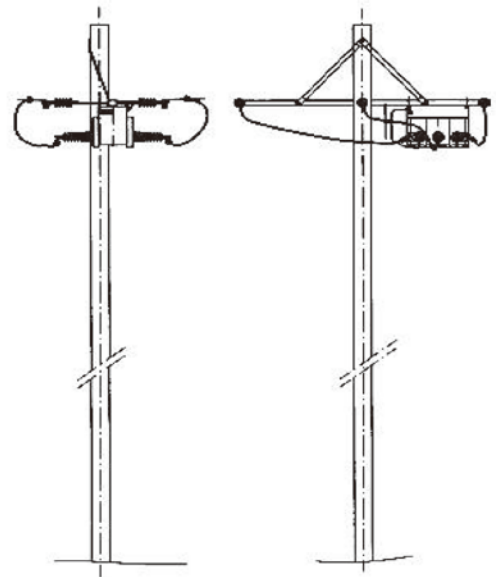
12. Installation examples

The Sectos can be installed in many ways on different types of poles and steelwork. Some mounting examples are shown on the following pages.

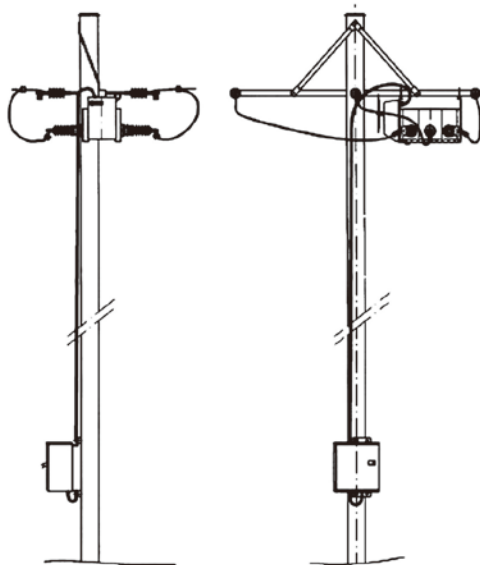
12.1 NXA installation examples



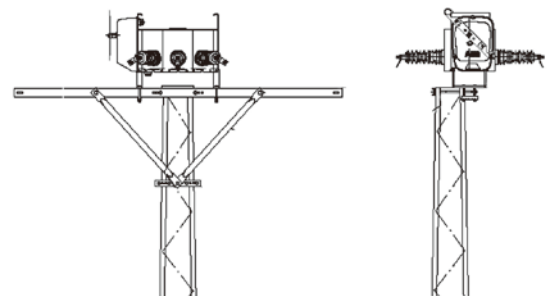
12.1.1 NXA, double pole, hook-stick operation, below the line crossarm



12.1.2 NXA, single pole, hook-stick operation, below the line crossarm

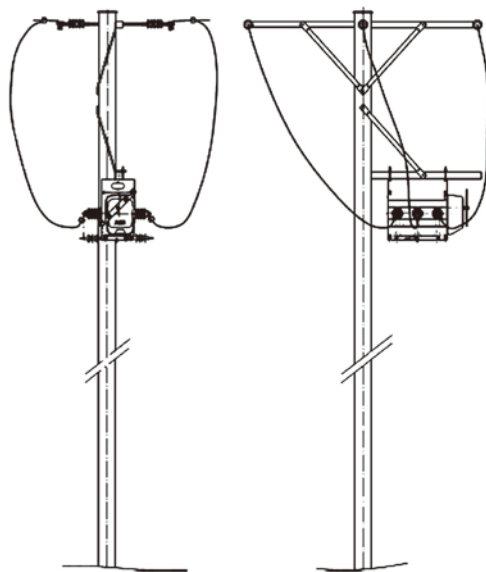


12.1.3 NXA, single pole, motor operation, below the line crossarm

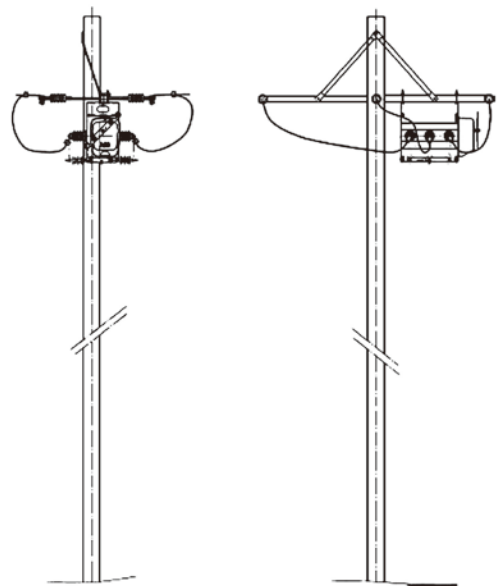


12.1.4 NXA, single pole, motor/manual operation, above the line crossarm

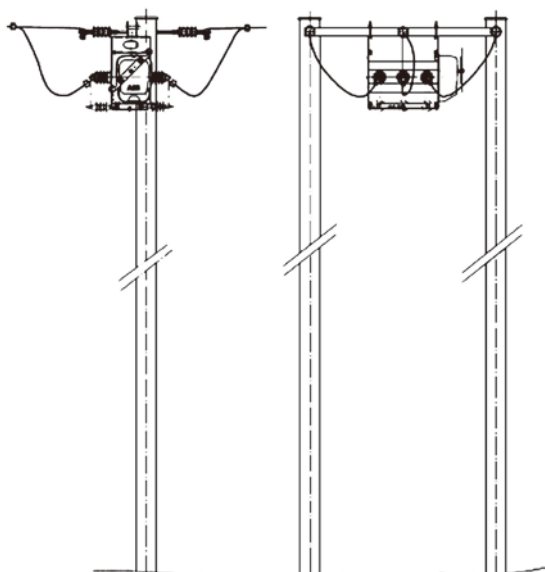
12.2 NXB installation examples



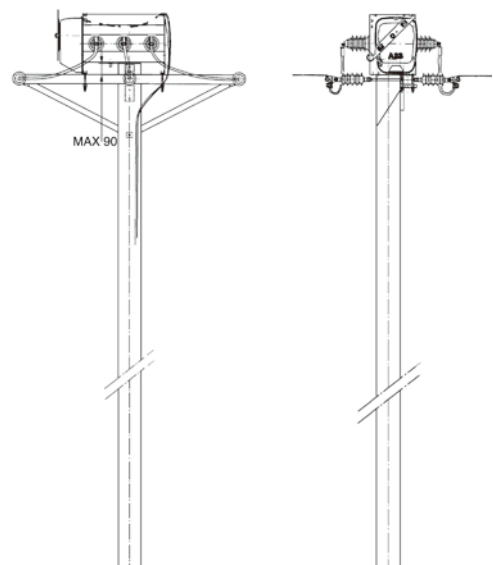
12.2.1 NXB_below a separate crossarm



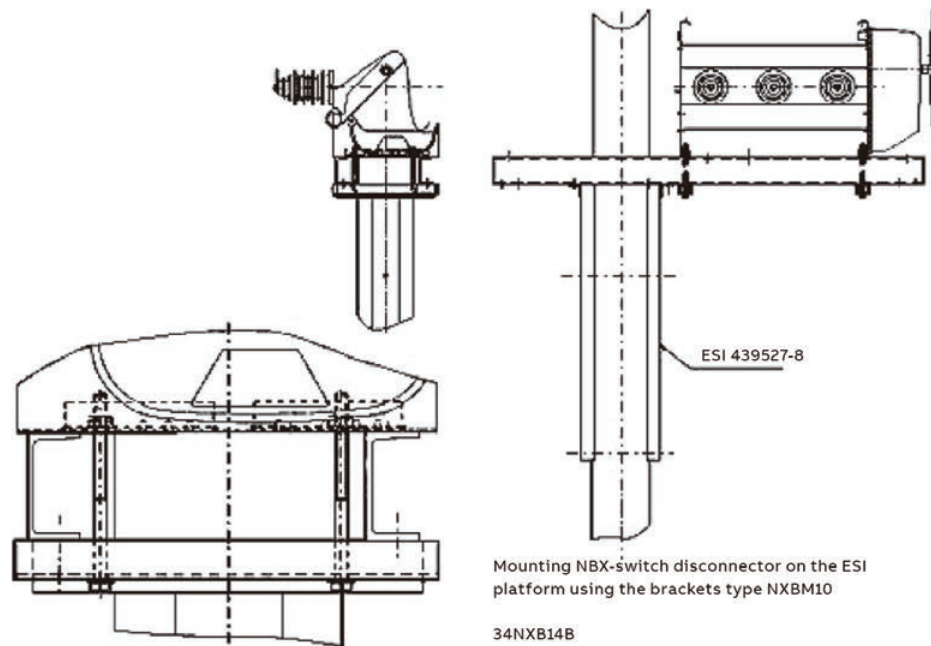
12.2.2 NXB_below the line crossarm



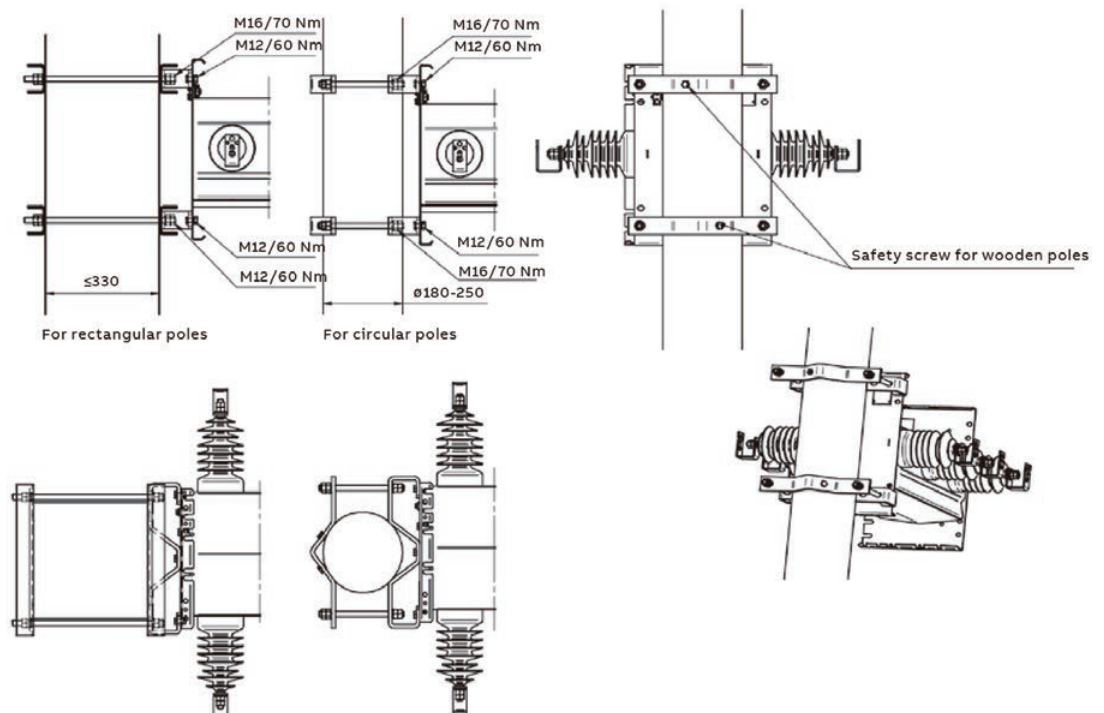
12.2.3 NXB_below the line crossarm, double pole



12.2.4 NXB_above the line crossarm

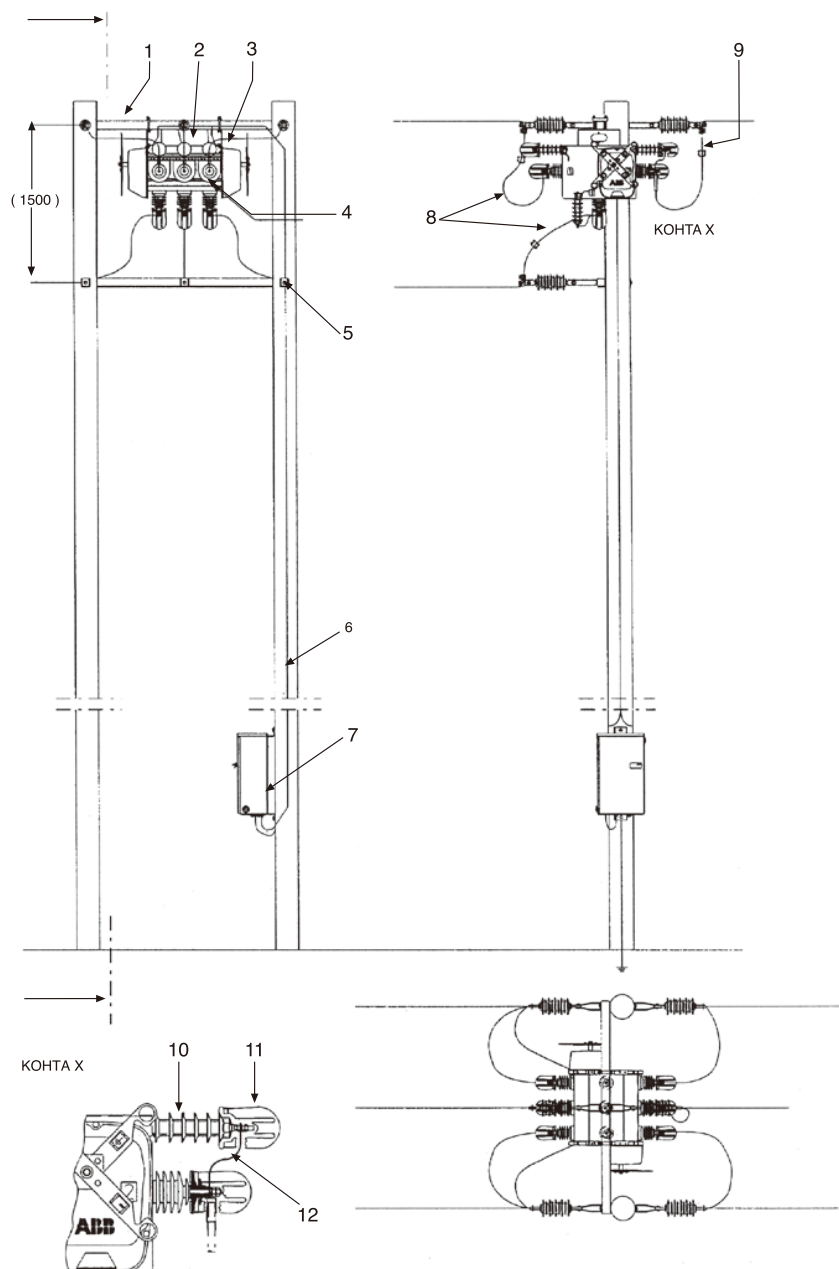


12.2.5 NXB_on the ESI platform (439527)



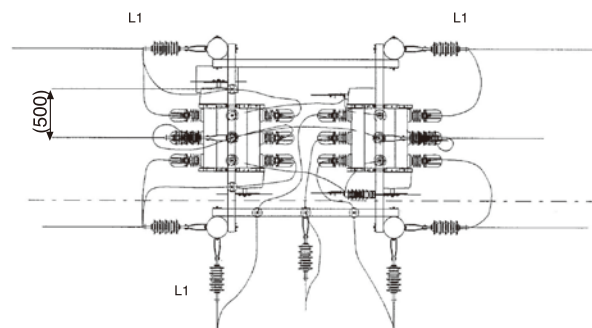
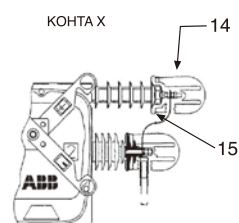
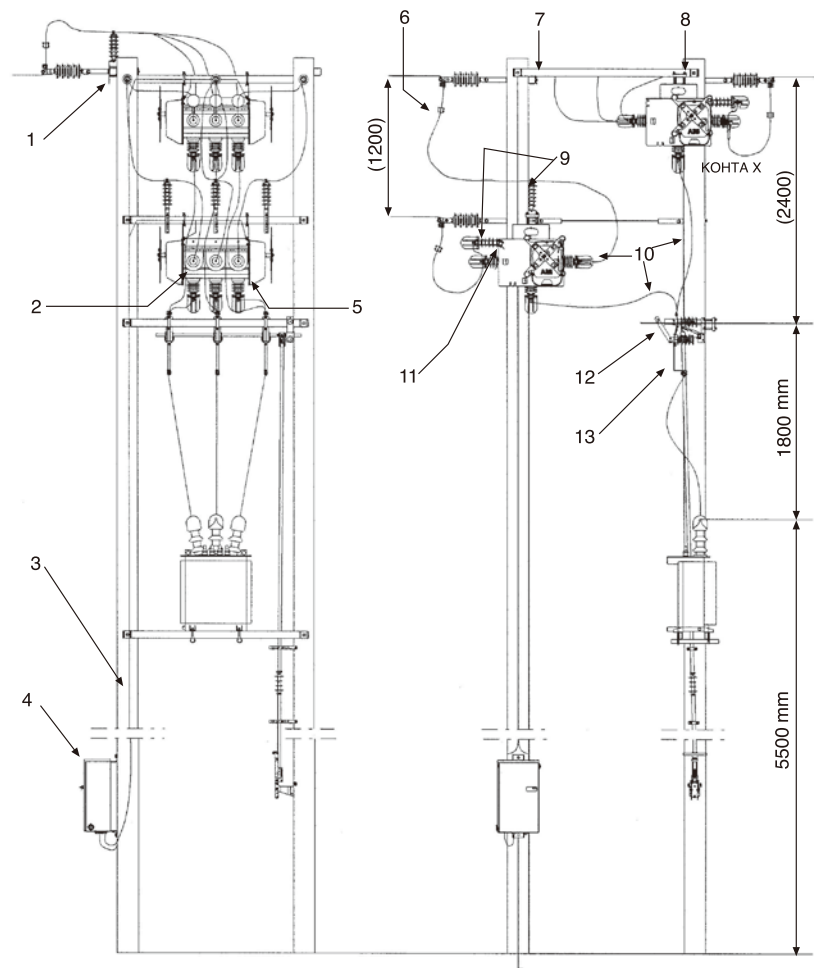
12.2.6 Installation direct on the pole

12.3 NXBD installation examples



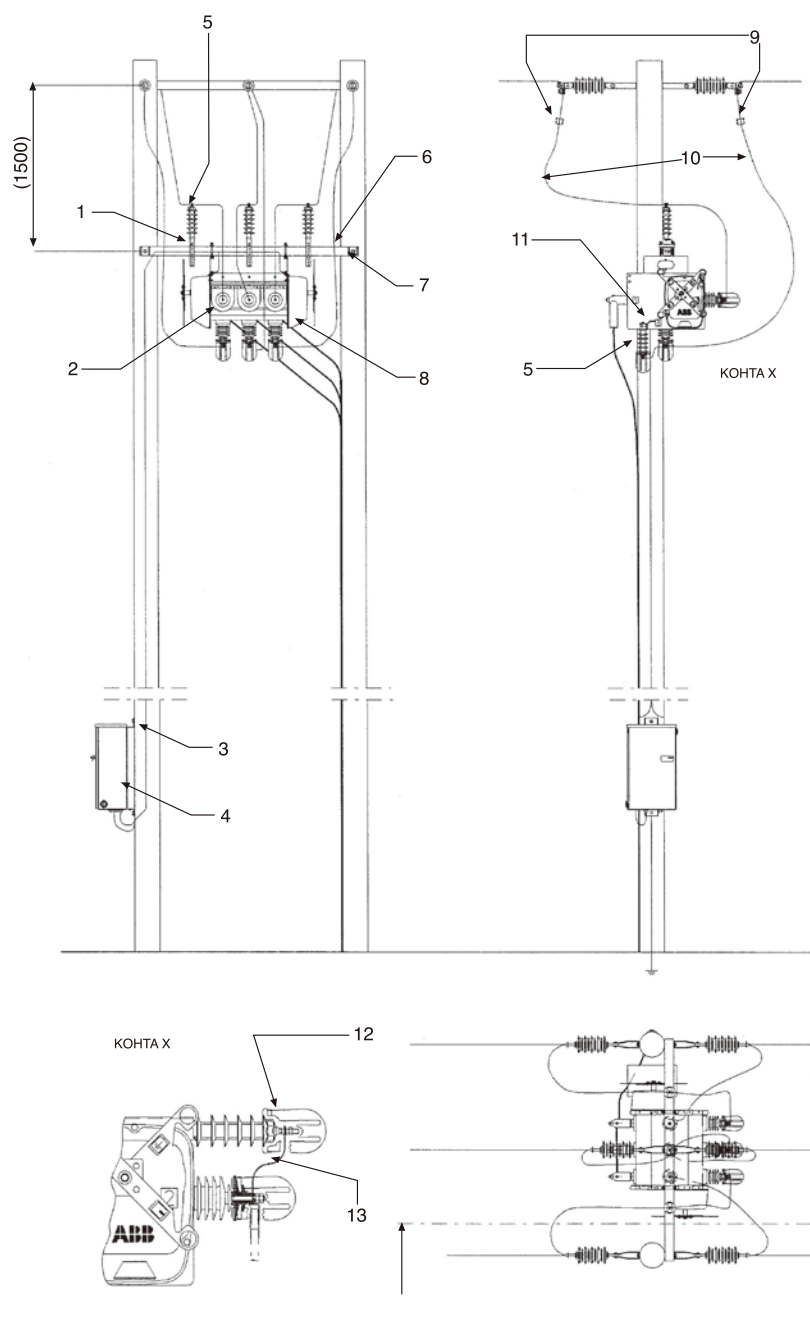
- | | |
|-------------------------|-------------|
| 1. OJUPZK8 | (4 PCS) |
| 2. KZNC120-160A01/NXA/3 | (1/2/3 SET) |
| 3. NXBD24C630CM3 | |
| 4. NXDZ-KOKU071G4/3/L | (L=12 M) |
| 5. NXD220 | (1/2/3 PCS) |
| 6. NXAZH16F1XL | (2 PCS) |
| 7. UEMC- | |

- | | |
|-----------------|-------------|
| 8. NXBC23C120/3 | (3 SET) |
| 9. OJUZLL4/3 | (3 SET) |
| 10. MWK20 | (3/6/9 PCS) |
| 11. NXBC9/3 | (1/2/3 SET) |
| 12. NPTRNIT6 | (2 PCS) |



- | | |
|----------------------|----------|
| 1. NXB2178/3 | (2 SET) |
| 2. NXDZ-KOKU072G4/3L | (L=12 M) |
| 3. NXAZH16F1XL | (4 SET) |
| 4. UEMC- | |
| 5. NXBD24C630CM3 | |
| 6. OJUZLL4/3 | (5 SET) |
| 7. NPTRNIT6 | (5 PCS) |
| 8. OJUP-ZK8 | (12 PCS) |

- | | |
|--------------------------|-------------|
| 9. MWK20 | (12 PCS) |
| 10. NXBC23S120/3 | (6 SET) |
| 11. NXD220 | |
| 12. NPS248101 | |
| 13. NPAC5/3 | |
| 14. KZNC120-160A01/NXA/3 | (1/2/3 SET) |
| 15. NXBC9/3 | (1/2/3 SET) |



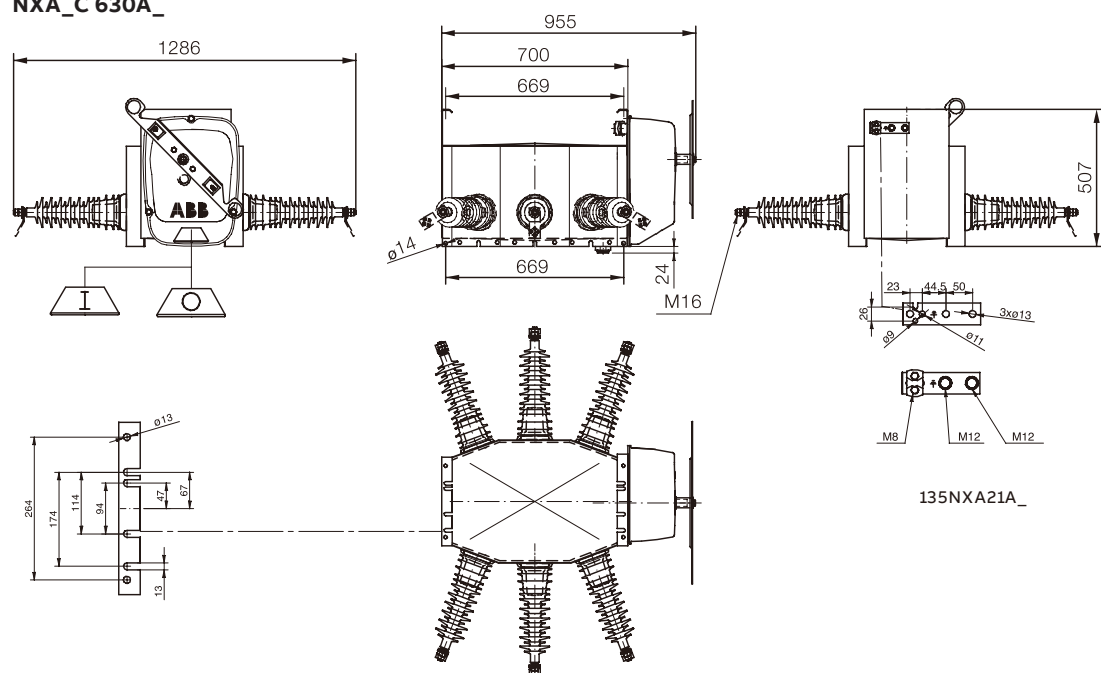
- 1. NXB2178/3
- 2. NXDZ-KOKU072G4/3L (L=12 M)
- 3. NXAZH16F1XL (2 PCS)
- 4. UEMC-
- 5. MWK20 (3/6 PCS)
- 6. NPTRNIT6
- 7. OJUPZK8 (2 PCS)

- 8. NXBD24C630CM3
- 9. OJUZZLL4/3 (2 SET)
- 10. NXBC23S120/3 (2 SET)
- 11. NXD220 (0/1 PCS)
- 12. KZNC120-160A01/NXA/3 (1/2 SET)
- 13. NXBC9/3 (0/1 SET)

13. Dimension drawings

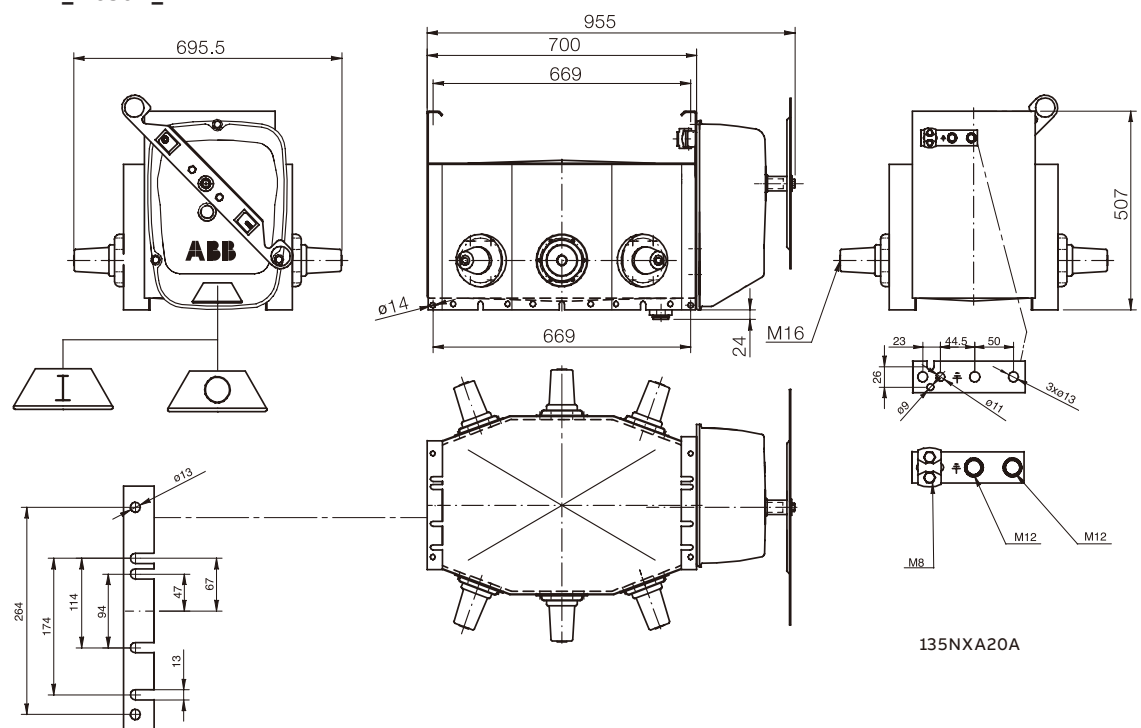
13.1 NXA

NXA_C 630A_



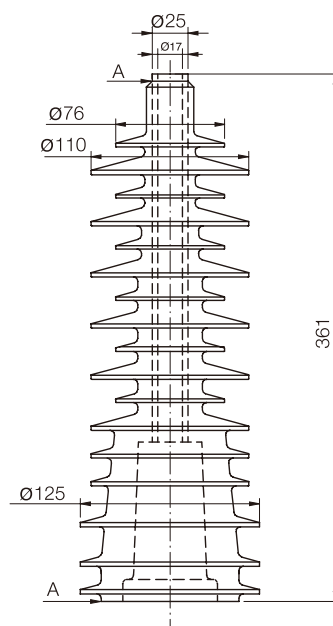
135NXA21A_

NXA_E 630A_

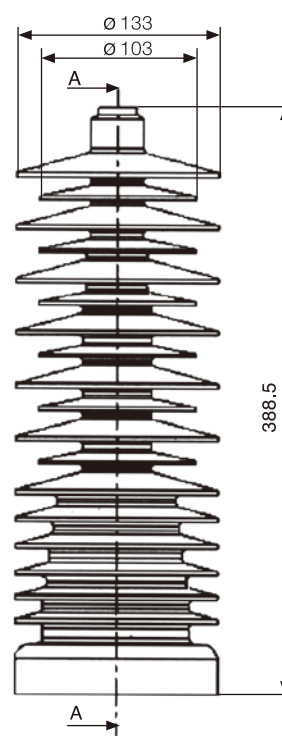


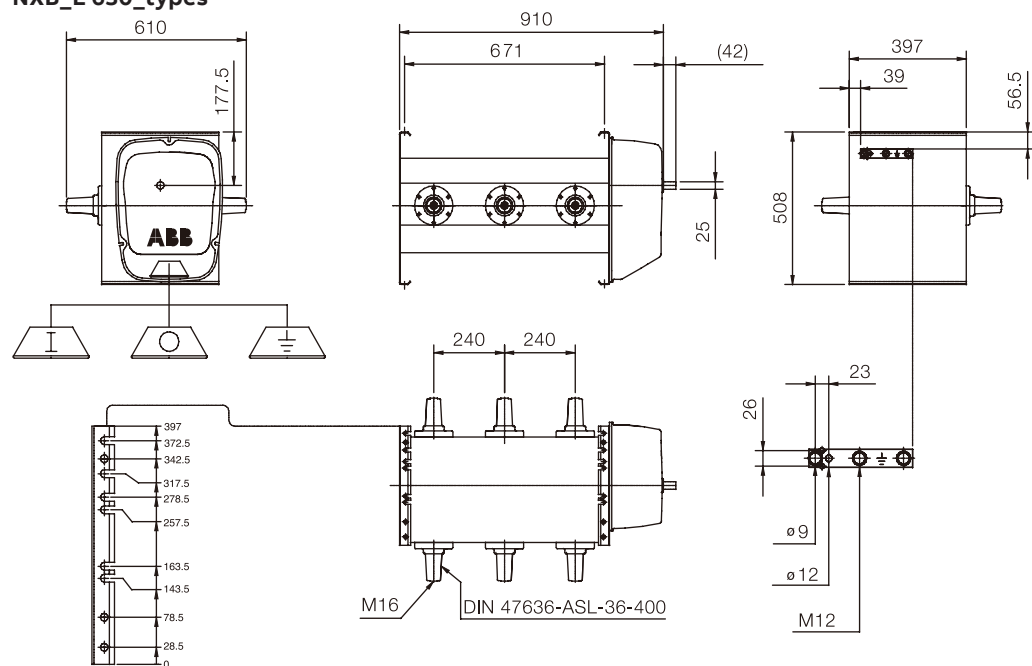
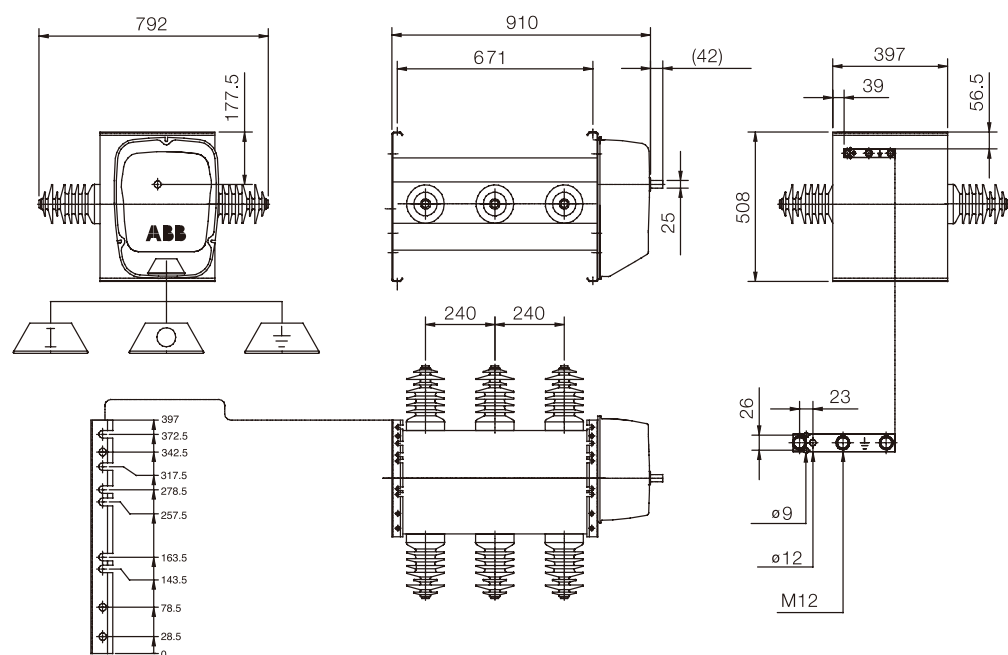
135NXA20A

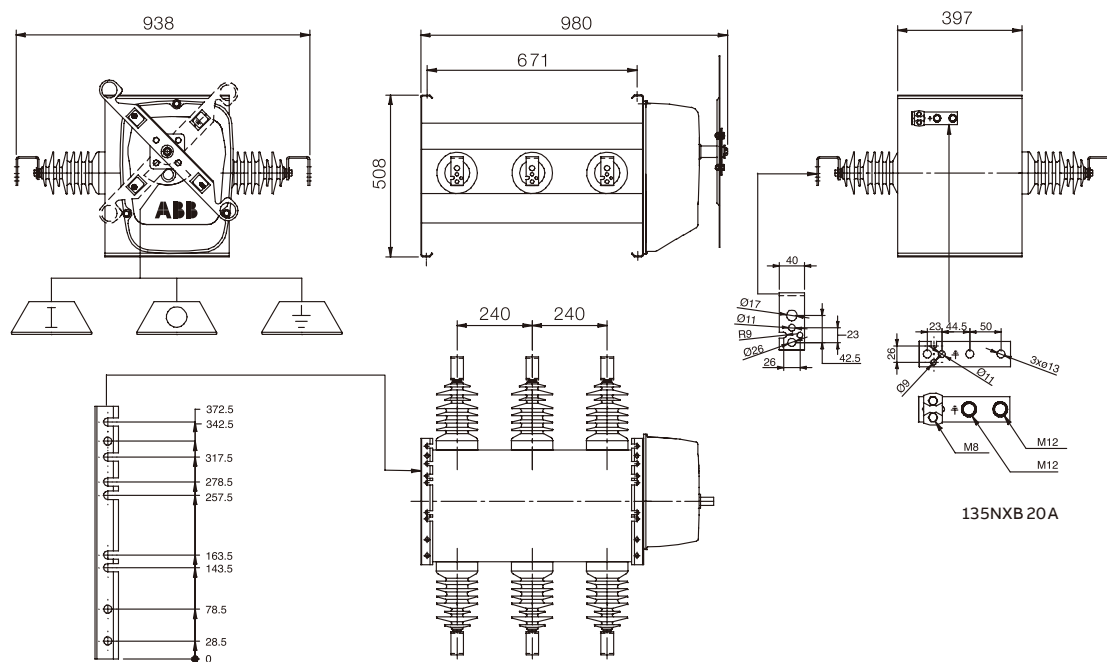
Silicon insulator NXAZJ1 (NXA)
400 series interface (DIN 47636)
creepage distance A-A min 960mm



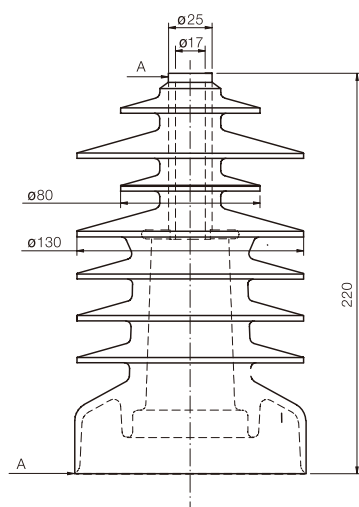
Silicon insulator NXAZJ4 (NXA)
(Creepage distance 1440mm)



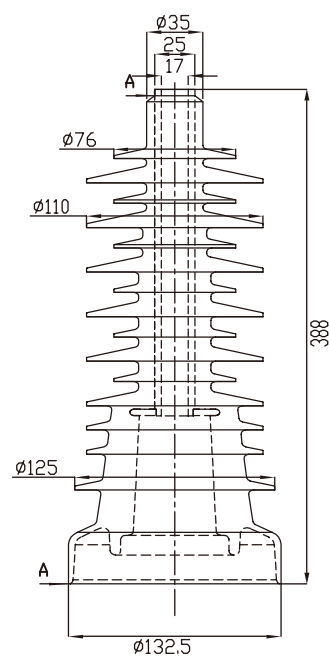
13.2 NXB**NXB_E 630_types****NXB_C 630_types**

NXB_D 630_types

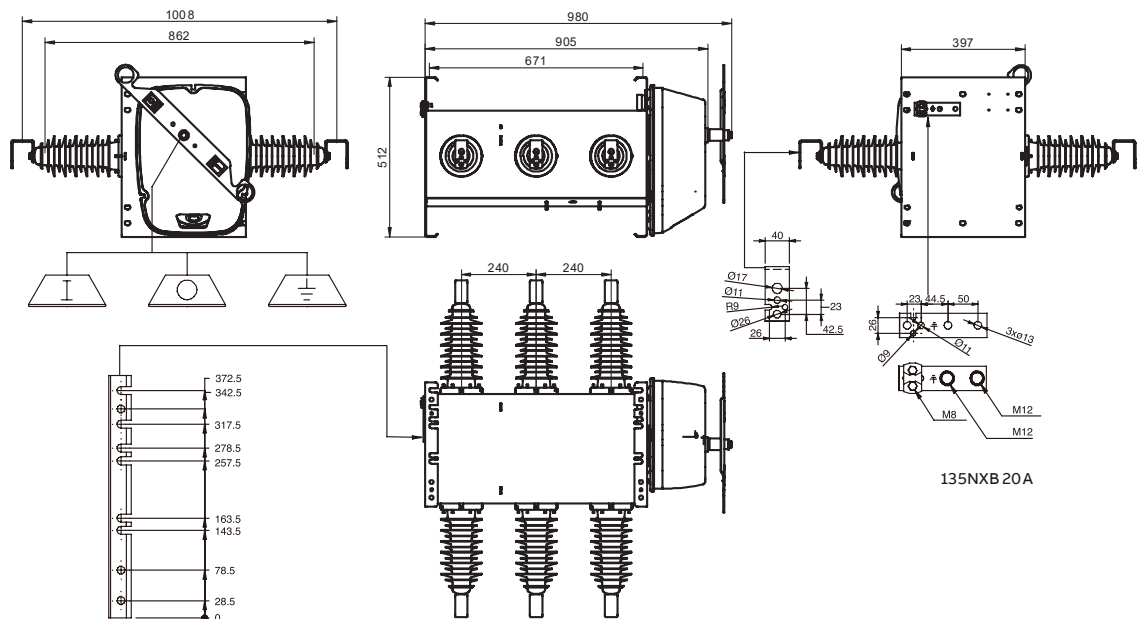
1. 400 series interface (DIN 47636) creepage distance A-A min 620mm silicon insulator NXAZJ2 (NXB).



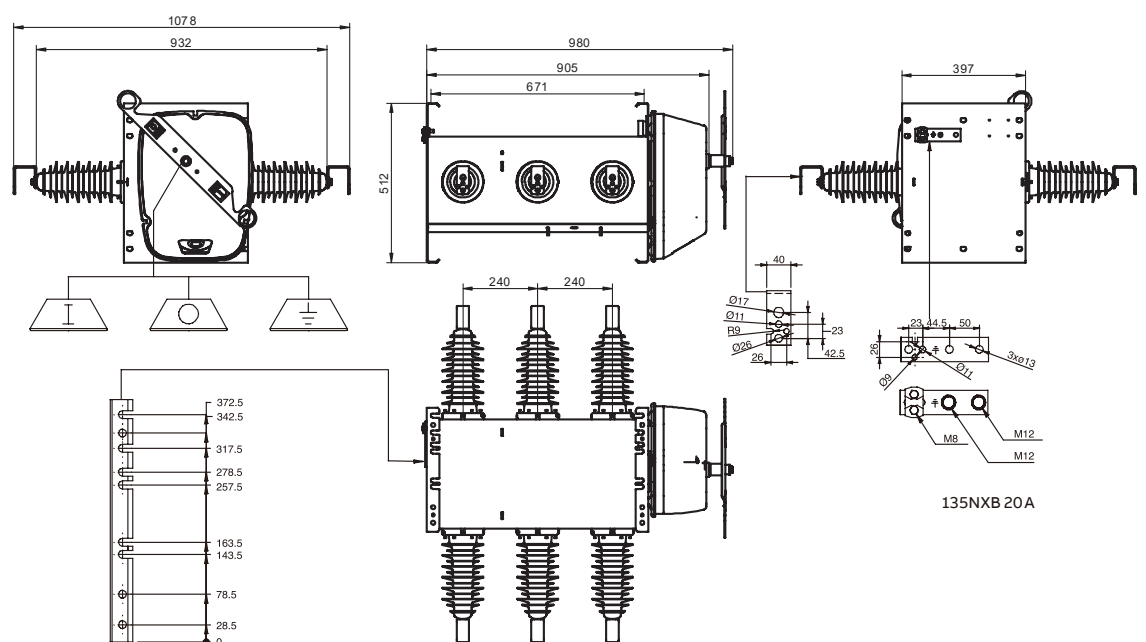
2. 400 series interface (DIN 47636) creepage distance A-A min 960mm silicon insulator 8XECD.720.024.



NXB_R 630_types

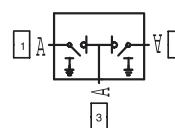


135NXB 20A

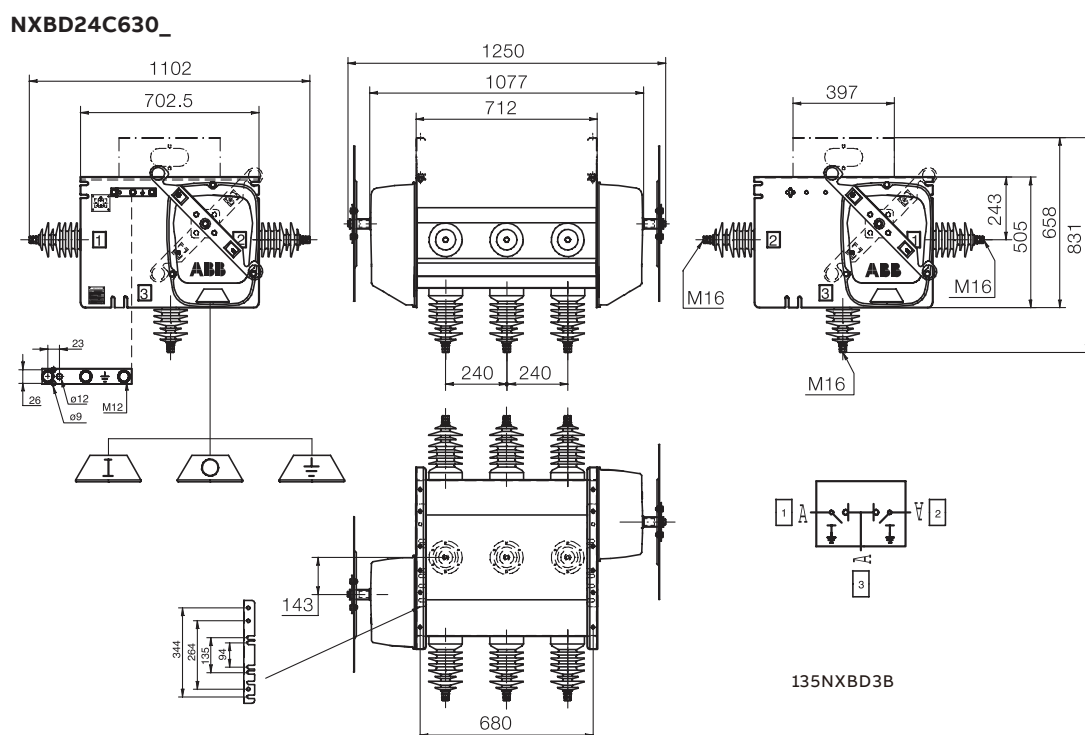


135NXB 20A

NXBD24E630_



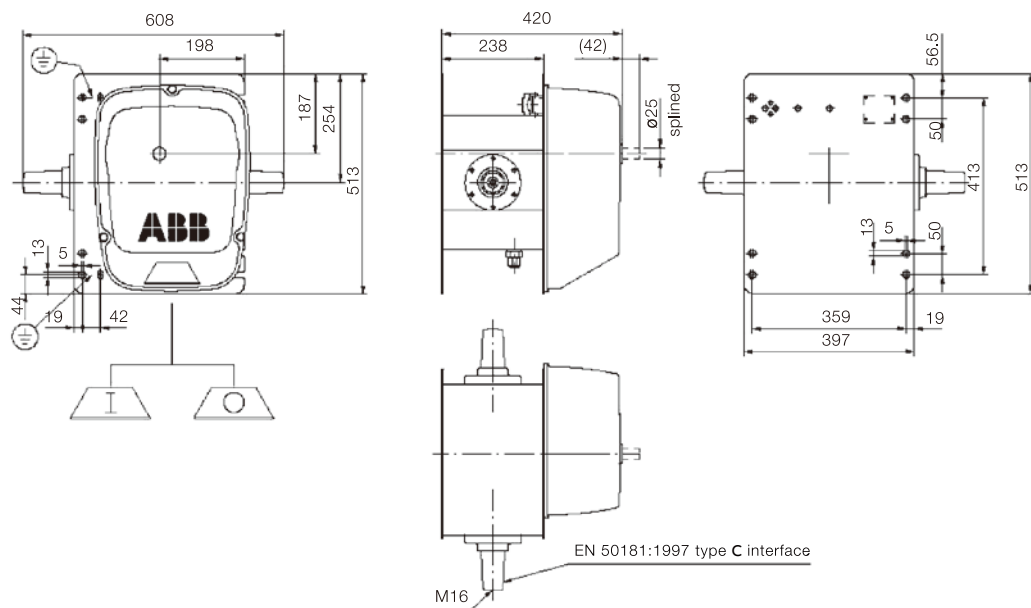
135NXBD1B



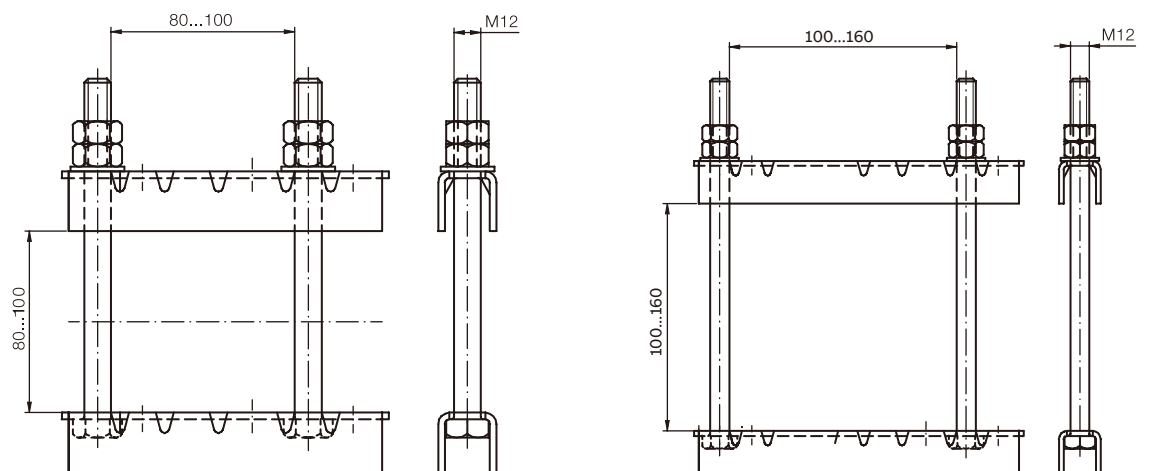
135NXBD3B

13.4 NXBS

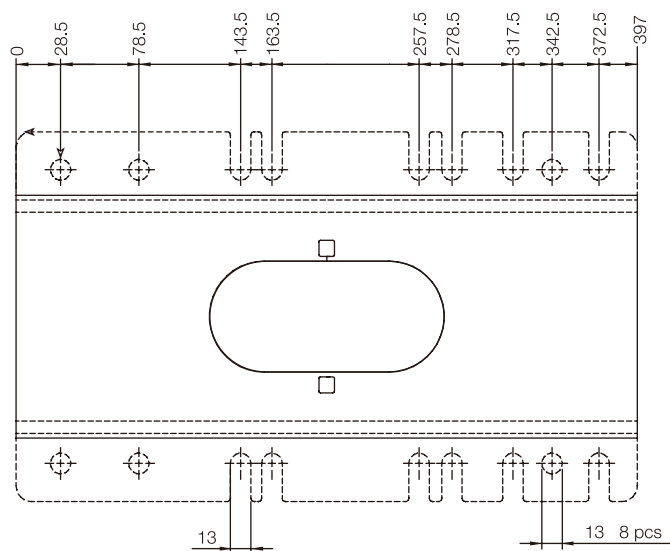
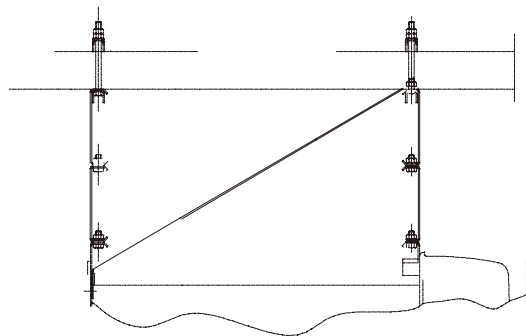
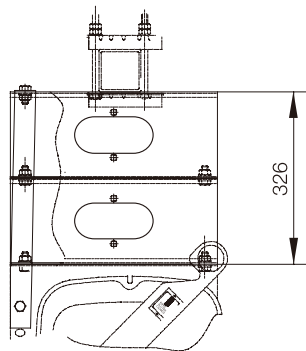
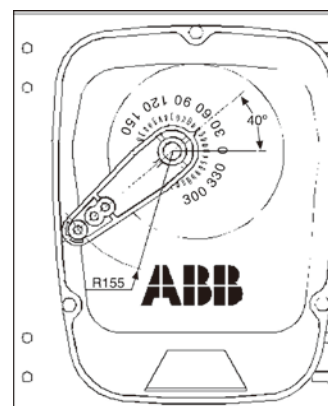
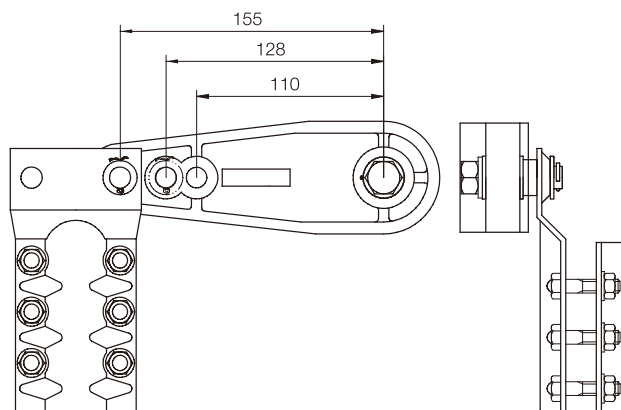
NXBS24E630_

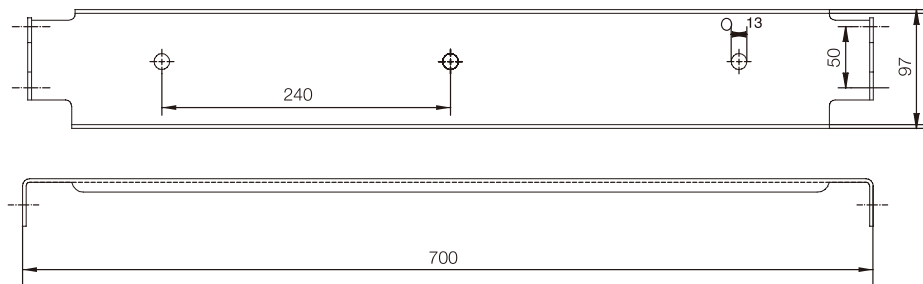
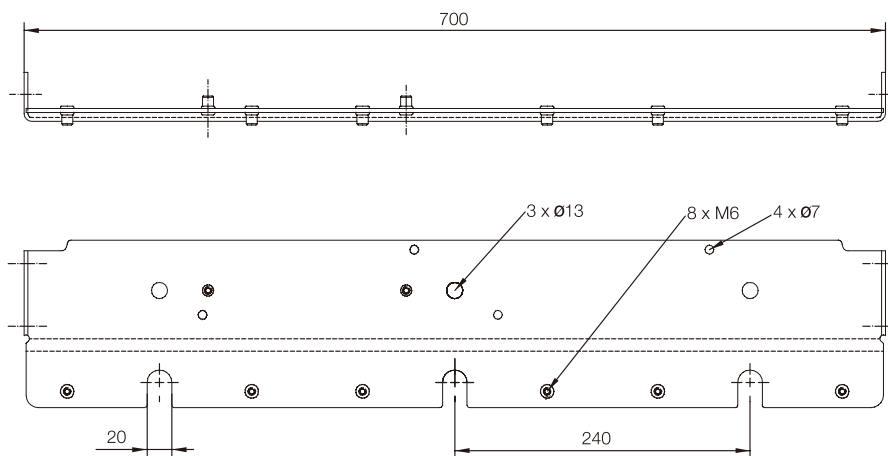
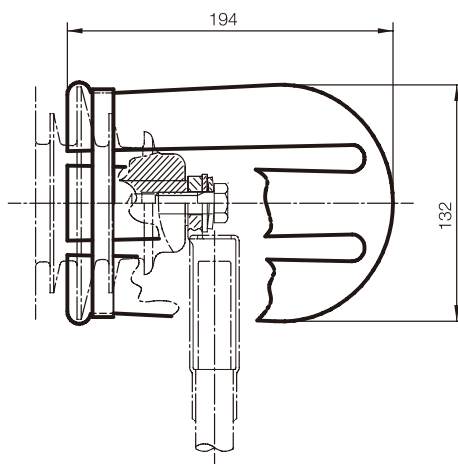
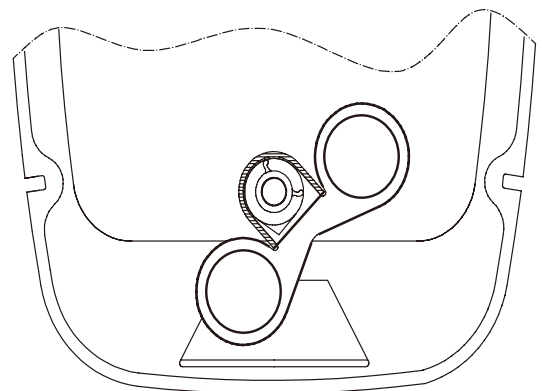


13.5 Accessories

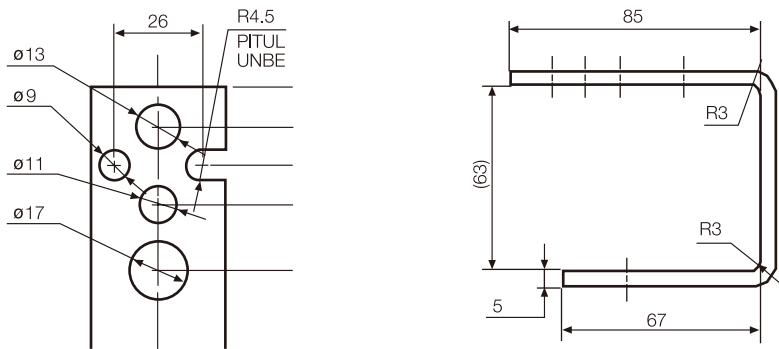


Fixing brackets NXAM1(left) and NXAM2 (right)

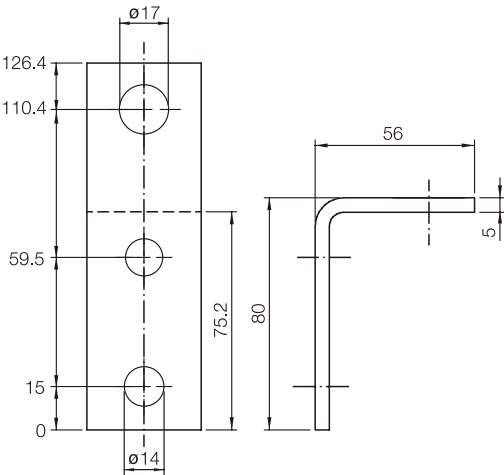
Spacer plates NXBZ59**Double spacer plates with angular support NXBZ127****Lever and tube fixing set (NXBC8) for a separate manual operating device**

Surge arrester mounting brackets NXBZ71 included in NXBZ81/3**Combined fixing brackets for CT:s and surge arresters NXBZ60****Bird caps KZNC/NXB/3 (assembled)****Mechanical locking device NXBZ90**

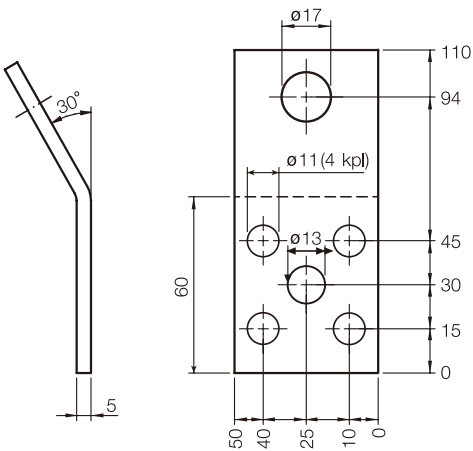
Standard terminal bars
NXBZ200 for silicon insulators (NXA, NXB_C_)



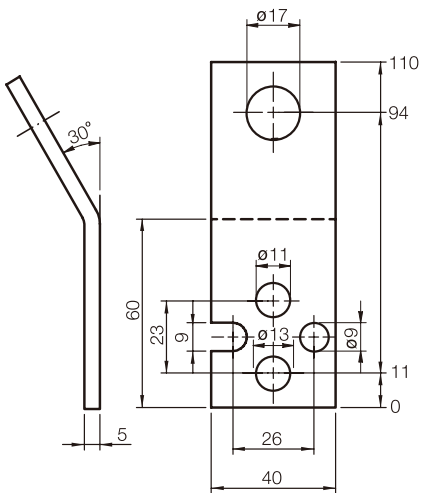
Special terminal bars
1 NXAZ140



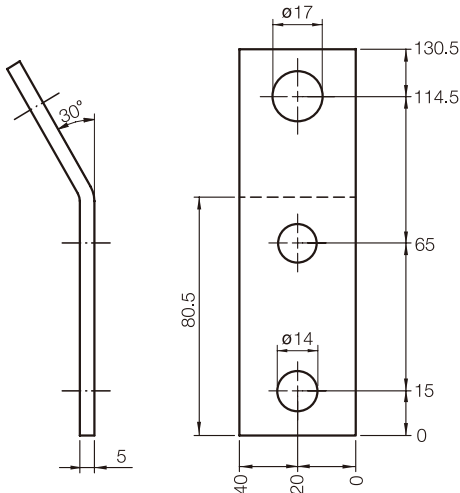
2 NXAZ18 (NXAC2)

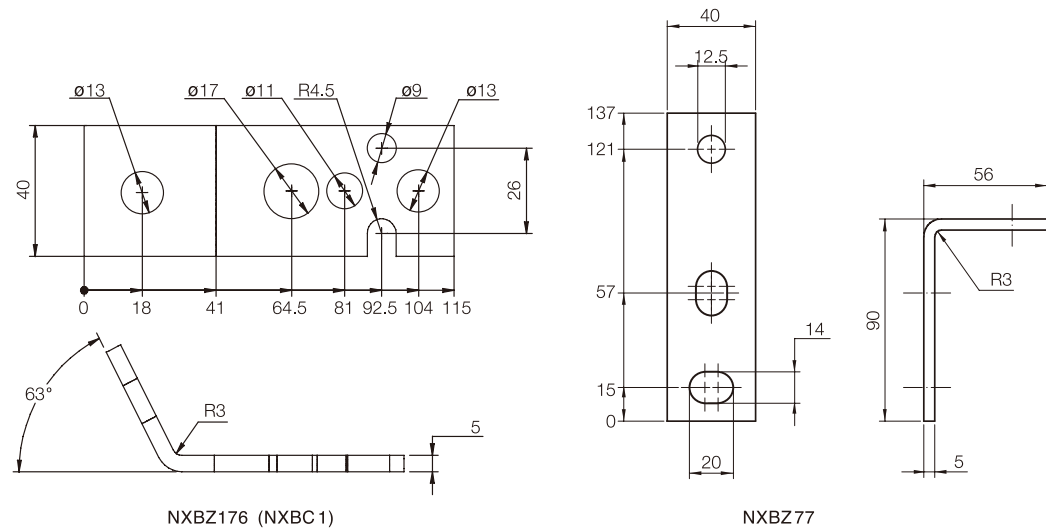
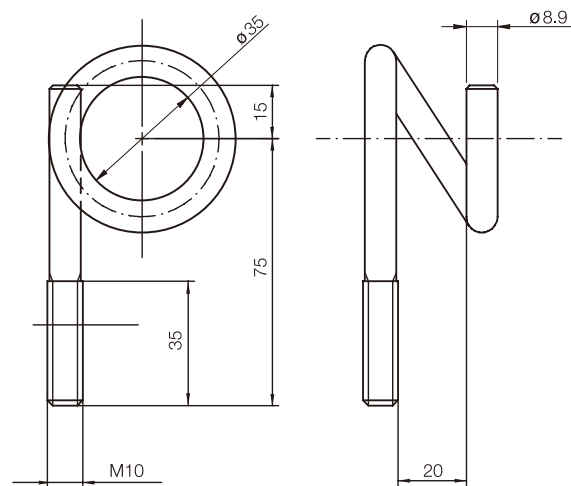
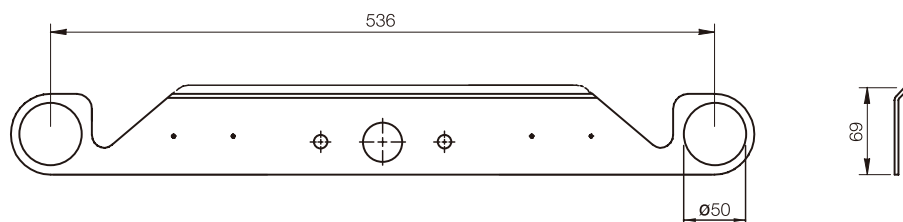


3 NXAZ48 (NXAC1)



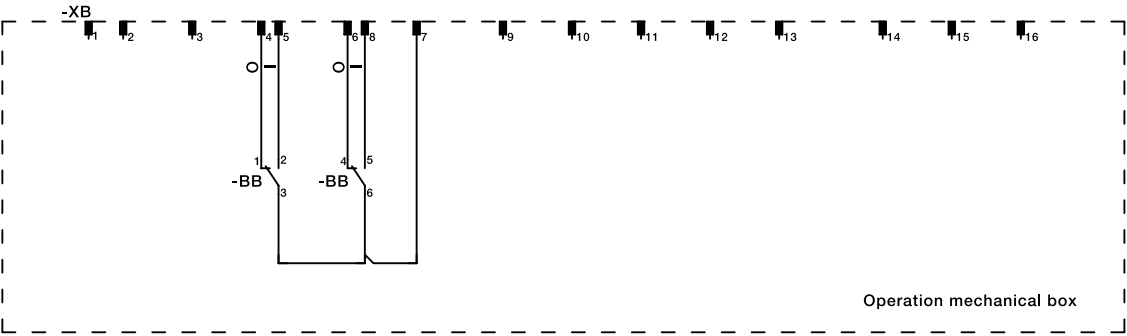
4 NXAZ115 (NXAC4)



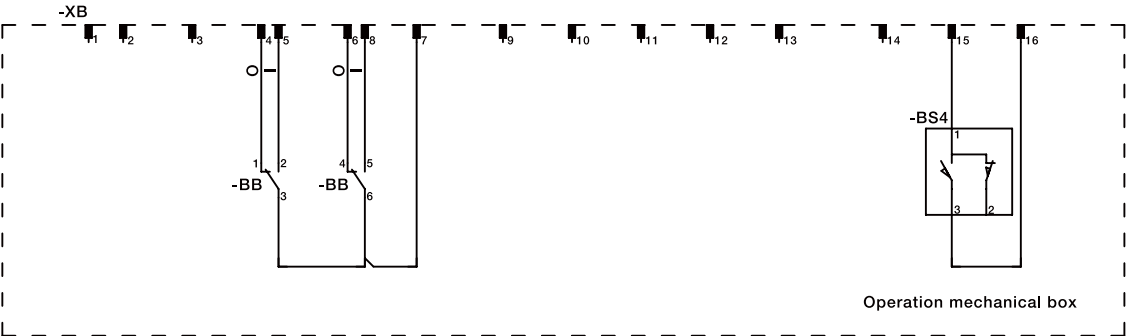
Special terminal bars**Lifting hooks NXAM6 (2 pcs)****Hook-stick lever NXBZ58**



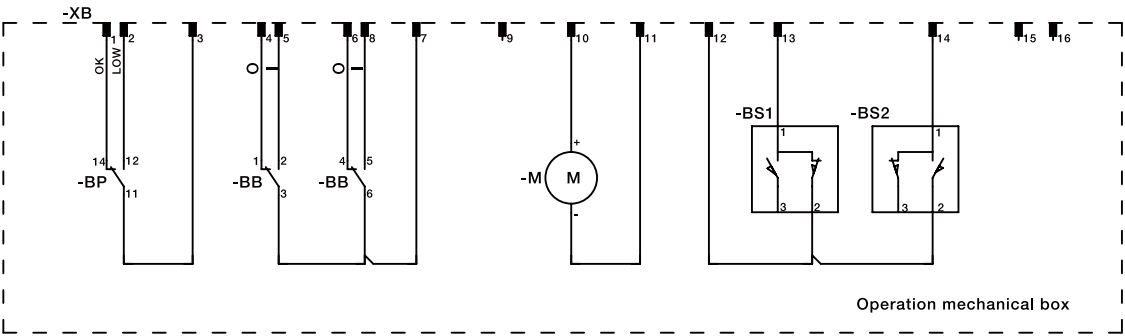
14. Auxiliary circuit diagrams



| | |
|-----------------|--|
| BB | Auxiliary switch |
| XB | Universal plug |
| Circuit diagram | SF ₆ -switch type NX_A3+density gauge (NXAP3) |
| 31NXB10B | 2-Position switch, manual operation |

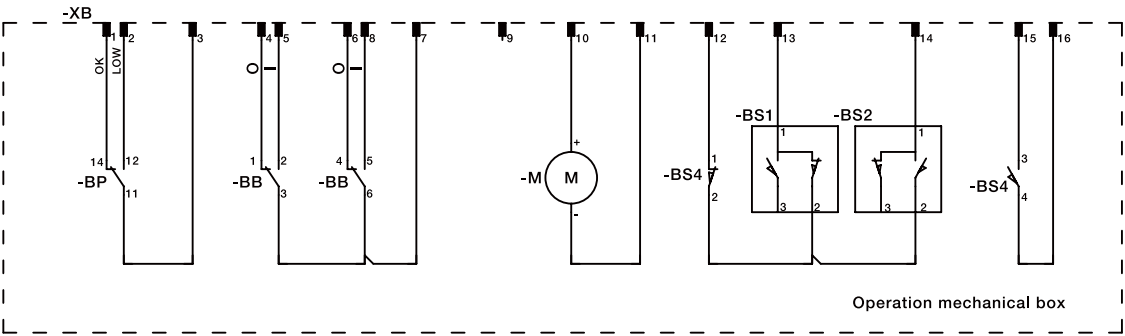


| | |
|-----------------|--|
| BB | Auxiliary switch |
| BS4 | Microswitch (manual lock device) |
| XB | Universal plug |
| Circuit diagram | SF ₆ -switch type NX_A3+manual lock device (NXBZ90)+density gauge (NXAP3) |
| 31NXB10BG | 2-position switch with manual locking device, manual operation |



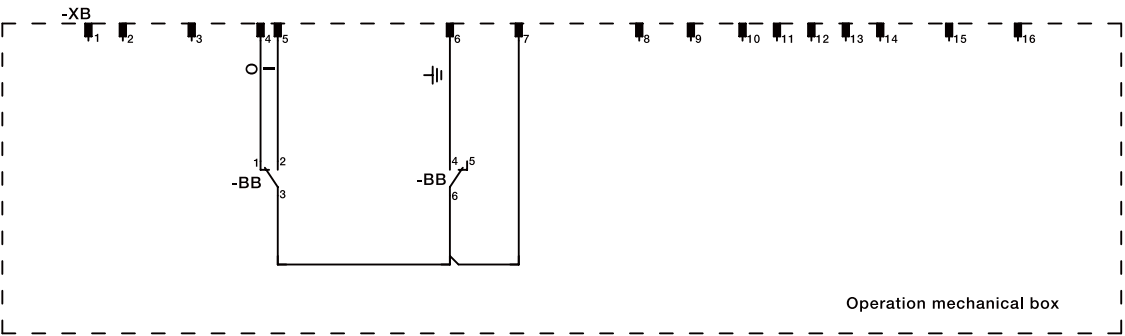
- BB Auxiliary switch
- BP Density switch
- BS1 Micro switch
- BS2 Micro switch
- M Motor
- XB Universal plug

Circuit diagram SF₆-switch type NX_AM3+density switch (ELEGMD1/0)
31NXB9C 2-position switch with motor



- BB Auxiliary switch
- BP Density switch
- BS1 Micro switch
- BS2 Micro switch
- BS4 Micro switch (manual lock device)
- M Motor
- XB Universal plug

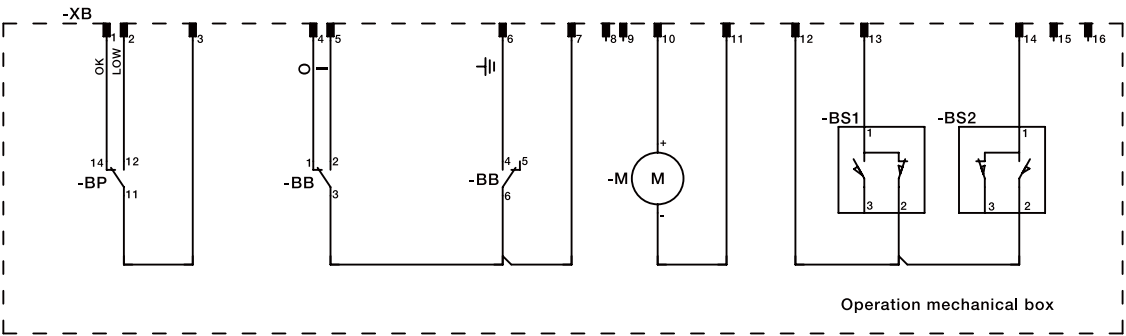
Circuit diagram SF₆-switch type NX_AM3+manual lock device (NXBZ90)+density switch (ELEGMD1/0)
31NXB8C 2-position switch with motor and manual locking device



| | |
|-----------------|--|
| BB | Auxiliary switch |
| BB | Auxiliary switch |
| XB | Universal plug |
| Circuit diagram | SF ₆ -switch type NX_C3+density gauge (NXAP3) |
| 31NXB3D | 3-Position switch, manual operation |

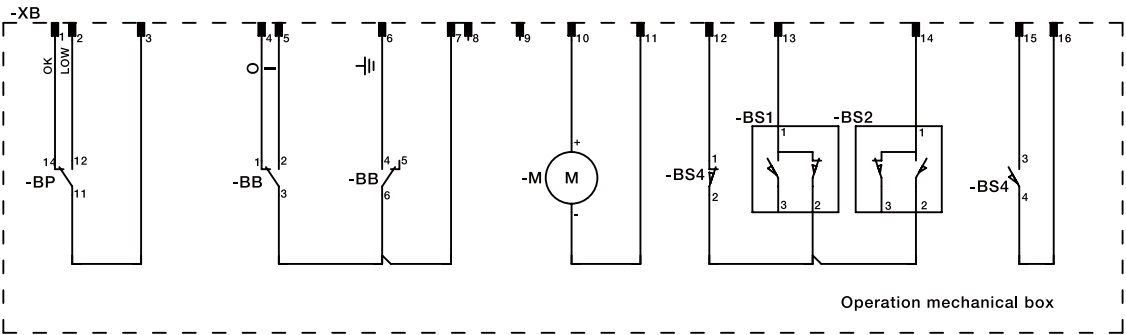


| | |
|-----------------|--|
| BB | Auxiliary switch |
| BS4 | Microswitch (manual lock device) |
| XB | Universal plug |
| Circuit diagram | SF ₆ -switch type NX_C3+manual lock device (NXBZ90)+density gauge (NXAP3) |
| 31NXB3E | 3-position switch with manual locking device, manual operation |



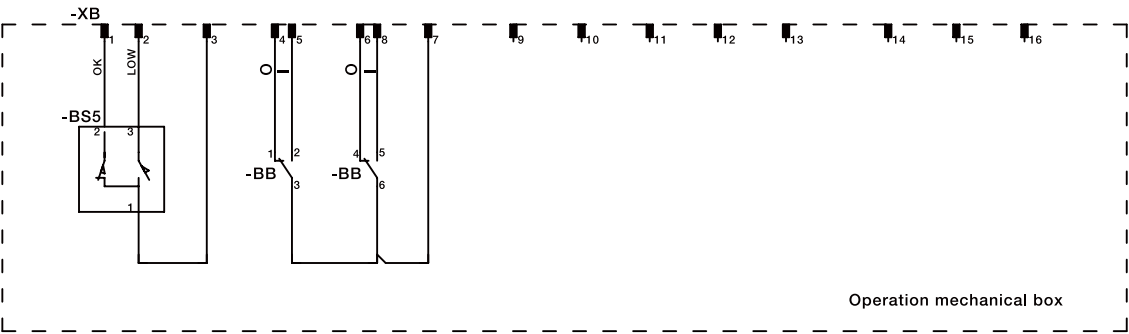
- | | |
|-----|------------------|
| BB | Auxiliary switch |
| BP | Density switch |
| BS1 | Micro switch |
| BS2 | Micro switch |
| M | Motor |
| XB | Universal plug |

Circuit diagram SF₆-switch type NX_CM3+density switch (ELEGMD1/0)
31NXB6D 3-position switch with motor

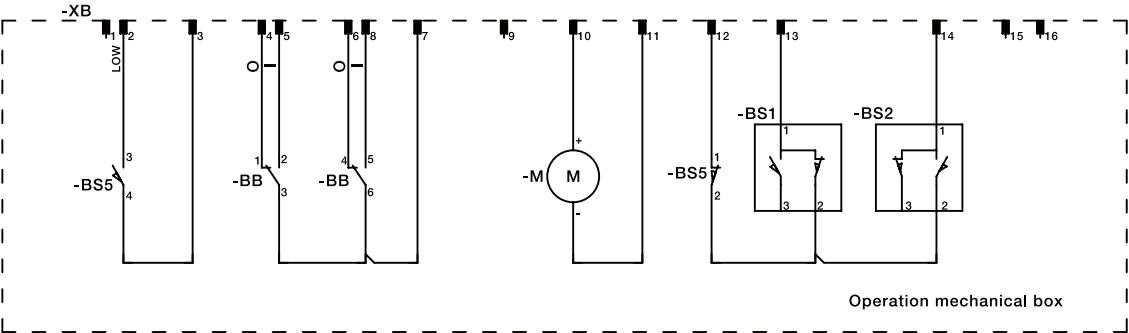


- | | |
|-----|-----------------------------------|
| BB | Auxiliary switch |
| BP | Density switch |
| BS1 | Micro switch |
| BS2 | Micro switch |
| BS4 | Micro switch (manual lock device) |
| M | Motor |
| XB | Universal plug |

Circuit diagram SF₆-switch type NX_CM3+manual lock device (NXBZ90)+density switch (ELEGMD1/0)
31NXB7C 3-position switch with motor and manual locking device



- | | |
|-----|---------------------------------|
| BB | Auxiliary switch |
| BS5 | Micro switch (gas low lock out) |
| XB | Universal plug |
- Circuit diagram SF₆-switch type NXB_+gas low lock out (NXBZ4)
- 31NXB10AG2 2-position switch with gas low locking device, manual operation



- | | |
|-----|---------------------------------|
| BB | Auxiliary switch |
| BS5 | Micro switch (gas low lock out) |
| BS1 | Micro switch |
| BS2 | Micro switch |
| M | Motor |
| XB | Universal plug |
- Circuit diagram SF₆-switch type NXB_+gas low lock out (NXBZ4)
- 31NXB9CG 2-position switch with motor and gas low locking device

Enclosure 1

Line connections

General

Copper connectors:

Note the conductor area fits the used connector and tighten by correct torque.

Aluminum connectors:

Ensure that the conductor area and material fits the used connector. The solid aluminum bar shall be left in the empty slot, if a double slot connector (type KG_) is used for a single conductor. The oxidized surface of the conductor end and the grooved bottom of the connector shall be removed by a steel brush and the surfaces greased immediately by a special grease for aluminum connections to prevent reoxidation. The slots of the connectors are greased by the manufacturer. Tighten by correct torque.

Recommended greases: Ensto type SRI, ABB DSAXRK, PENETROX-A.



Note:

The aluminum oxide layer increases contact resistance and may cause dangerous overheating.

Combined connectors for aluminum and copper:

Note which slot is for copper; tin plated copper bars are forced in the other slot for copper conductors. Follow the proceeding instructions depending on the conductor type. Leave the solid aluminum bar in the aluminum slot, if only copper conductor is connected.

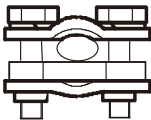
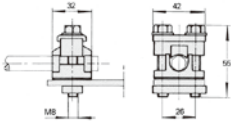
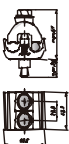
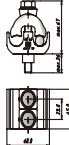
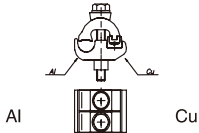
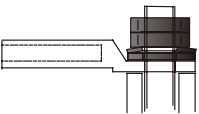
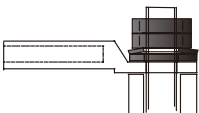
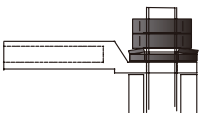
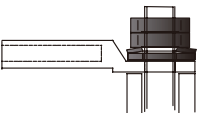
Aluminum cable clamps:

Cable clamps may be connected direct on the bushings or on the optional terminal bar. Ensure that the conductor area and material fits the used clamp. Brush the conductor end. The conductor hole is filled with grease, which also protects the connector, if immediately inserted. Compress according to the instructions of the tool manufacturer starting from the cable end. It is not necessary to brush the tin plated cable lugs. The large washer is used to stabilize stresses and the spring washer compensates dimension variations due to temperature changes and creepage.

Copper cable clamps:

Follow the instructions of aluminum clamps. The brushing and greasing is not necessary.

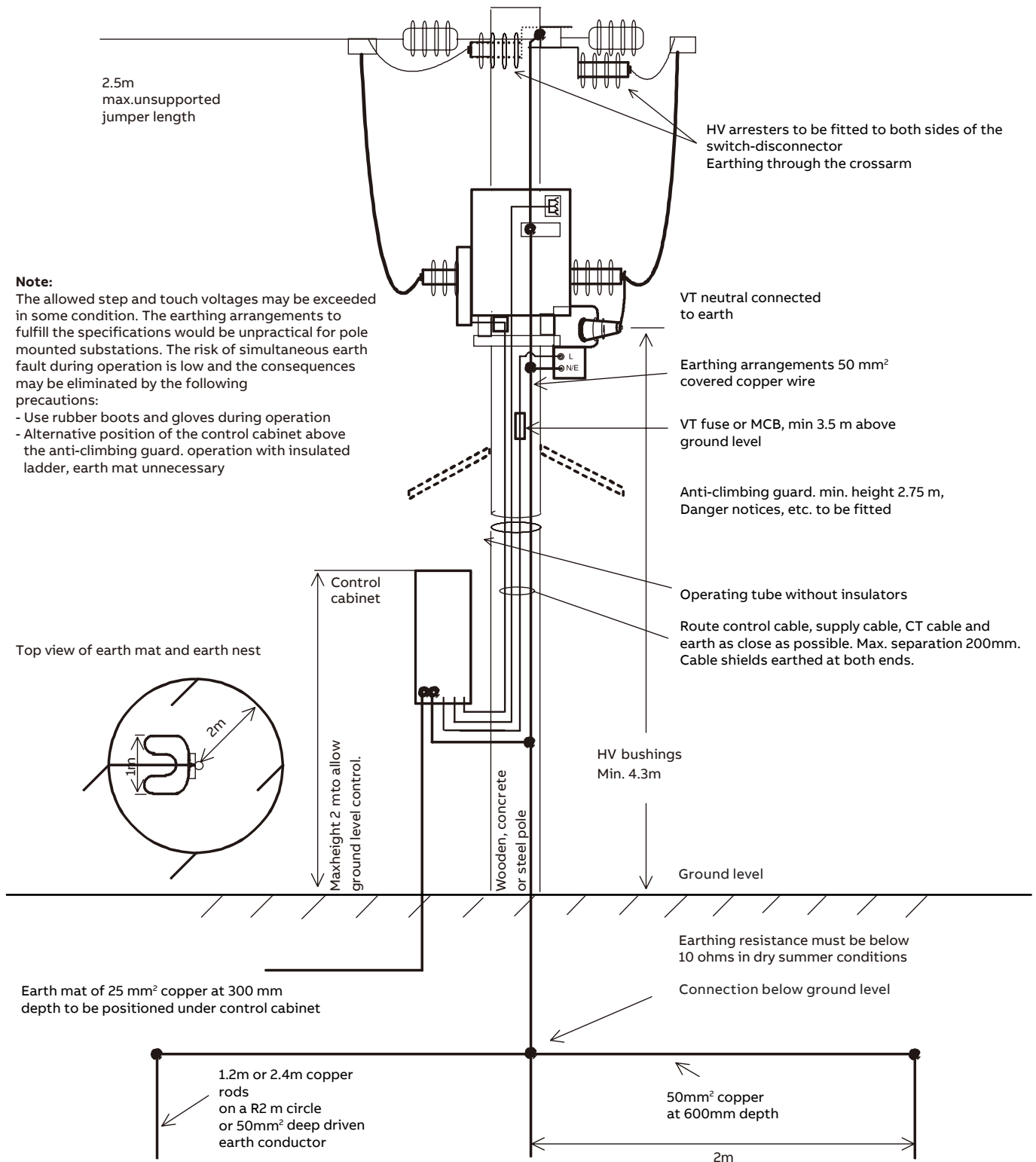
—
Standard line connectors for Sectos

| Connector type | | Conductor material and area | Bolt size/torque | |
|---|---|--|------------------|------|
| OJUZLL 1/3 |  | Cu 16...63mm ² | M8 | 20Nm |
| NPTL 24/3 |  | Al 62...90mm ² | M8 | 20Nm |
| OJUZLL 3/3 (KG6.1) |  | 2×Al 16...70mm ² | M8 | 20Nm |
| OJUZLL 4/3 (KG43) |  | 2×Al 50...240mm ² | M10 | 40Nm |
| KG 36 |  | Al 50...240mm ² | M10 | 44Nm |
| Cable clamps: EXMAR1 7050-12/Sn40 EXMAR1 7050-16/Sn40 |  | Al 50mm ² | M12 | 50Nm |
| | | 2 compressions by hexagonal tool nr.16, Elpress or compatible | M16 | 70Nm |
| EXMAR1 7095-12/Sn40 EXMAR1 7095-16/Sn40 |  | Al 95 mm ² | M12 | 50Nm |
| | | 3 compressions by hexagonal tool nr.22, Elpress or compatible | M16 | 70Nm |
| EXMAR1 71 20-12/Sn40 EXMAR1 71 20-16/Sn40 |  | Al 120mm ² | M12 | 50Nm |
| | | 3 compressions by hexagonal tool nr.22, Elpress or compatible | M16 | 70Nm |
| EXMAR1 71 50-12/Sn40 EXMAR1 71 50-16/Sn40 |  | Al 150mm ² | M12 | 50Nm |
| | | 3 compressions by hexagonal tool nr.25, Elpress or compatible | M16 | 70Nm |

Enclosure 2

General arrangements

General arrangements for remotely controlled pole mounted switch disconnecter in solidly or low-ohm earthed networks (31NXA23B)



Enclosure 3

General earthing arrangements

General earthing arrangements for isolated, high-ohm and resonant earthed neutral systems

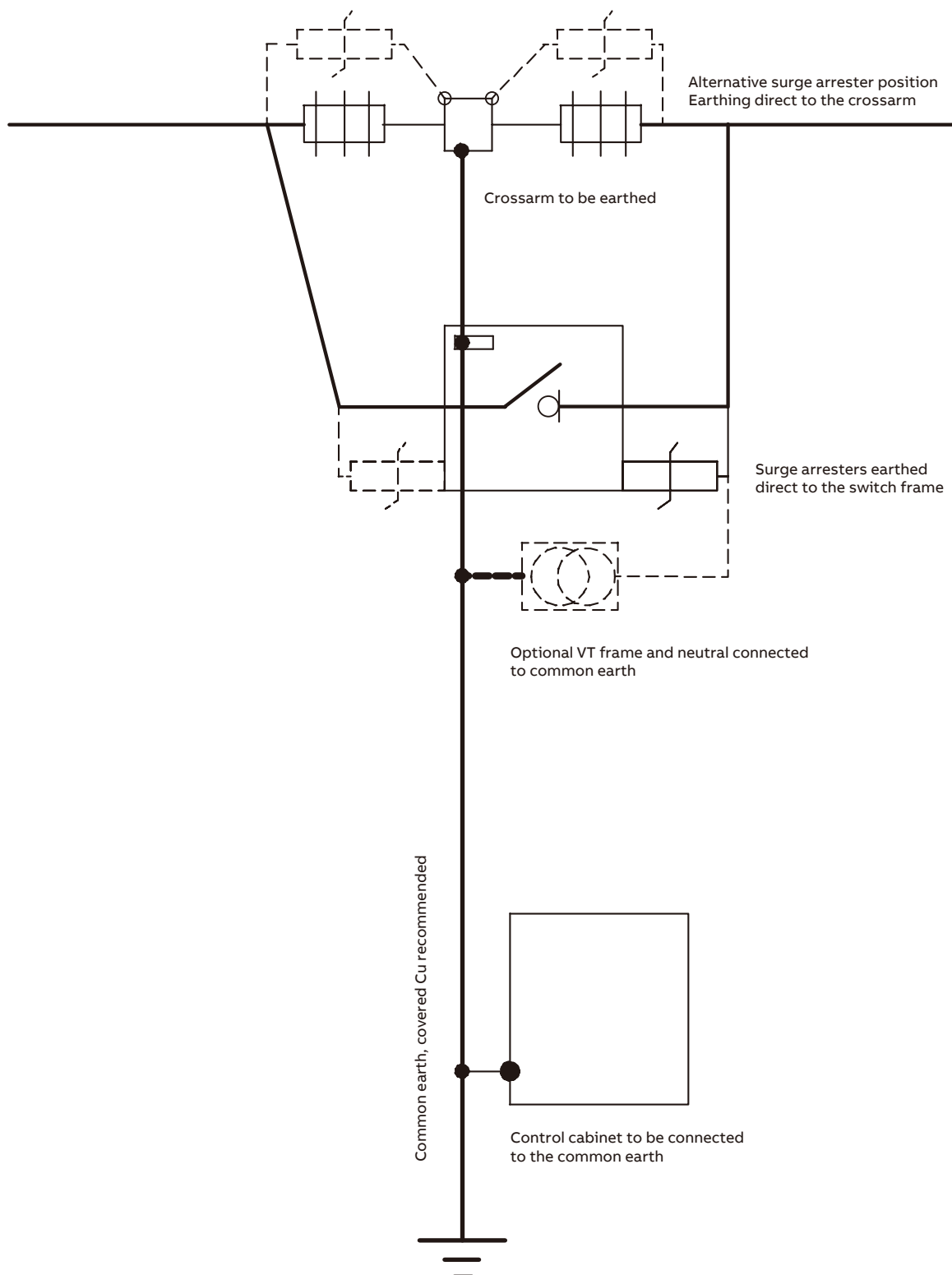




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