

Uniswitch Medium Voltage Switchgear

12 kV, 17.5 kV, 24 kV
630 A and 1250 A

Installation Manual



ABB

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Y o u r s a f e t y f i r s t – a t a l l t i m e s !

This is why our manual begins with the following recommendations:

- Only install switchgear in closed rooms suitable for electrical equipment.
- Ensure that installation, operation and maintenance are carried out by specialist electricians only.
- Fully comply with the legally recognized standards (IEC or local), the connection conditions of the local electrical utility and the applicable safety at work regulations.
- Observe the relevant information in the manual for all actions involving switchgear.

Pay special attention to the hazard notes in the manual marked with this warning symbol.

WARNING !

Make sure that the specified data are not exceeded under switchgear operating conditions.

Keep the manuals accessible to all personnel involved in installation, operation and maintenance.

The user's personnel must act responsibly in all matters affecting safety at work and correct handling of the switchgear.

WARNING !

**Always follow the instructions in the manual and
respect the rules of good engineering practice !**

Hazardous voltages can cause serious injury or death!

**Disconnect the power, then earth and short-circuit
before proceeding with any work on this equipment.**

Contact us!

**If you have any further questions about this manual, the
members of our field organization will be pleased to
provide the required information.**

1 Summary

Uniswitch product family Uniswitch switchgears are either fixed or withdrawable type cubicles. In this manual, details of the fixed type are referred to and, where different, details of the withdrawable (and fixed + withdrawable) type are included as notes, or in the case of, for example, the cubicle design, as separate sections.

Technical documentation • Uniswitch technical documentation consists of two publications: *Instruction Manual* and *Installation Manual*.

Critical messages User-critical messages are shown as follows:

- ...for Danger

- ...for Warning

- ...for Caution

- ...for Note

2 Transportation and storage

2.1 Condition on delivery

Delivery package

Uniswitch is delivered either as single cubicles or switchgear units with a length of no more than 2.0 m, and with the doors closed. The size of the package(s) depends upon the number of cubicles and has to be defined separately for each case.

The factory-assembled cubicles have been checked at the factory for completeness in terms of the order, and simultaneously subjected to routine testing (normally without AC voltage testing of the busbars) to IEC publication 60298, and are therefore tested for correct structure and function.

The busbars are assembled in the circuit-breaker cubicle, but the busbar material between two cubicles and the busbar end, fasteners and accessories are packed separately.

At the time of dispatch, the withdrawable parts are in the service position.
--

2.2 Unpacking at installation site

Storage and inspection

The Uniswitch switchgear should only be installed indoors. Therefore it is important to store the switchgear cubicles in their transportation packages as long as possible.

The packaging should only be opened for the inspection of possible damage occurring during transportation. After inspection the packaging should be restored to its original condition.

Any transportation damage should be reported immediately to the carrier/forwarder. If the installation of the switchgear is to be made right after the delivery, the transportation packaging can be removed except for the plastic film around the cubicles, which should be removed at the final switchgear installation site.
--



Figure 2.1
Two Uniswitch cubicles on a pallet.

General

Depending on the cubicle type, the cubicles are fixed to the pallet using either separate fixing plates (**90.1**) (Figure 2.2) located outside the cubicle, or by using bolts (**90.2**) (4 pcs) (Figure 2.3) inside the cubicle (corner fixings).

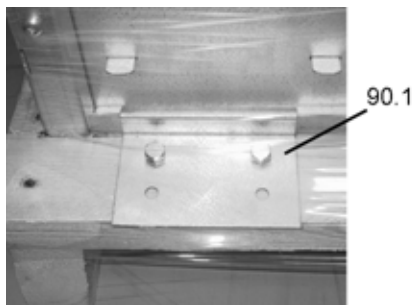


Figure 2.2
Fixing plate outside the cubicle.

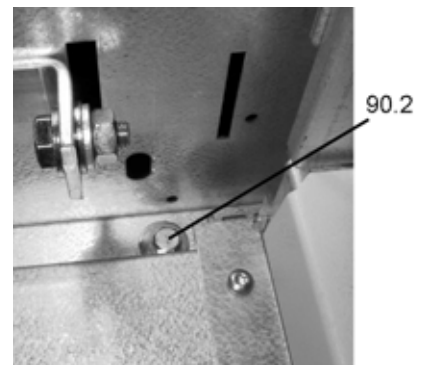


Figure 2.3
Bolts inside the cubicle.

Instructions

- 1) Remove the plastic film from the cubicles.
- 2) Take off and discard the fixing plates and bolts. These will not be needed.

2.3 Transfer of cubicles at installation site

2.3.1 General warnings and cautions

Only carry out loading operations when it has been ensured that all precautionary measures to protect personnel and materials have been taken.

! The switchgear cubicles should usually be transferred in an upright position. Take the high center of gravity into account. Leaning or overturning should be avoided. If necessary, single cubicles can be carried horizontally, for example, because of a low doorway. In such cases the cubicle has to be supported from a wide area.

2.3.2 Instructions

Transport units

The transport units normally are comprised of individual cubicles and, in exceptional cases, small groups of cubicles. The cubicles are each fitted with lifting lugs.

Transfer instructions

The cubicles should be transferred horizontally by a manual forklift or a forklift truck, or exceptionally by means of rolling tubes (using at least four tubes).

! The packages should be placed on a smooth base.

Lifting instruction

Use the following tools for lifting:

- Crane
- Fork-lift truck and/or
- Manual trolley jack

If a crane is available, lifting of a single cubicle is done using two or four (depending of size of cubicle) lifting wire cables from the lifting lugs situated on the top of the cubicle.

When loading by crane, do the following:

- 1) Fit lifting ropes of appropriate load capacity with spring catches (eyebolt diameter: 34 mm).
- 2) Keep an angle of at least 60° from the horizontal for the ropes leading to the crane hook.

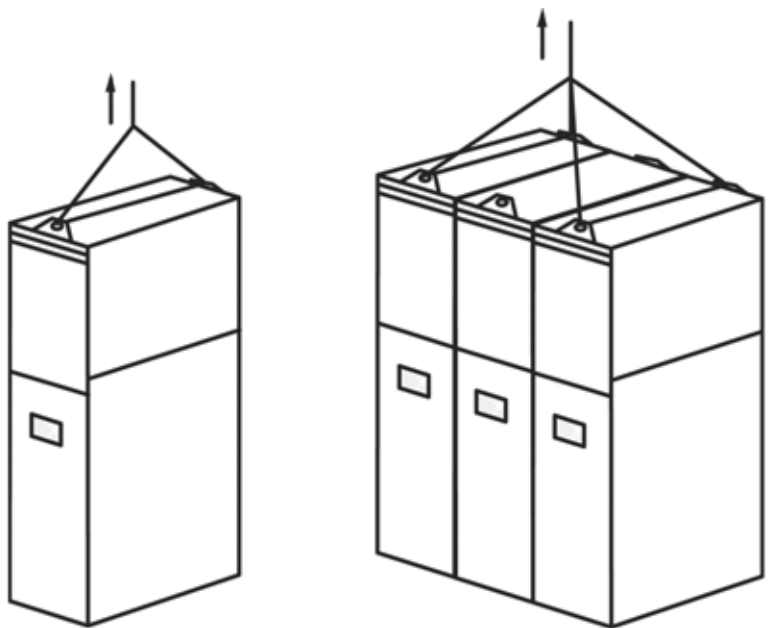


Figure 2.4
Lifting by crane.

! When lifting several cubicles or a whole switchgear unit (4 cubicles at the most or a maximum length of 2 m) four lifting wires, of sufficient length, should be used (see Figure 2.4).

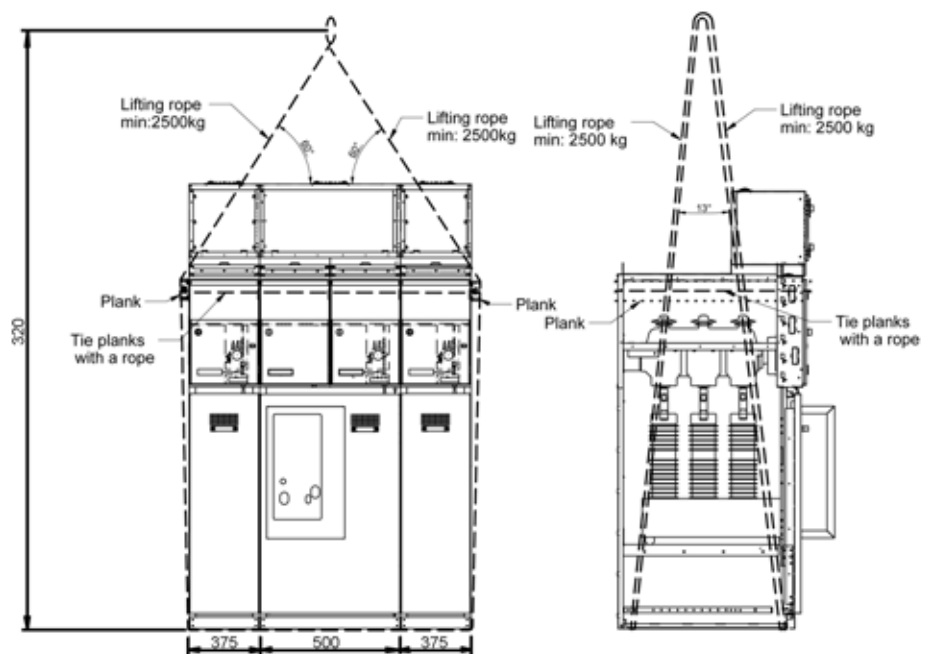


Figure 2.5
Lifting without using the lifting lugs.

2.4 Weights

Table 2.1 Weights of different cubicles without packaging.

Cubicle type	Approximate weight/kg						
	Height = 1635 mm Depth = 900 mm			Height = 1885 mm Depth = 900 mm			Height = 1905 mm Depth = 1335 mm
	Width mm			Width mm			Width mm
	375	500	750	375	500	750	800
SDC ¹	130	140		140	150		
SDF ²	140	150		150	160		
CBC ³			420			440	
DBC	110	120		120	130		
SEC	140	150		150	160		
SBC ³			420			440	
BRC ¹	140	150		150	160		
SMC ³			440			460	
CBW ⁴							650
SBW ⁴							680

Table 2.2 Weights of different devices.

Device	Approximate weight/kg
Instrument transformer 12/17.5 kV	25
Instrument transformer 24 kV	30
Circuit-breaker VD4/S	103
Circuit-breaker VD4/US	115
Circuit-breaker HD4/S	103
Circuit-breaker HD4/US	125

¹ without instrument transformers

² without fuses

³ without circuit-breaker

⁴ with circuit-breaker and current transformers

2.5 Temporary storage

2.5.1 General warnings and cautions

Do not walk on the TOP of the cubicles!

! The package should immediately be taken indoors after having arrived. The conditions have to meet the environmental demands of the IEC 60721-3-1 standard, classification 1K3 (see Table 2.3).

! Inhibitors, placed in the cubicles for protection against humidity during temporary storage and transport, should not be removed before the end of the installation.

! Maximum temporary storage time for the cubicles is 12 months. When the maximum storage period, starting from the date of packing, has been exceeded, the protective function of the packaging can no longer be guaranteed. Take suitable action if intermediate storage is to continue!

2.5.2 Optimum conditions

Definition

Optimum intermediate storage, where it is necessary, without any negative consequences depends on compliance with a number of minimum conditions for the cubicles and assembly materials.

Table 2.3 Climatic conditions according to IEC 60721-3-1, classification 1K3.

Low air temperature	- 5 °C
High air temperature	+ 40 °C
Low relative humidity	5 %
High relative humidity	95 %
Rate of change of temperature	0.5 °C/min

Depending on packaging type:

Special instructions depending on the packaging type follow:

1. Cubicles with basic packaging or without packaging

- 1) Use a dry, well-ventilated storeroom with a climate in accordance with Table 2.3
- 2) The room temperature must not fall below -5°C .
- 3) There must not be any other negative environmental influences.
- 4) Store the cubicles upright.
- 5) Do not stack cubicles.
- 6) Cubicles with basic packaging:
 - a) Open the packaging, at least partially.
- 7) Cubicles without packaging:
 - a) Loosely cover with protective sheeting.
 - b) Ensure that there is sufficient air circulation.
 - c) Check regularly for any condensation until installation is started.

2. Cubicles with seaworthy or similar packaging with internal protective sheeting

- 1) Store the transport units:
 - protected from the weather,
 - in a dry place,
 - safe from any damage.
- 2) Check the packaging for damage.

2.6 Delivery responsibilities

Responsibilities

The responsibilities of the consignee when the switchgear arrives at site include, but are not limited to, the following:

- Check the consignment for completeness and lack of any damage (e.g. also for moisture and its detrimental effects). In case of doubt, the packaging must be opened and then properly resealed.

Always take photographs to document any major damage.

- If any quantities are short, or defects or transport damage are noted, these must be:
 - documented on the respective shipping document.
 - notified to the relevant carrier or forwarding agent immediately in accordance with the relative liability regulations.

3 Assembly of the switchgear at site

3.1 General warnings and cautions

! When the final construction documents are compiled, the binding data supplied by ABB must always be taken into account!

! In order to obtain an optimum installation sequence and ensure high quality standards, site installation of the switchgear should only be carried out by specially trained and skilled personnel, or at least by personnel supervised and monitored by responsible persons.

Where switchgear cubicles have top-mounted pressure relief ducts or top-mounted low voltage compartments, it must be ensured that the ceiling height is sufficient for them.

3.2 Preparations

Before starting

On commencement of installation on site, the switchgear room must be completely finished, provided with lighting and the electricity supply, lockable, dry and with facilities for ventilation.

All the necessary preparations, such as wall openings, ducts, etc., for laying the power and control cables up to the switchgear must already be completed.

3.3 Dimensions

3.3.1 Fixing dimensions

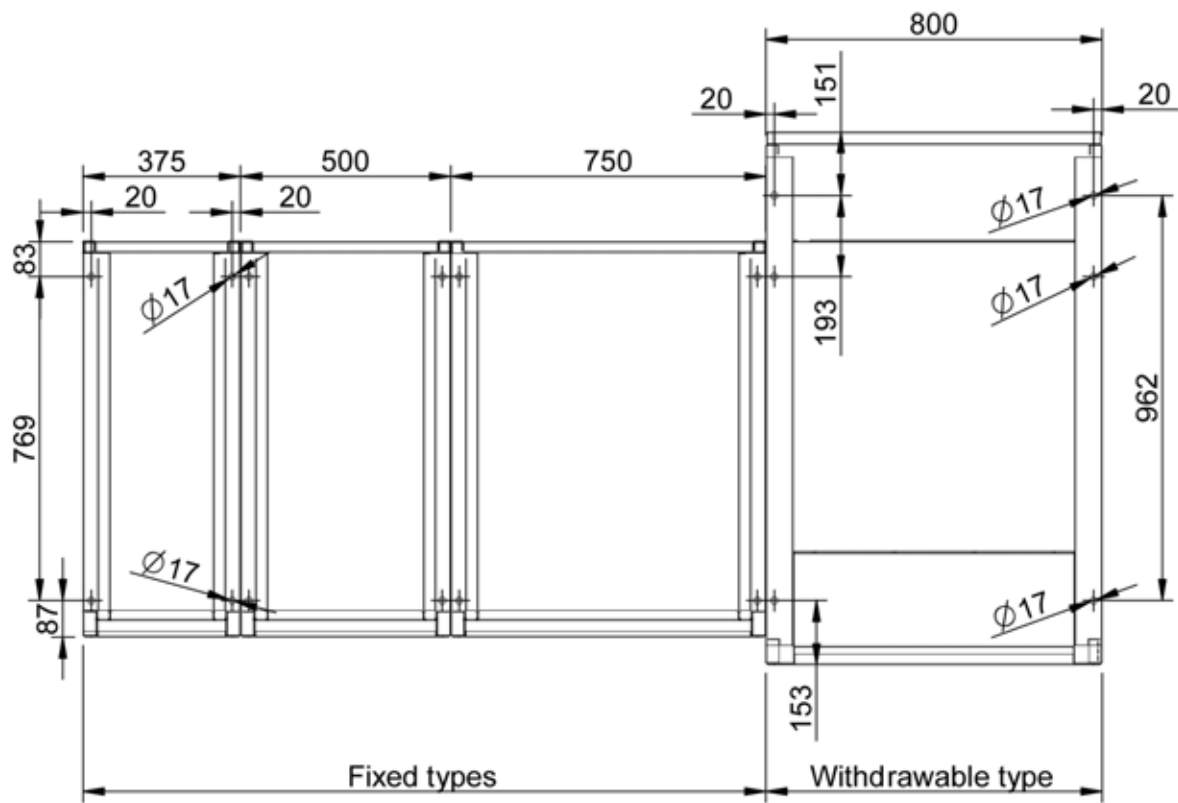


Figure 3.1
Fixing dimensions.

3.3.2 Cubicle dimensions

There should be at least 250 mm (fixed type) or 50 mm (withdrawable type) pressure release space between the back of the switchgear and the switchgear room wall. This space should be closed by fastening a metal sheet (thickness at least 2 mm) between the back of the switchgear and the wall of the switchgear room.

If the switchgear is situated in the middle of the switchgear room it has to be equipped with pressure relief channels.

Drawings

The following drawings illustrate the main dimensions and the space requirements of different cubicle types.

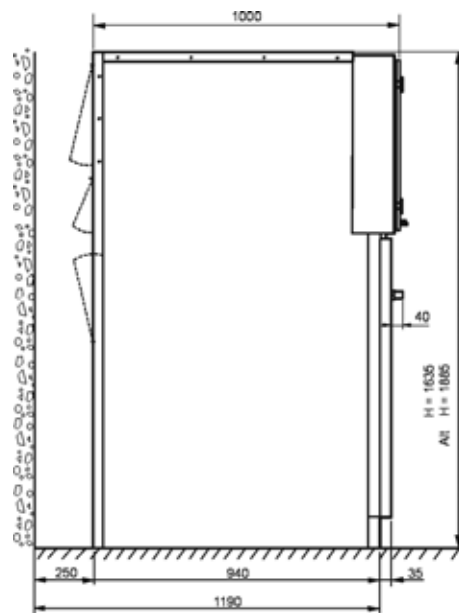


Figure 3.2
Cubicle types SDC, SDF, DBC, BRC, SEC

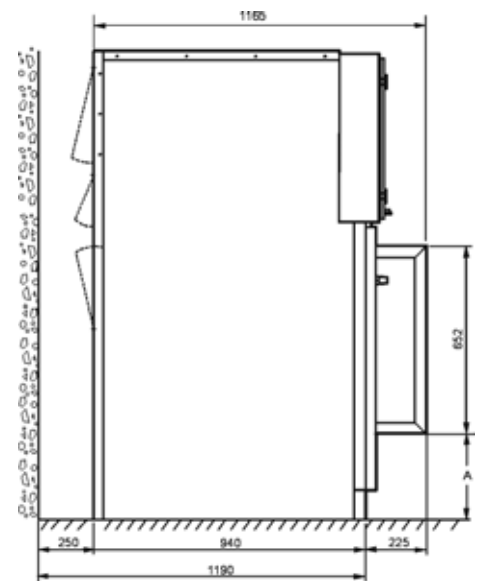


Figure 3.3
Cubicle types CBC, SMC, SBC
A = 230 mm by H = 1635
A = 480 mm by H = 1885

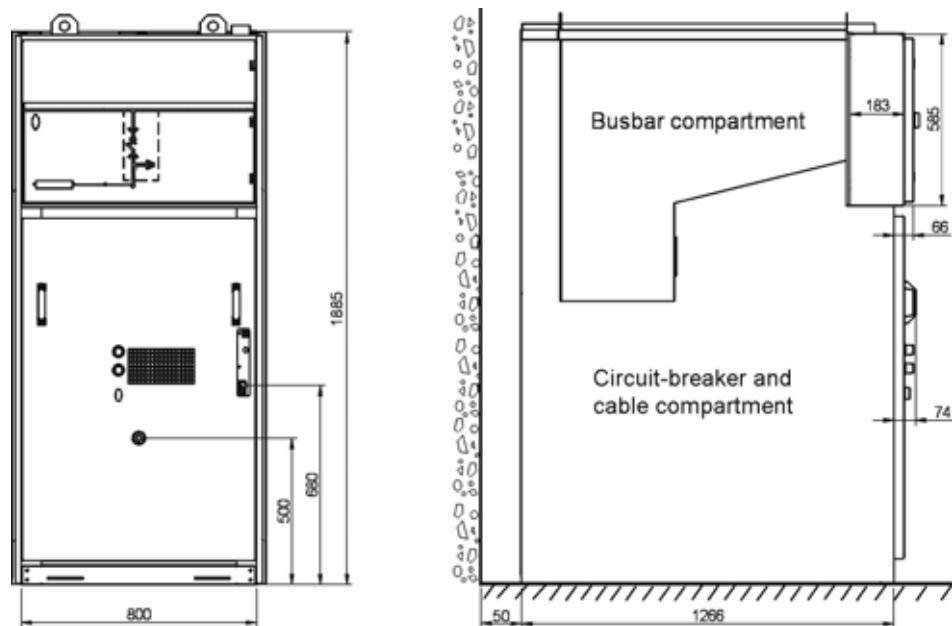


Figure 3.4
Main dimensions mm of the cubicles (withdrawable type).

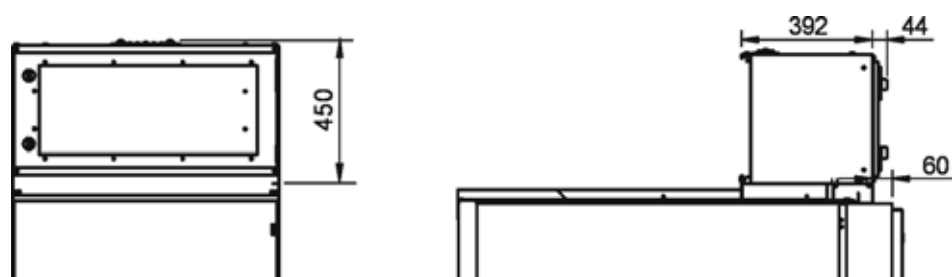
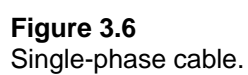


Figure 3.5
Dimensions of low voltage compartment (optional).

3.3.3.1 Single-phase cable



3.3.3.2 Three-phase cable

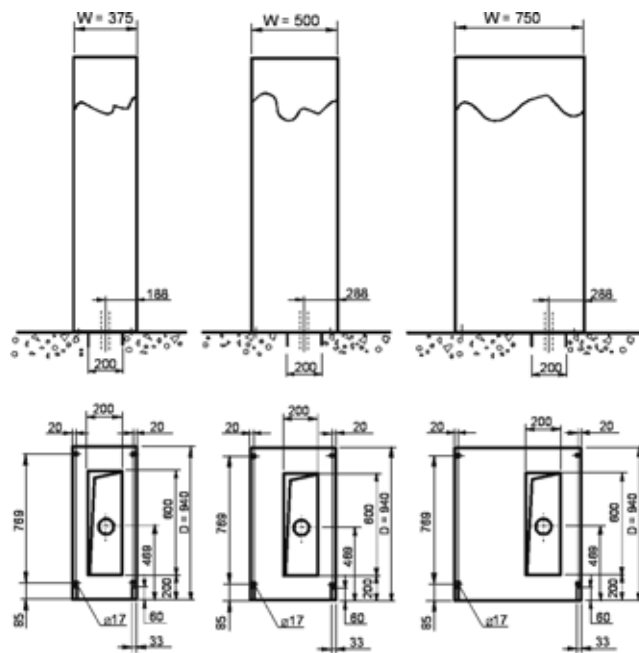


Figure 3.7
Three-phase cable.

3.3.4 Examples of room lay out

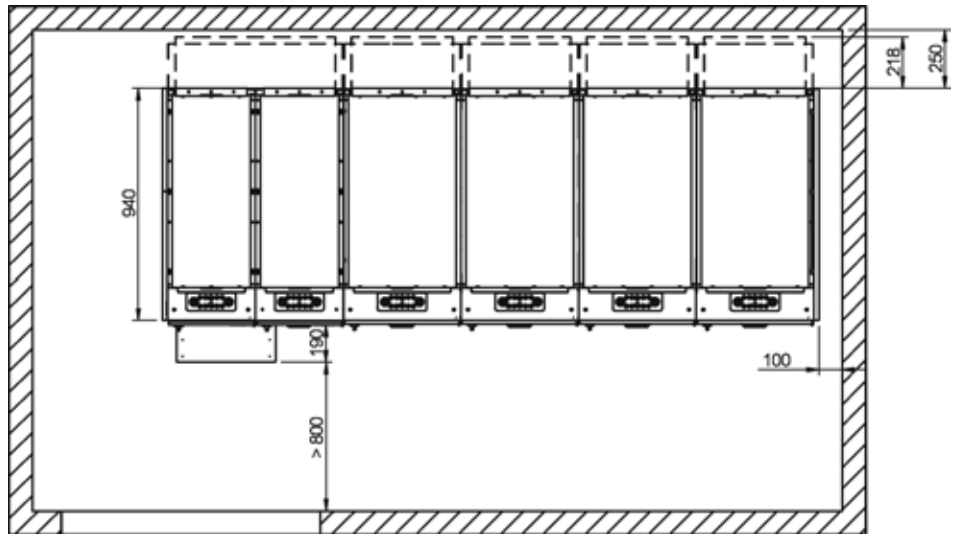


Figure 3.8
Example of room lay out for fixed type switchgear.

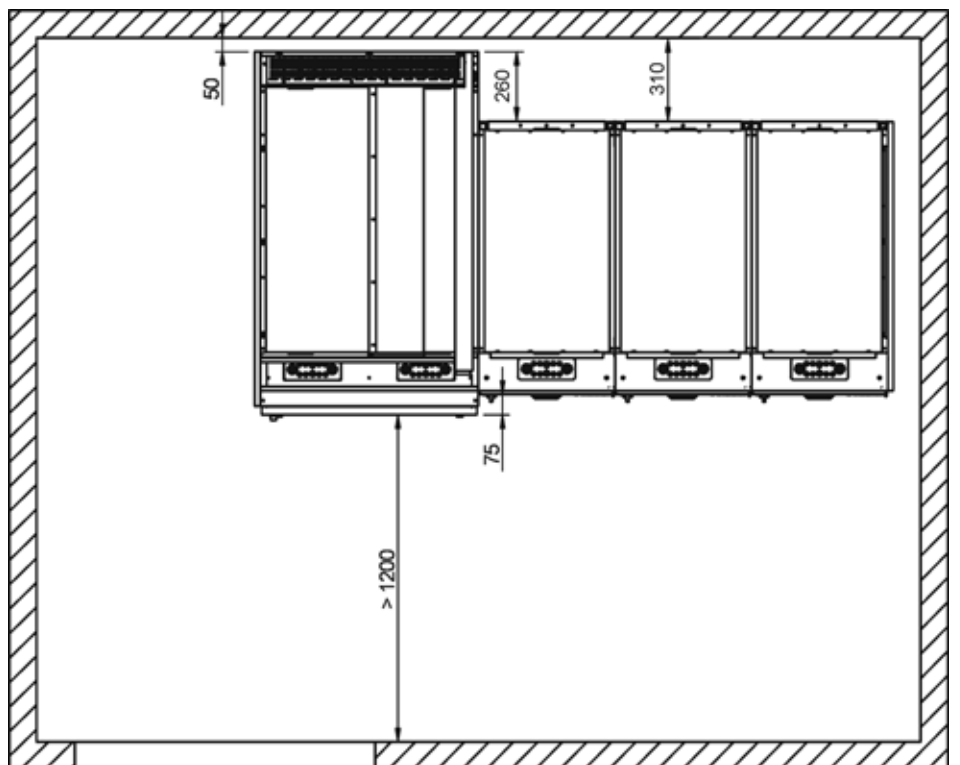


Figure 3.9
Example of room lay out for withdrawable+fixed type switchgear.

3.4 Foundations

3.4.1 Foundation types

General

The switchgear is to be erected on the foundation that fulfils requirement of maximum horizontal height deviation of 2 mm over length of, and across the switchgear. It is difficult to work concrete foundation which fulfils above straightness requirement therefore the adjustments are made by a metal frame or by installing steel plates under the corner of cubicles if needed.

The load capacity of the floor and foundation should also be sufficient.

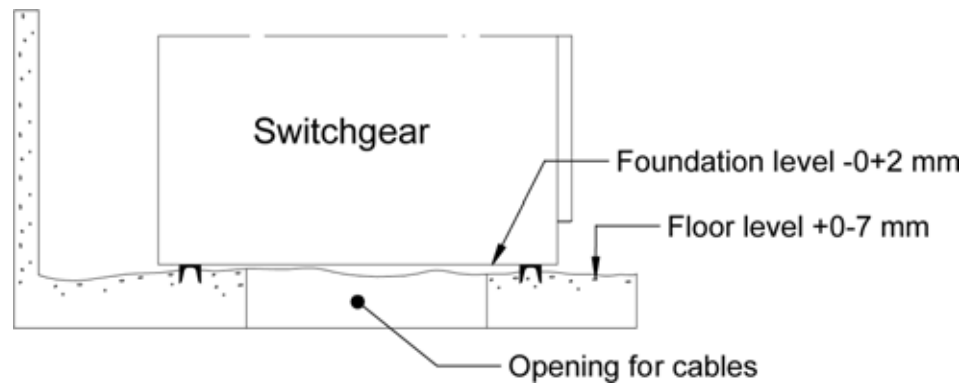


Figure 3.10
Switchgear erected on the metal frame.

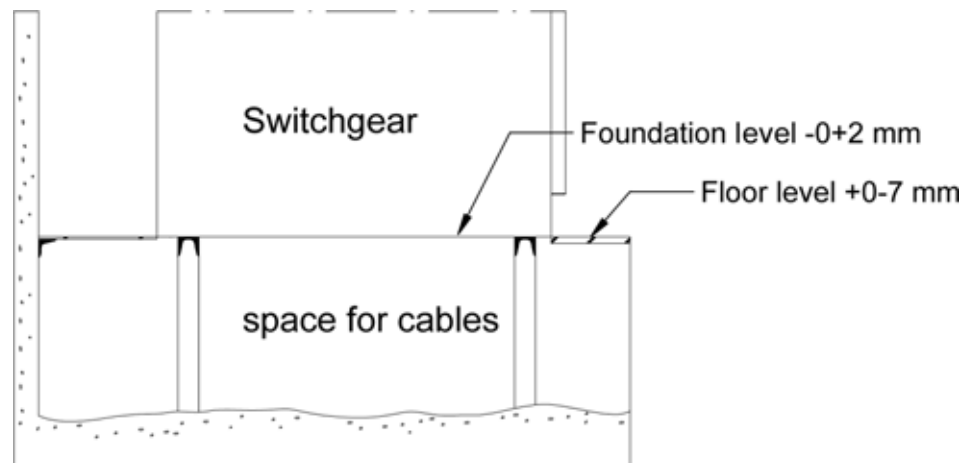


Figure 3.11
Switchgear erected on the raised floor.

If the switchgear consists of only a few cubicles, and there are no heavy cubicles included, it can be installed on the concrete floor.

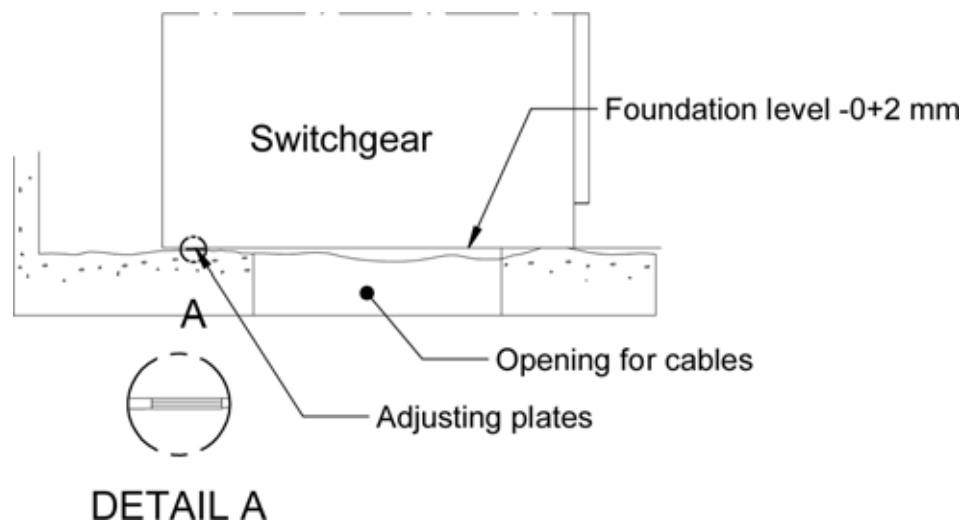


Figure 3.12
Switchgear installed on the concrete floor.

3.4.2 Fastening of the switchgear to the floor

Instructions

When designing cable ducts in the concrete floor, the dimensioning drawings in section 3.3 should be applied.

- The switchgear is to be fastened to the metal frame by welding through the holes in the bottom of the cubicle (2 welding seams/cubicle) or by two spline bolts/cubicle (M12) straight into the concrete floor. Fastening of switchgear consisting of several cubicles is to be done by securing every second cubicle.
- The left-hand end cubicle is fastened from the left-hand front and the right-hand back corners of the cubicle floor.
- The right-hand end cubicle is fastened from the right-hand front and left-hand back corners.

! Before positioning the different switchboard units, check both the levelness of the floor, with particular attention to longitudinal levelling (maximum planarity 2/1000).

! The end cubicles of the switchgear should always be fastened according to the Figure 3.13.

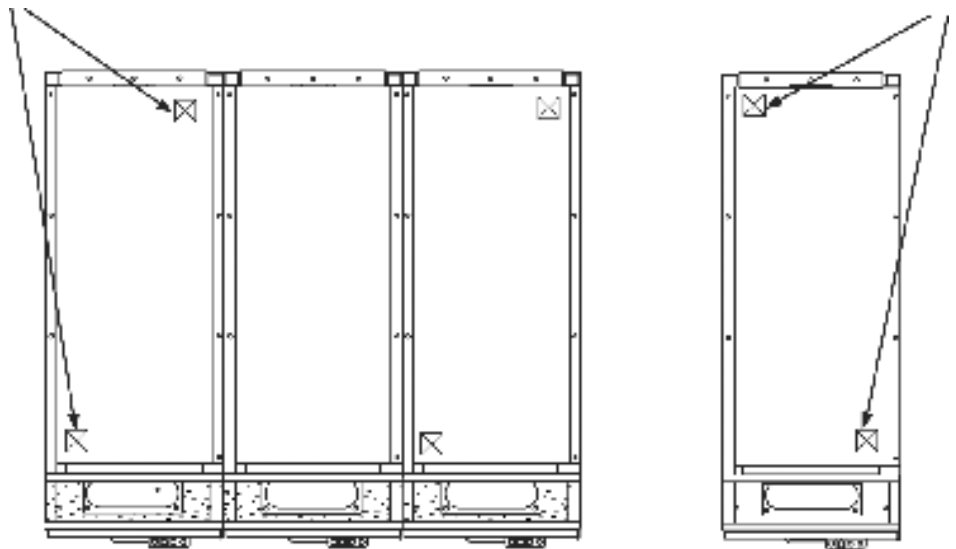


Figure 3.13
Fastening the end cubicles.

Fixing with anchoring bolts to concrete floor

- 1) Clean the installation area.
- 2) On the slab, visibly trace the perimeter of all the units making up the switchgear, taking the minimum wall and obstacle clearances into account.
- 3) Level the floor both longitudinally and transversely.
- 4) Drill the floor at the fixing points, referring to the slab drilling drawings. To make the holes, use a hammer drill with suitable bit.
- 5) After cubicle installation, insert the expansion anchoring bolts into the holes (four bolts per cubicle).

Fixing to a floating floor

- 1) Clean the installation area.
- 2) On the slab, visibly trace the perimeter of all the units making up the switchgear, taking the minimum wall and obstacle clearances into account.
- 3) Drill the floor at the fixing points, referring to the slab drilling drawings. To make the holes, use a drill with a suitable bit for the type of fixing to be made (through or threaded hole).

3.4.3 Assembly of the switchgear cubicles

Instructions

The individual installation stages are as follows:

- 1) Remove the withdrawable parts (if any) from the switchgear cubicles and store them with suitable protection.
- 2) Then transport the switchgear cubicles to the prepared installation point following the sequence shown on the switchgear plan.
- 3) Align the switchgear cubicles on the floor for correct positioning and vertical alignment (deviations of the cubicle edges from the vertical must not exceed 2 mm, especially at the front) and bolt the cubicles together.

It is advisable to start from the centre when assembling switchgears with more than ten cubicles.

- 4) When the switchgear has been properly assembled, fix the cubicles to the concrete floor using plugs to adequately bolt them to the foundation frame.

3.5 Connecting the cubicles

3.5.1 Connecting cubicles in the cable compartment

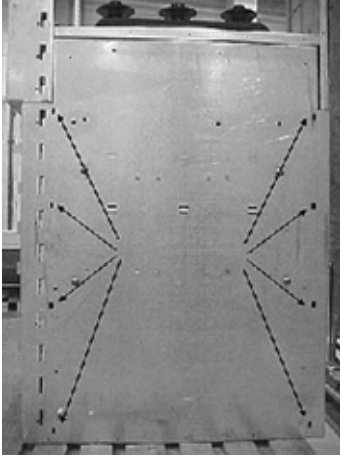


Figure 3.14
Holes in the cubicle
sidewalls.

In **fixed type cubicles**, there are four 11x20 mm holes for 1635 mm high cubicles (five holes for 1885 mm high cubicles) at the front and back of the sidewalls for connecting the cubicles to each other in the cable compartment.

The holes are vertical on the right-hand sidewalls and horizontal on the left-hand sidewalls. Therefore, a small tolerance for erection is acceptable.

The connection is made by a 10.5 washer, an M10 x 20 bolt and an M10 nut. The torque of the fastening bolts should be 10 Nm.

In **withdrawable type** cubicles, there are five 11 x 20 mm holes for cubicles in the front and back of the cover plate for connecting the cubicles to each other in the cable compartment.

The holes are vertical on the right-hand cover plate and horizontal on the left-hand cover plate. Therefore a small tolerance for erection is acceptable.

A 10.5 washer, an M10 x 20 bolt and an M10 nut make the connection. The torque of the fastening bolts should be 10 Nm.

3.5.2 Connecting cubicles in the secondary compartment



Figure 3.15
Holes in the secondary
compartment.

In the secondary compartment the cubicles connect to each other through three $\varnothing 8$ holes nearest the front of the secondary compartment.

The connection is made with a 6.5 washer, an M6 x 20 slot-headed screw and an M6 nut. The torque of the fastening screws should be 5 Nm.

3.5.3 Connecting cubicles from the back upper part



Figure 3.16
Position for back-up strip.

To ensure the connection of the back upper part of the cubicles, a back-up strip of approximately 20 cm length is mounted from above.

The back-up strip is pushed as far down into the seam of the back upper part of the cubicles as possible.

3.5.4 Connecting cubicles at the top

Instructions

As a final step in connecting the cubicles to each other the roof seams between the cubicles are secured. This is done by mounting a back up strip of the same length as the cubicle depth into the seams.

The strip should be pushed so deep that the bending on the end of it touches the bottom edge of the seam.

The strip must be fixed with a screw from its middle point.

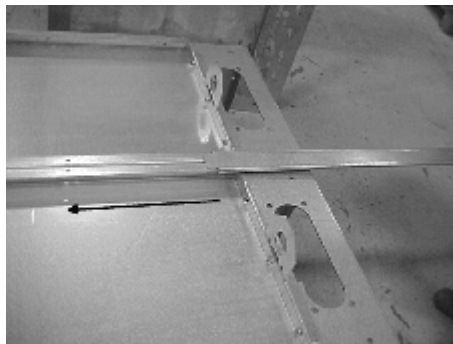


Figure 3.17
Positioning the top strip.

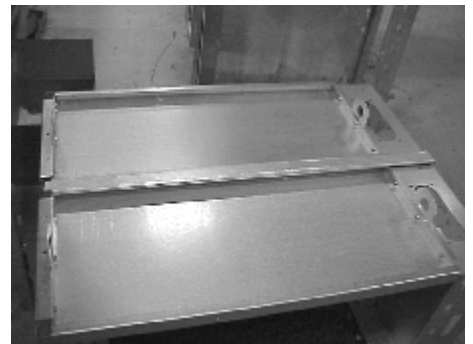


Figure 3.18
The top strip in position.

3.6 Connecting the busbars

3.6.1 General warnings and cautions

A warning sign is placed on the top plate indicating high-voltage beneath the roof.

! We recommend mounting the busbars from the side of the cubicle.

The torque of the joint for other busbar connections than described below is 35 Nm.

General

The busbar connection in the end cubicles are made through the top openings of adjacent cubicles. Access to busbars is possible either from above after dismounting the top plate 1.1 (see *Uniswitch Instruction Manual* for general overview picture of the switchgear), or from the side of the cubicle, if the side wall is not installed.

Instructions (both switchgear types)

- 1) Clean the insulation on the busbar sections with a soft, dry cloth, and check for insulation damage. Remove greasy or adhesive dirt as described in *Uniswitch Instruction Manual*.
- 2) Clean the busbar connections:
 - The silver plated surfaces of the connections must be cleaned with a metal-free non-woven cleaning cloth and thinly and evenly coated with Isoflex Topas NB 52 grease.
 - The non-silver plated surfaces of the connections are either brushed with a wire brush, preserving the grease film, or cleaned with a metal-free non-woven cleaning cloth and evenly greased with a thin coat of Isoflex Topas NB 52.
- 3) Install the busbars panel by panel. Screw on the individual busbar elements one above the other (depending on the system layout) and in line with the flat branch conductor.

3.6.2 Fixed type switchgear

Accessing the busbar compartment

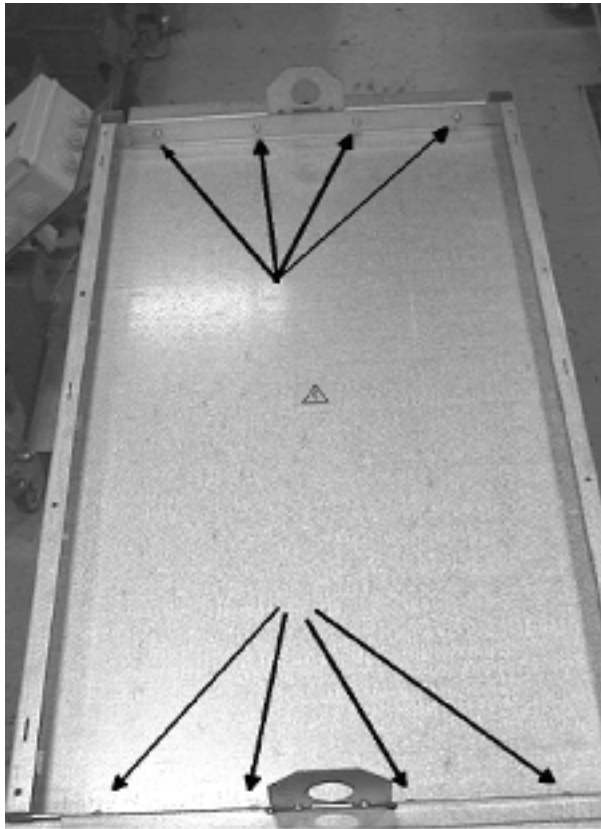


Figure 3.19

Screw places in the busbar compartment (500 mm wide cubicle)(fixed type switchgear).

The busbar compartment is covered with the top plate. The top plate is fixed to the cubicle by screws at the front and back. There are 6 screws in the 375 mm wide and 8 screws in the 500 mm wide cubicle.

The busbar compartment can be accessed by loosening the screws and removing the top plate.

The top plates of the end cubicles of the switchgear cannot be removed.

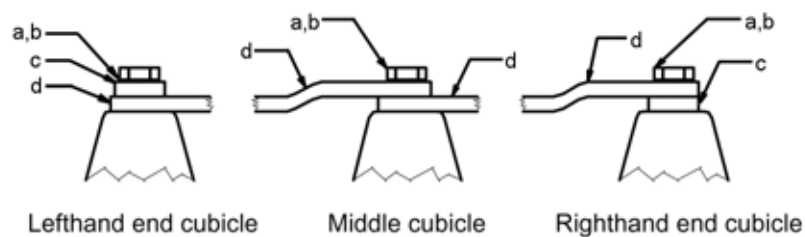


Figure 3.20

Connecting busbars in 12 kV and 17.5 kV cubicles, up to 630 A (fixed type).

a: Hexagon head bolt M10 x 40 ($I_r \leq 630$ A) Hexagon bead bolt M10 x 50 ($I_r > 630$ A, double busbar)
b: Spring washer, hole $\varnothing 10.5$
c: Copper busbar shim, outer diameter $\varnothing 30$, height 8 mm, hole $\varnothing 10.5$
d: Nonisolated 40 x 8 copper bar with rounded edges

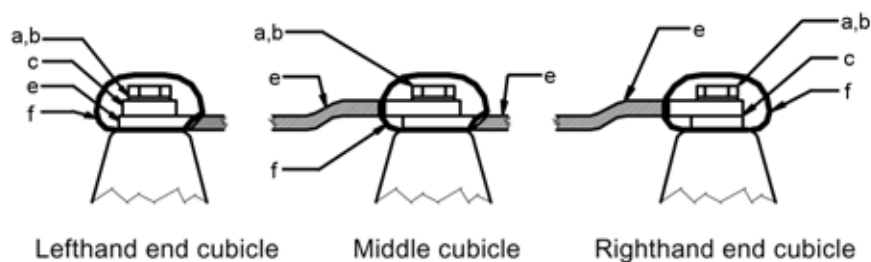


Figure 3.21

Connecting busbars in 24 kV cubicles, up to 630 A (fixed type).

a: Hexagon head bolt M10 x 40
b: Spring washer, hole $\varnothing 10.5$
c: Copper raising ring, outer diameter $\varnothing 30$, height 8 mm, hole $\varnothing 10.5$
d: Isolated 40 x 8 copper bar with rounded edges
f: Field control cap (aluminum and EPDM-rubber)

Instructions for 12 and 17.5 kV connections

- 1) Mount the busbars with their bended end always to the right.
- 2) In the left-hand end cubicle, mount the busbar end to the terminal of the SFG switch-disconnector.
- 3) Mount a copper busbar shim, of the same thickness as the busbar, onto the busbar.
- 4) In the right-hand end cubicle of the switchgear, mount the busbar shim between the bended end of the busbar and the upper terminal of the SFG switch-disconnector.
- 5) Make the busbar joints with a 10.5 spring washer and an M10x40 hexagon head bolt. The torque of the joint is 35 Nm.

Additional instructions for 24 kV connections

24 kV busbar joints are made in the same manner as 12 kV and 17.5 kV busbar joints with the following exception: 24 kV busbars are always isolated.

- 1) On the 24 kV busbar joints, mount two-piece field control caps (consisting of aluminum part and EPDM-rubber part) according to the following figures.

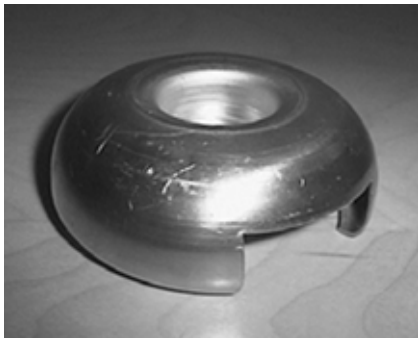


Figure 3.22
Aluminum cap with one cutout for end cubicles.

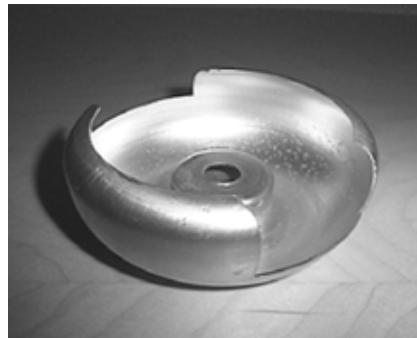


Figure 3.23
Aluminum cap with two cutouts for middle cubicles (upside-down).



Figure 3.24
EPDM-rubber cap with a low cutout for left-hand end cubicles.



Figure 3.25
EPDM-rubber cap with a high cutout for right-hand end cubicles.

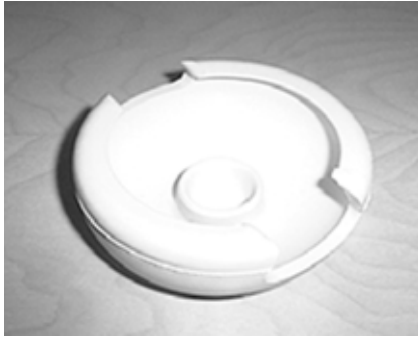


Figure 3.26
EPDM-rubber cap with two cutouts for middle cubicles (upside down).



Figure 3.27
Aluminum field control caps.



Figure 3.28
Aluminum field control caps covered by EPDM-rubber caps.

3.6.3 Withdrawable type switchgear

Accessing the busbar compartment

Removable ventilated top element of the withdrawable type cubicles is fixed to the top plate by six screws, two on each side and one at each end. The busbar compartment can be accessed by loosening the screws and removing the element (10.6).



Figure 3.29
Removable top element and places of fixing screws.

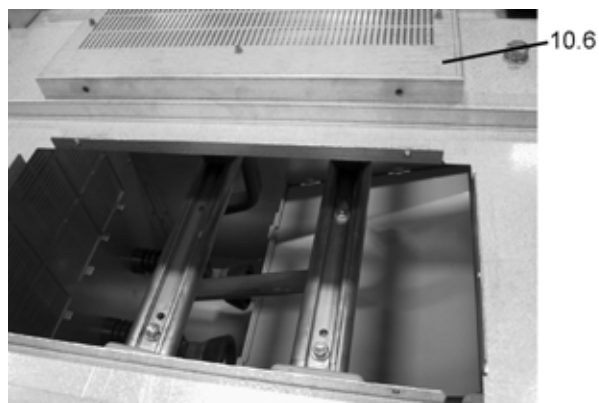


Figure 3.30
View when the top element is removed.

General

In the withdrawable type cubicles the busbars (40) are fixed on the post insulators (41.1) and connected to branch conductor (41) at the factory. The fasteners (40.5) for busbar connections are also installed in the end of the busbars. The busbars between cubicles (40.4) are packed separately.

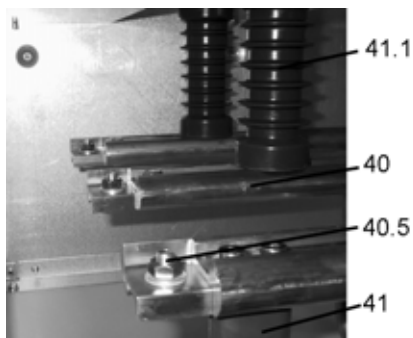


Figure 3.31
Busbars before installation.

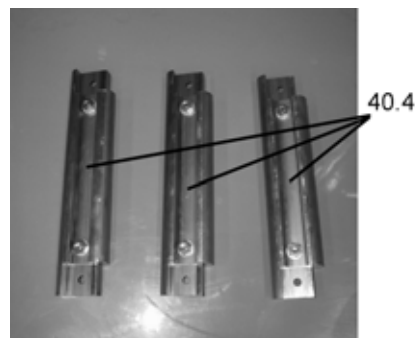


Figure 3.32
24 kV, 1250 A busbar element.

Installation

See also section 3.6.1.

- 1) Remove the fasteners' (40.5) nuts, washers and bolts but do not lose these parts.
- 2) Install the busbars (40.4) between the cubicles. The right position of busbars and fasteners can be seen in the Figure 3.33 and Figure 3.34.

Take care to retain the original order and orientation of the fasteners' nuts, washers and bolts - the nuts and washers are situated on the top side of busbar. The torque of the connection is 35-45 Nm.

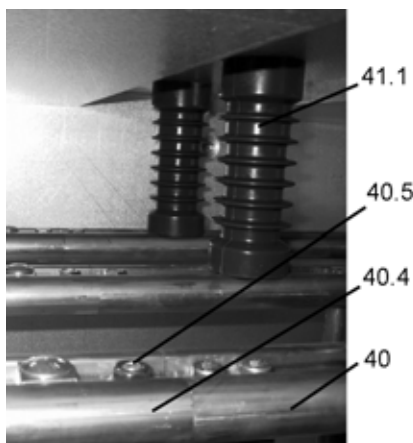


Figure 3.33
Busbar connection upper view.

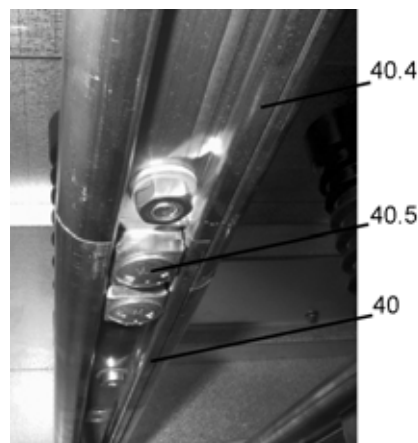


Figure 3.34
Busbar connection viewed from below.

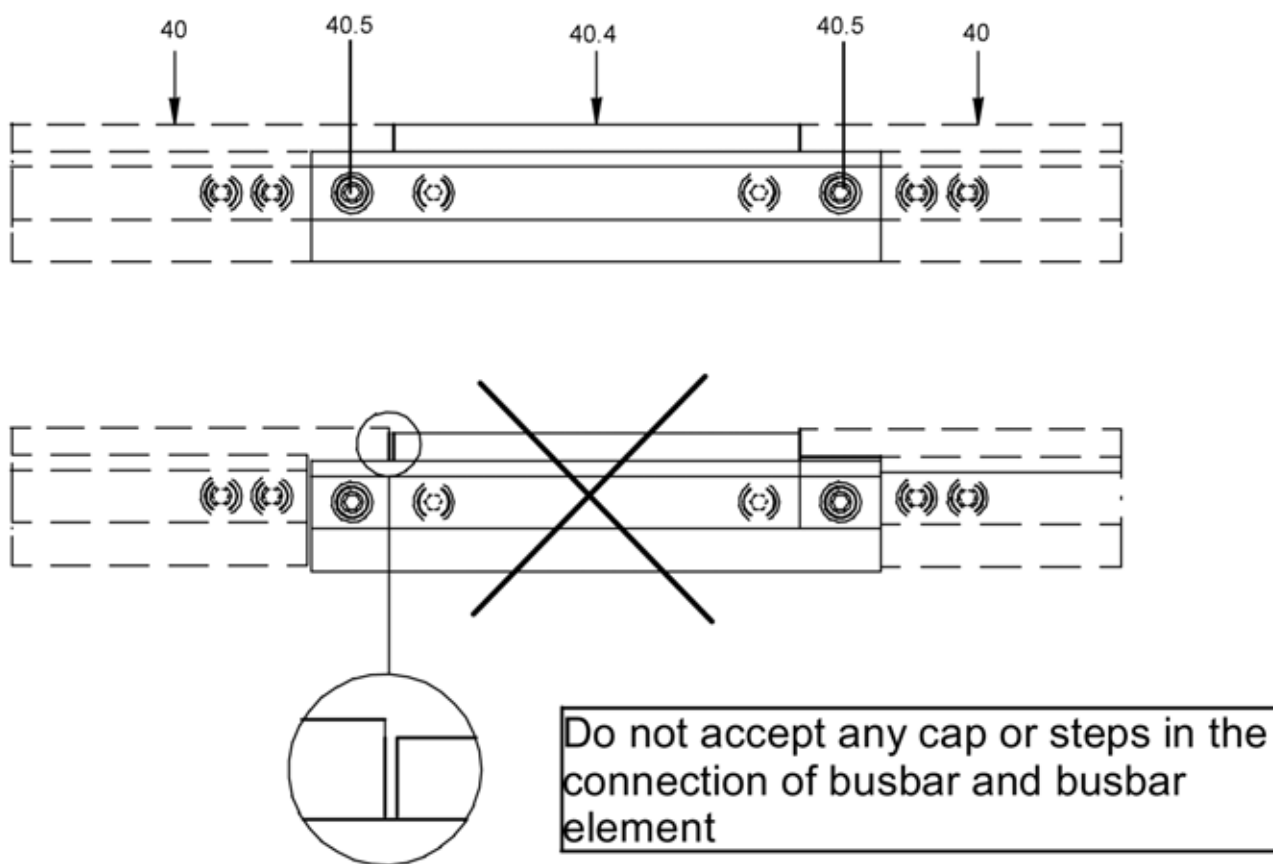


Figure 3.35

Installation of busbars between two cubicles (withdrawable type).

Busbar endings

Invariably the ends of busbars have to be protected by an end cover (40.3). Normally the end cover has been installed at the factory.

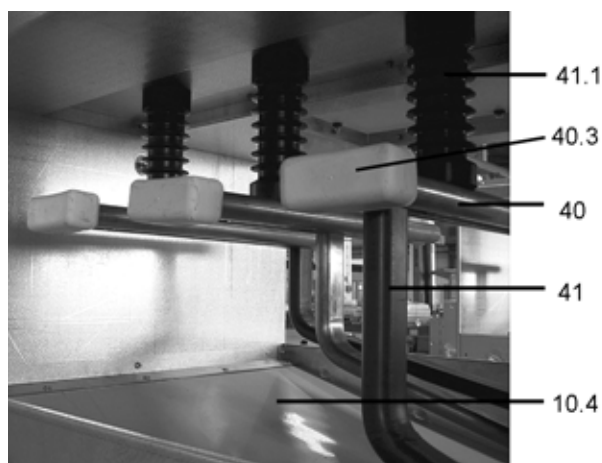


Figure 3.36

View into the busbar compartment (withdrawable type).

3.7 Installing the pressure relief ducts

The pressure relief ducts are an optional part of the delivery and the instructions are provided separately. Please contact us for detailed instructions.

4 Cable connections

4.1 Preparation for cable installation

Instructions

- 1) Remove the door from the cable compartment.

! The door can be opened only when the switch-disconnector is in the earthed position and the locking unit is in the 'door open' position.

- 2) Loosen the 4 screws on the bottom front base plate in front of the door step of the cubicle.



Figure 4.1
Screws on the base plate.

- 3) Loosen the 4 screws from the door step and remove it from the cubicle by pushing it straight forward in its side steering tracks.

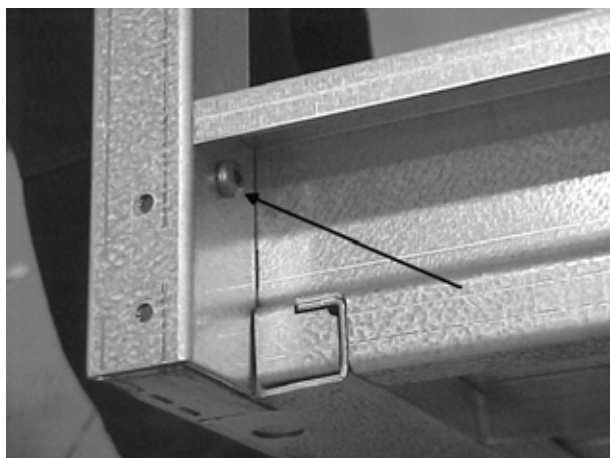


Figure 4.2
Screws on the door step / 1.

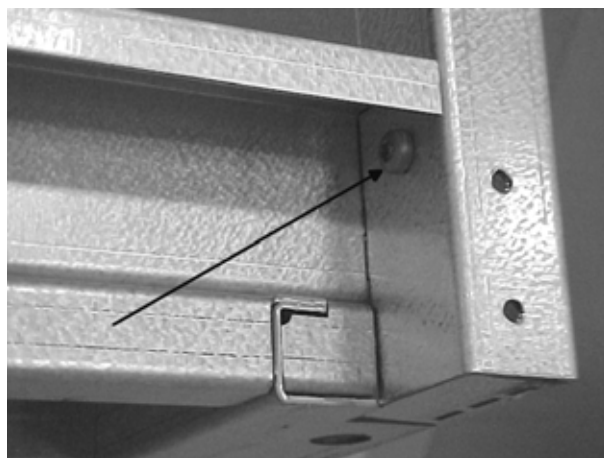


Figure 4.3
Screws on the door step / 2.

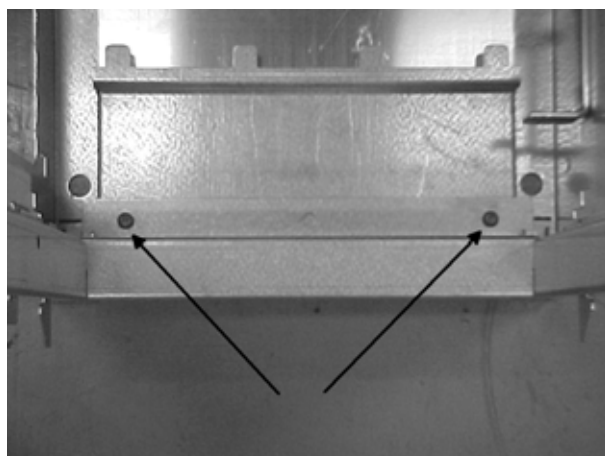


Figure 4.4
Screws on the door step / 3.

- 4) Remove the floor plates, including plastic parts, from phases L1 and L2 by pulling them forward in their side steering tracks.
- 5) Remove the front floor plate and the plastic cable sealing of phase L3.

! The rearmost floor plate of phase L3 should not be removed.

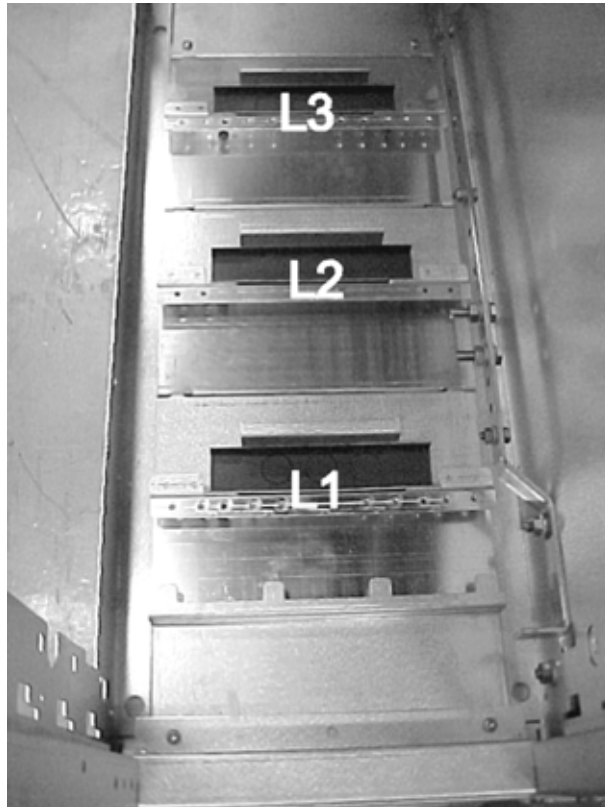


Figure 4.5
Floor plate.

4.2 Installation of the cables

Fixed type cubicles

- 1) Pull the cables through the open bottom into the cubicle. Measure and cut the cables to sufficient length, taking into consideration the installation of cable terminations and cable lugs.
- 2) Bend the conductors of phase L1 and L2 out through the open front of the cubicle during the installation of the conductor of phase L3.
- 3) Connection of the conductor of phase L3
 - a) Take the plastic cable seal and thread it onto the conductor. Measure the right length of cable, taking into consideration the right location of the seal.
 - b) Install the necessary cable termination and clamp an appropriate cable lug to the conductor.
 - c) Loosen the nut and spring washer of the connector.
 - d) Hang the conductor from its cable lug on the bolt of the connector.
 - e) Install the pressure relief washer, the spring washer and the nut.
 - f) Tighten the connection to the correct torque setting, in the switch-disconnector and circuit-breaker cubicles 55 Nm, and the fuse switch-disconnector cubicle 35 Nm.
 - g) Pull the front floor plate (aluminum) in its side guides tight to the rearmost floor plate and attach them together with M6 bolts. Taking into consideration the size of the conductor, take the right size of cable clamp and attach the cable with sufficient tightness to the rearmost bushing, considering the straightness of the cable from the fixture to the connection bolt.
- 4) Connection of the conductor of phase L2
 - a) Pull the rearmost floor plate (steel) of phase L2 in its side guides tight to the floor bushing of phase L3.
 - b) Take the precut conductor of phase L2 and continue according to section 3) above.
- 5) Connection of the conductor of phase L1
 - a) Pull the rearmost floor plate (steel) of phase L1 in its side guides tight to the floor bushing of phase L2.
 - b) Take the precut conductor of phase L1 and continue according to section 3) above.

4.2.1 Power cables in withdrawable type cubicles

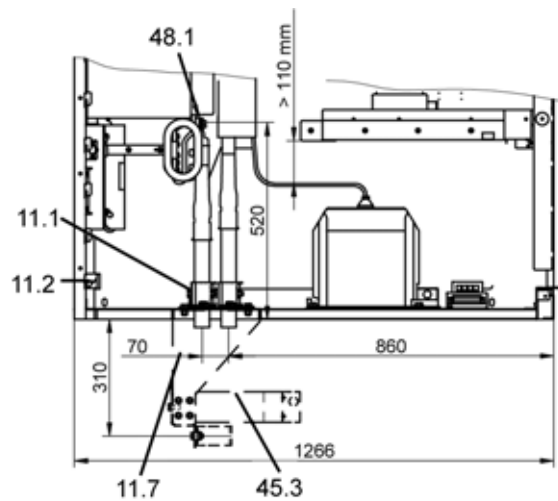


Figure 4.6

Dimensions of power cable connection of Uniswitch.

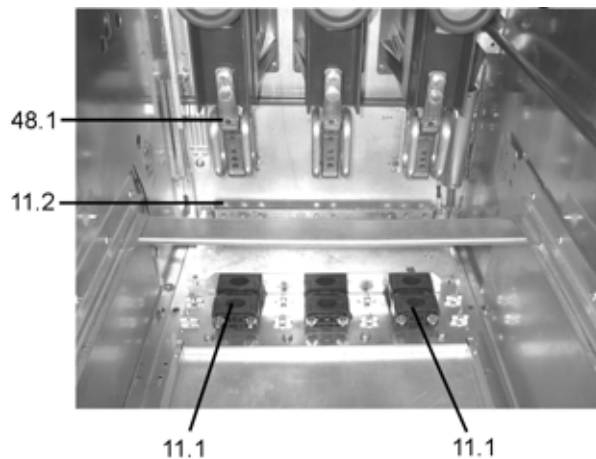


Figure 4.7

Partial view of the cable connection and cable entry.

The standard method for entry of power cables in the switchgear is shown in Figure 4.6. The cables are conveyed from below through floor covering, which is divided at the cable entry point Figure 4.8. The cables go through rubber reducer rings (11.5), which can be adapted to the required cable diameter in a range from 20 to 45 mm. Cables are fastened in the cubicle by means of cable clamps (11.1) mounted on cable strips (11.6), which are part of the cubicle floor covering. The clamps make it possible to fasten cables with diameters up to 45 mm.

Before cable installation

- Loosen the cable clamps (11.1)
- Loosen the floor plates (11.3) and (11.4)

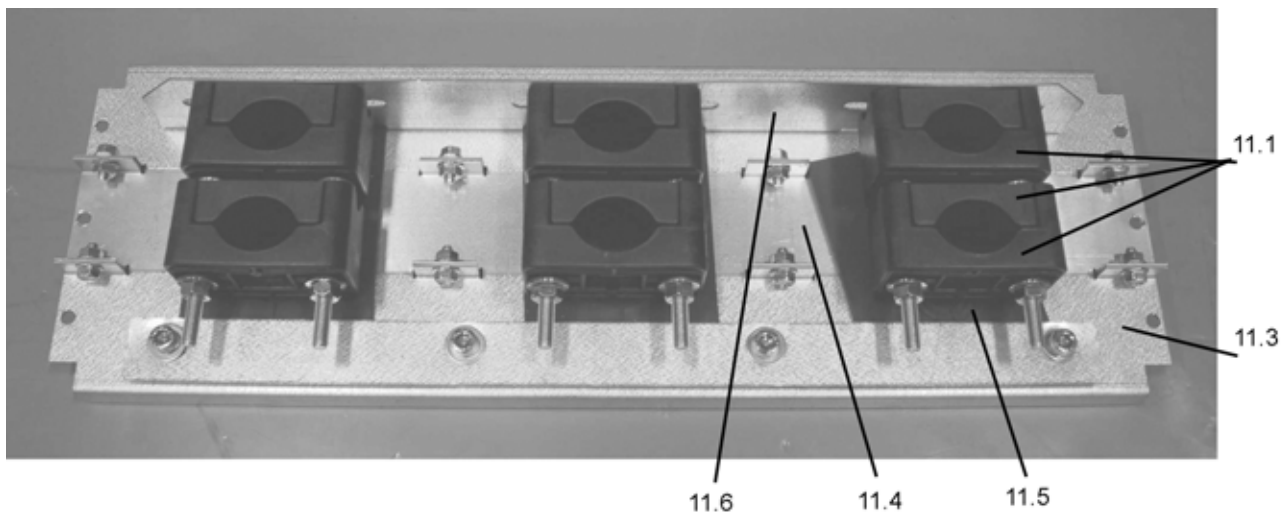


Figure 4.8

The bars (**48.1**) are equipped with holes for M12 screws. In all cases, the earthing of cable screens is carried out on the strip-holding cable clamps. The cable strip is connected to the earth potential.

The clearance (L) of the VT primary connection cable should be at least 80 mm, see the Figure 4.16.

If there are no voltage transformers in the cubicle, three fixed mounted surge arresters can be installed here.

Connection with single-core plastic insulated cables is presumed in the typical cubicles. In the case of any atypical cable connections or of special cables (e.g. three-core cables, cables with paper or special insulation etc.), an agreement must be reached between the customer and manufacturer.

Instructions

- 1) Insert power cables, cut them to length and strip them.
- 2) Adapt reducer rings (11.5) to the cable diameter and fit them onto the cable.
- 3) Prepare cable sealing ends and mount them on cable cores according to manufacturer's instructions.
- 4) Connect cable eyes to the prepared connection bars (48.1) with strain relief.
- 5) Connect the earthing of cables.
- 6) Mount floor plate (11.4) and (11.3).
- 7) Move down reducer rings (11.5) so that nuts in the rings fit into the corresponding recesses in the floor coverings. In this way, the cable passages are sealed.

Fasten the cables in the prepared cable clamps (11.5) (the maximum tightening torque applicable to the clamp screws is 9 ± 2 Nm).

Cable current transformer

If there is to be a cable current transformer (45.3) in the cubicle, it has to be installed under it, see Figure 4.6.

Remove the construction of cable entry Figure 4.8 and fixed the brackets (11.7) of the cable current transformer to the floor construction.

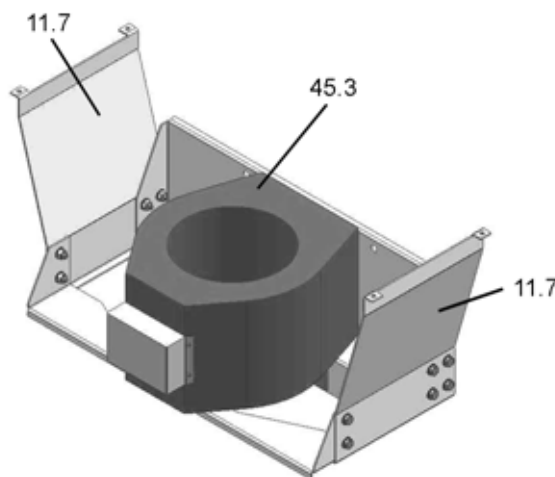


Figure 4.9

Cable current transformer and it's fixing brackets

4.2.2 Control cables

In the cubicle the control cable entry is in the bottom. An internal cable duct (**10.7**) size 30 x 60 mm supports the cable from the bottom up to the low voltage compartment. Internal wiring between cubicles is easily done through openings in side walls of the low voltage compartment.

Depending on delivery terms, there are three different practices concerning the wiring between cubicles:

- Wiring not included
- Wiring supplied rolled in a bundle in the low voltage compartment
- Wiring supplied in a bundle, equipped with plug connectors

Several options are available for control cable inlet:

- At both ends of the switchgears, it is possible to have side ducts (**80.7**) mounted.
- A duct (**80.6**) can also be placed on the top of the switchgear supporting cables coming from e.g. overhead cable ladder.

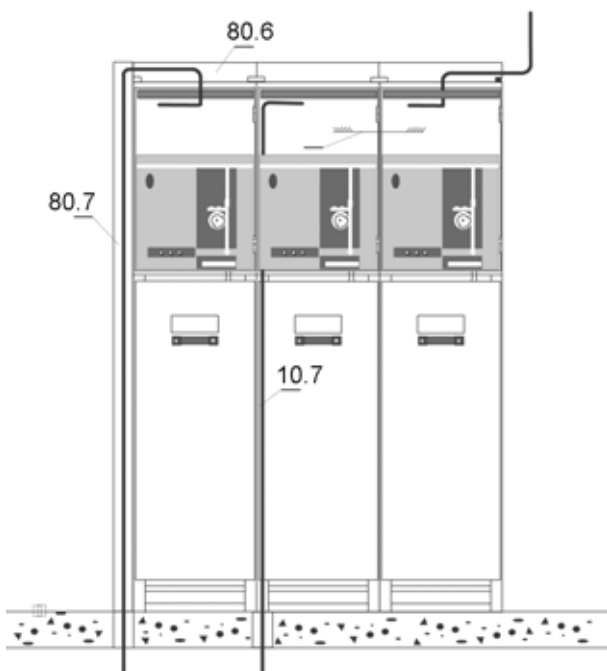


Figure 4.10
Control cable entries.

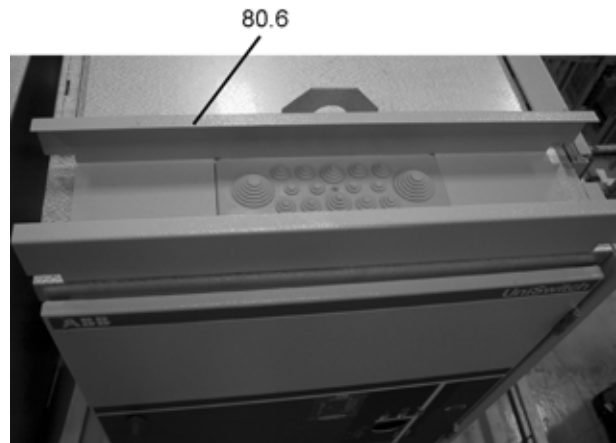


Figure 4.11
A duct on the top of the cubicle.

4.3 Earthing the switchgear

Instructions

The earth electrode is to be connected to the main earthing bar (**11.2**) of the cubicle (5 x 30 mm Cu). The connecting point is marked with the equipment earth symbol.

Make the connection with a 12 spring washer, M12 x 30 hexagonal head bolt and an M12 hexagonal nut. Tighten the connection bolt to a torque of 70 Nm.

In larger switchgears (more than 8 cubicles), connect the earth electrode to both end cubicles of the switchgear.

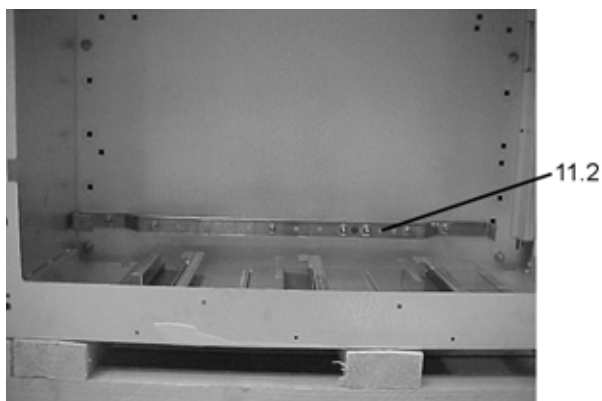


Figure 4.12
Earthing bar.



Figure 4.13
Position of earth symbol.

If the cubicles are connected together according to subclause 3.5 the interconnection between cubicles is capable of carrying the rated short-time and peak withstand current for the earthing circuit.

As an option the main earthing bars (11.2) Figure 4.12 can be connected together in the front of cubicles using additional earthing bars (3 x 25 mm Cu).

Make this connection with an 10.5 spring washer, M10 x 35 hexagonal socket-head bolt and an M10 hexagonal nut. Tighten the connection bolt to a torque of 40 Nm.

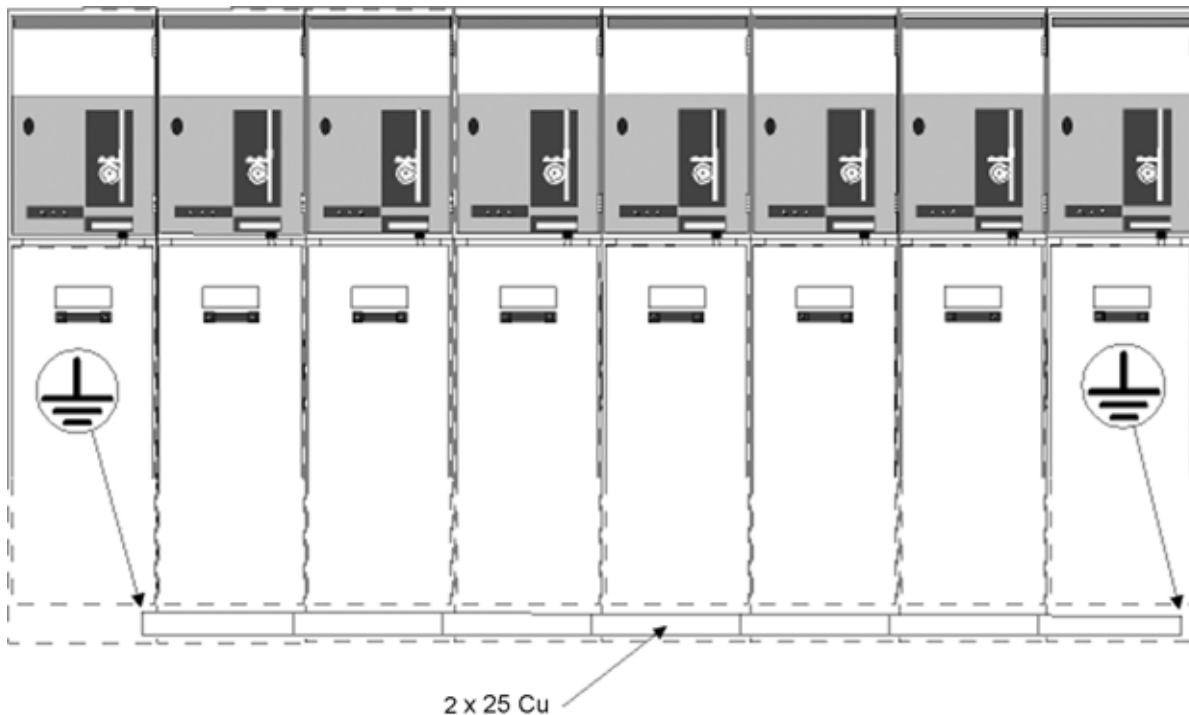


Figure 4.14
Position of the earth symbol on the earthing bar.

4.4 Finishing of the cable installation

Instructions

- 1) Install and attach the door step of the cubicle, which was removed when preparing for cable connections (see 4.1).
- 2) Install the base plate in front of the threshold of the cubicle (see 4.1).
- 3) Check that the shields of the feeder (outgoing) cables are connected to the main earthing bar of the cubicle. Check also the wiring if current transformers are installed.

4.5 Final erection work

Checkpoints

- Check painted areas of the switchgear for possible damage, touching up where required (see also repair instructions in *Uniswitch Instruction Manual*).
- Check bolt connections and tighten where required, in particular all those carried out during on-site erection of the busbars and earthing system.
- Clean the switchgear thoroughly.
- Remove all foreign bodies from the cubicles.
- Correctly replace all coverings, etc. removed during erection and connection.
- In the enclosure, any remaining openings must be closed if they are no longer needed.
- Check the isolating contacts and interlocking mechanisms for smooth motion, and grease again with Isoflex Topas NB 52 where necessary (see also repair instructions in *Uniswitch Instruction Manual*).
- Insert withdrawable circuit-breaker parts (if any) and connect the control wirings.
- Properly close the cubicle doors.

4.6 Examples

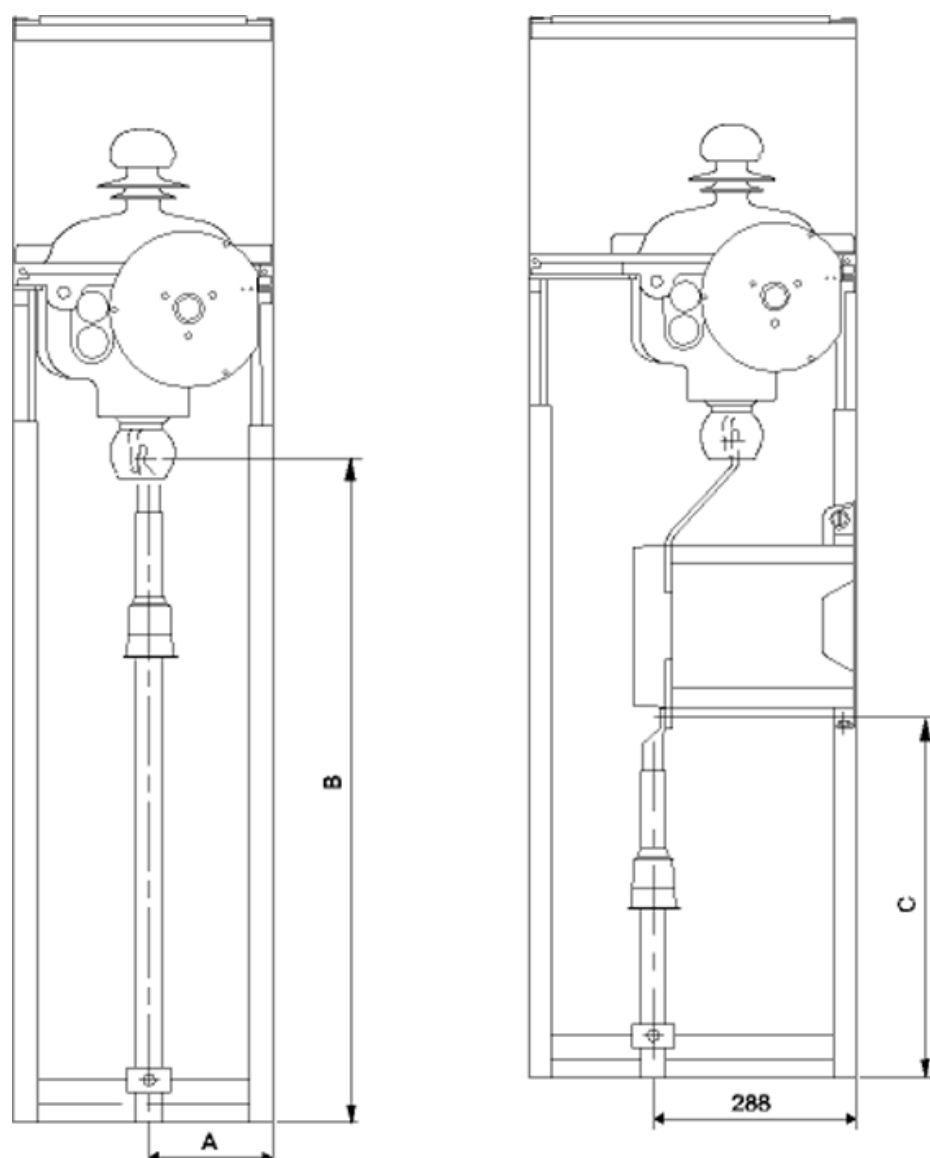


Figure 4.15
Cable arrangements for switch-disconnector (SDC) cubicles.

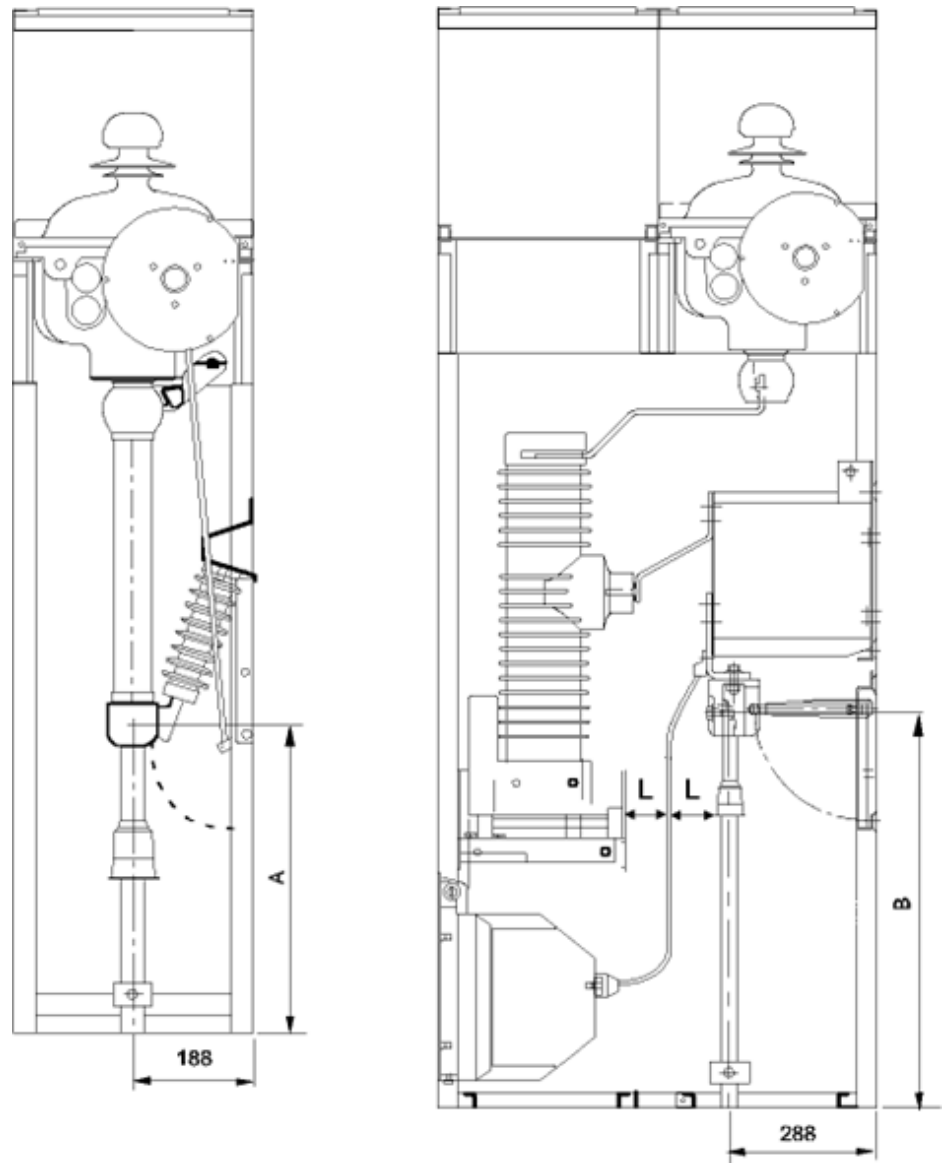


Figure 4.16
Cable arrangements for switch-disconnector cubicle with fuse (SDF) and circuit-breaker cubicle (CBC).

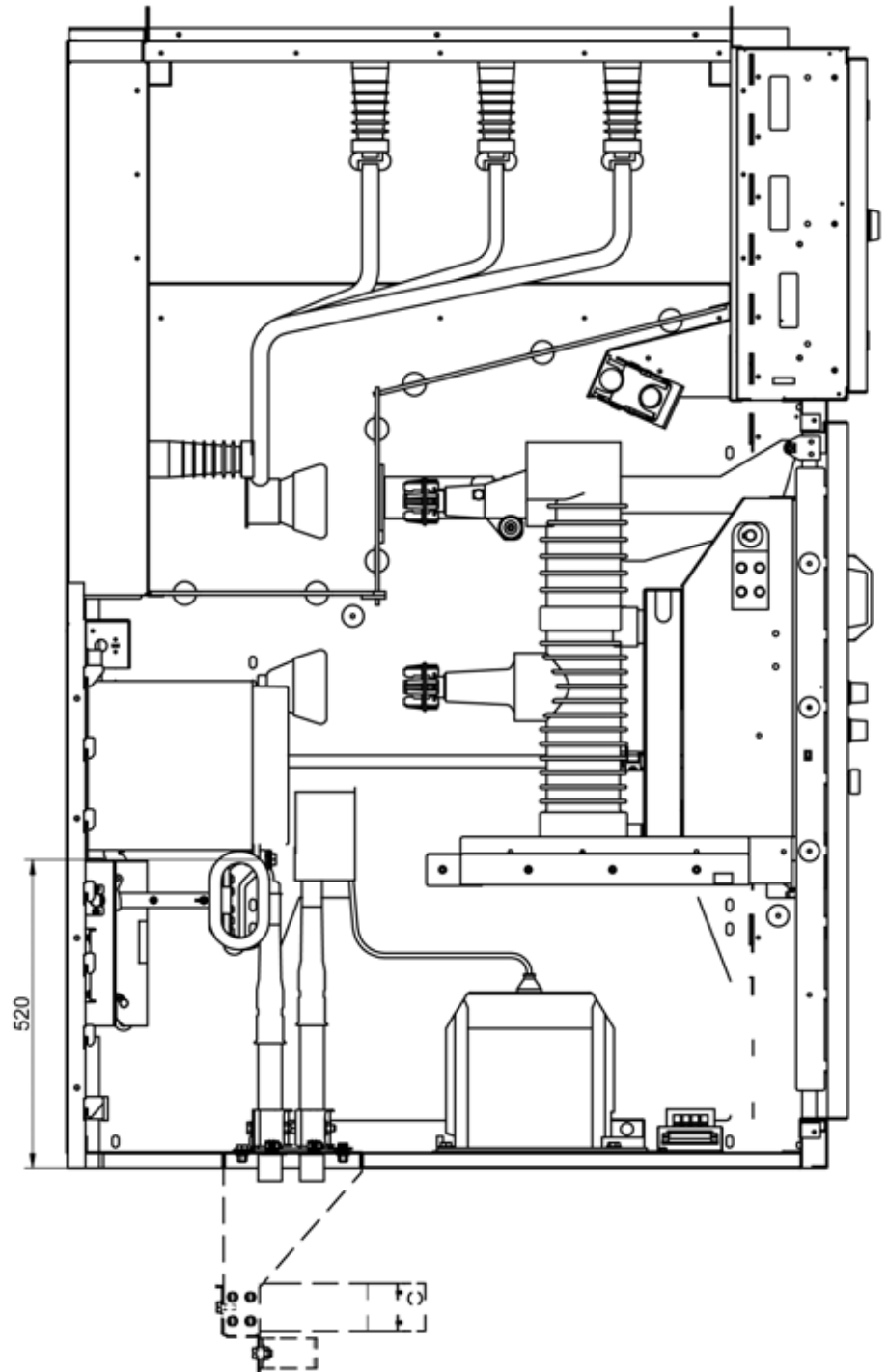


Figure 4.17
Cable arrangements for withdrawable type cubicle (CBW)

5 Mounting of equipment

5.1 Mounting of circuit-breakers

General

The circuit-breaker is to be lifted into the cubicle.

The correct tightening torques according to Table 5.1 should be applied during the installation.

Table 5.1 Tightening torques for circuit-breaker.

Connection	Torque/Nm
Busbar-busbar	35
Busbar-HD4/S	20 (upper poles) 35 (lower poles)
Busbar-VD4/S	68
Busbar-SFG	35
Busbar-CT	56 – 70



Figure 5.1
Circuit-breaker.

- 1) Before lifting the circuit-breaker, take off the plastic covers and remove the connection bars from the upper poles.



Figure 5.2
Taking off the plastic cover.



Figure 5.3
Removing connection bars.

- 2) Lift the circuit-breaker up to the same level as the mounted circuit-breaker floor.
- 3) Slide the circuit-breaker manually into its leader and push it in.

! Do not move lifting truck before the circuit-breaker is totally inside the cubicle because the breaker is very heavy in front.



Figure 5.4
Lifting the circuit-breaker.



Figure 5.5
Sliding circuit-breaker to the leader.

- 4) Mount the fixing plate at the bottom of the circuit-breaker front with 4 fixing screws/nuts.

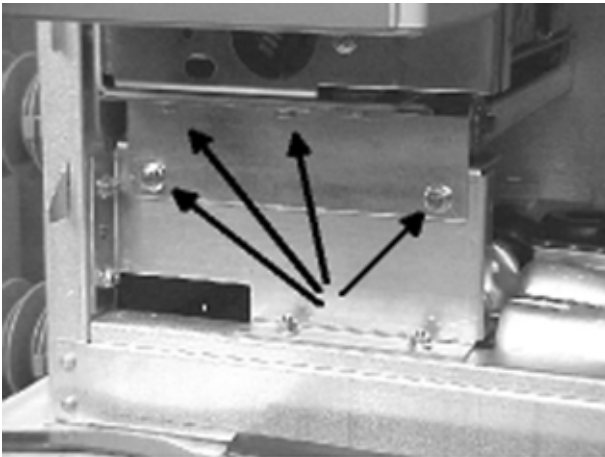


Figure 5.6
Mounting the fixing plate.

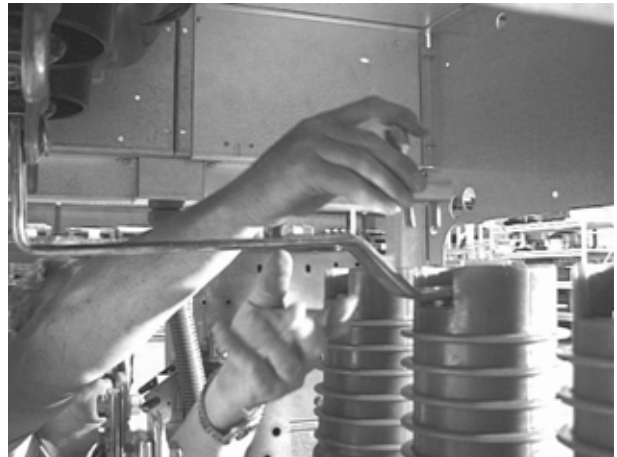


Figure 5.7
Installing the busbars.

- 5) Install the busbars starting with the lower poles of the circuit-breaker. After that connect the busbar to the upper poles of the circuit-breaker using the connection bar. If insulating shrink tubes are to be fitted to the connection bars, this should be done before bolting them in place.

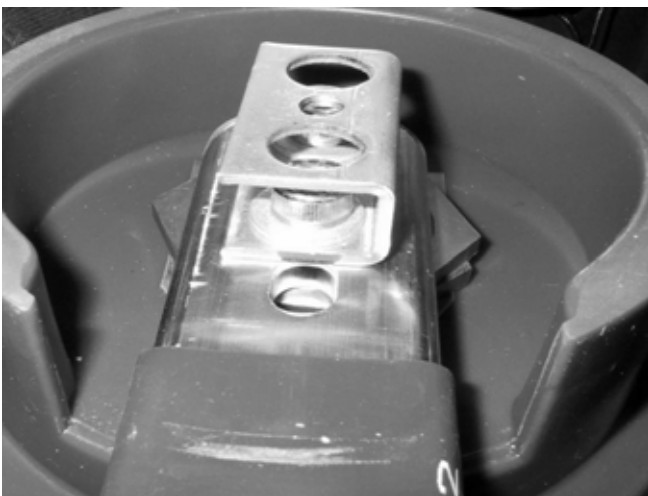


Figure 5.8
HD4/S connection.



Figure 5.9
VD4/S connection.

! The busbars of 24 kV CBC, SMC and SBC cubicles should be covered by a shrink tube where possible.

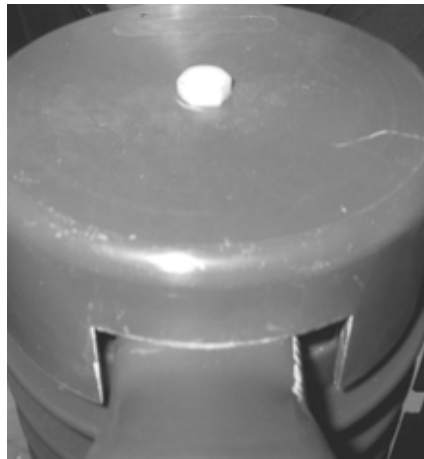


Figure 5.10
Control cup covering connection bar.

- 6) After mounting the circuit-breaker, put the white control pin into the cable terminal (Figure 5.11) and connect the terminal to the circuit-breaker. Notice the correct position of the flexible tube (HD4/S).(Figure 5.12)

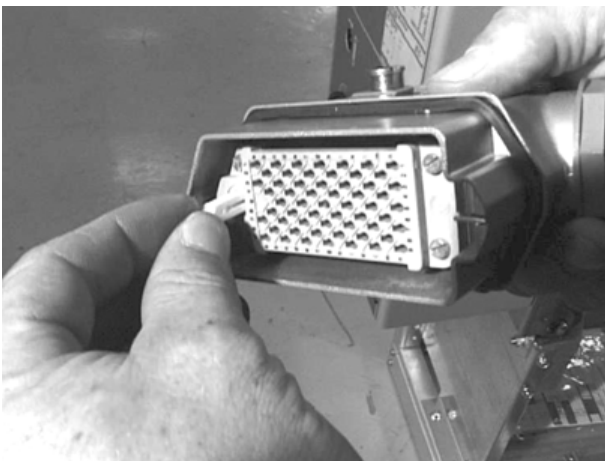


Figure 5.11
Inserting control pin into cable terminal.

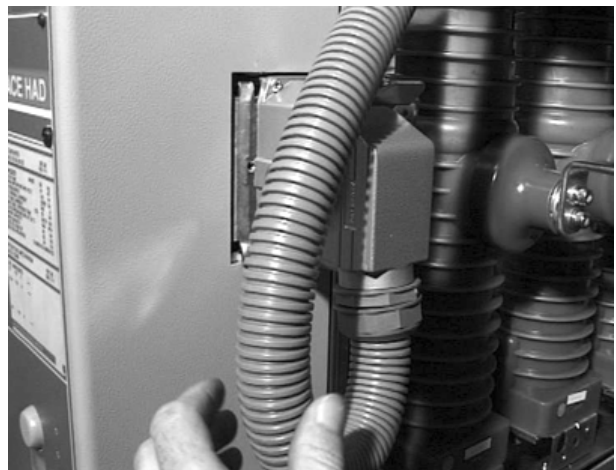


Figure 5.12
Connecting the terminal to circuit-breaker.

5.2 Mounting of motor operating device UEMC 40 K8_ for UES-K3/2

Instructions

- 1) Operate the SFG switch-disconnector to the earthed position.
- 2) Move the interlocking selector to the “Door open” position.
- 3) Open the cable compartment door and the secondary apparatus compartment door.
- 4) Take off the plastic cover (**A**) by pressing it with two fingers.
- 5) Loosen the four screws (**B**) and remove the interlocking unit.

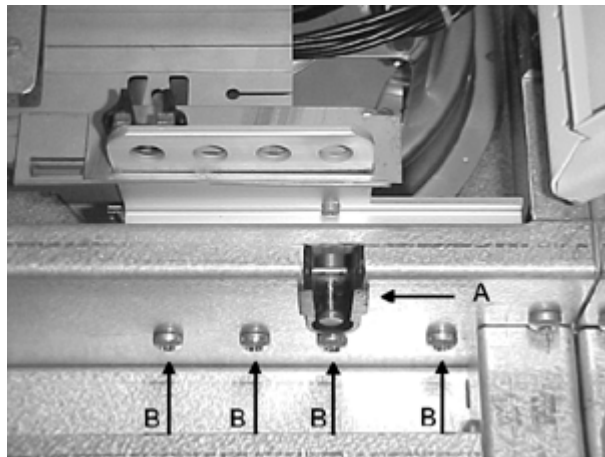


Figure 5.13
Removing the interlocking unit.

- 6) Operate the SFG switch-disconnector to the open position.
- 7) Unlock the position indication and operation set by loosening the locking ring. Then remove the set.

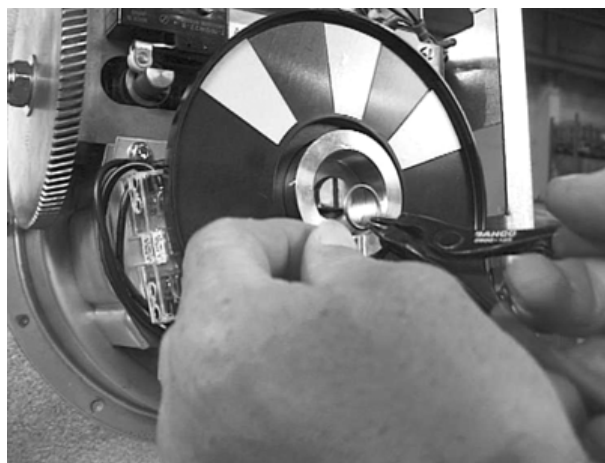


Figure 5.14
Unlocking the position indication and operation set.

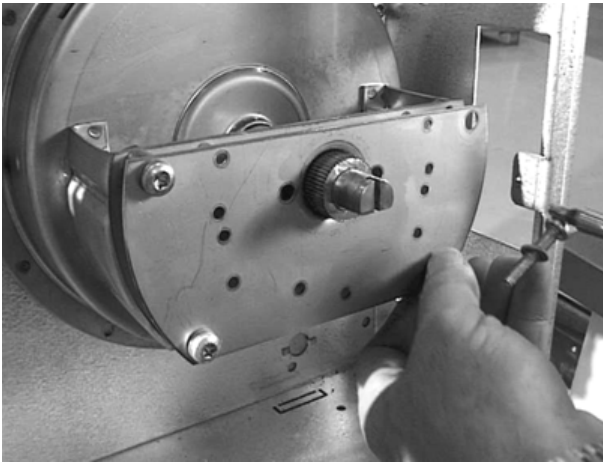


Figure 5.15
Removing the cover plates.

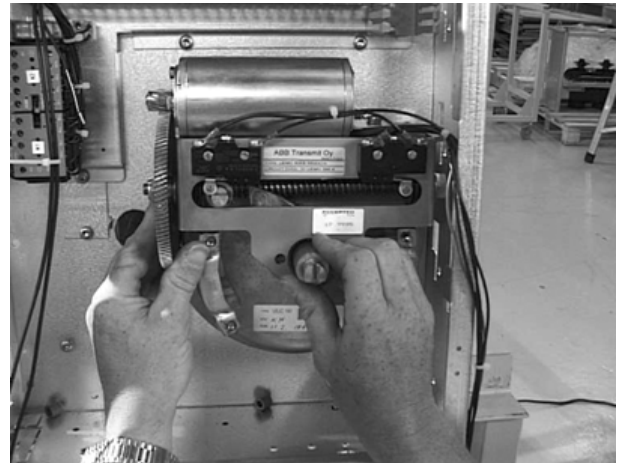


Figure 5.16
Installing the motor operating device.

- 8) Pull up the brass operation shaft and adjust the lifting arm to the correct position according to Figure 5.21.
- 9) Push the operation shaft back to the original position.

Notice that the motor operating device does not have any fixing screws to tighten. The small play between the motor operating device and the limiting surface does not affect the operation of the mechanism.

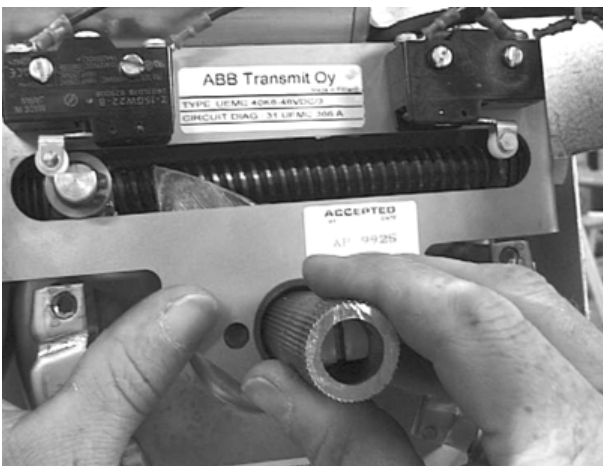


Figure 5.17
Pulling up the operation shaft and adjusting the lifting arm.

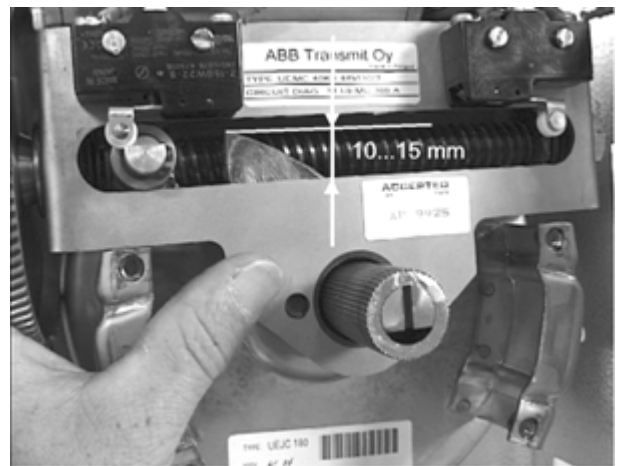


Figure 5.18
Pushing the operation shaft back.

- 10) Refit the cover plates, the position indication and operation set and the interlocking unit.

References

Further information is available in installation and operating manual for UEMC 40 K8_.

5.3 Mounting of auxiliary switches for UES-K3/2

Instructions

The auxiliary switches are to be mounted on the uppermost cover plate of UES-K3/2.

- 1) Remove the uppermost cover plate and tighten the screws with a torque of max. 1.3 Nm.
- 2) Use nyloc locking nuts behind the cover plate.

Both screws must be tightened with a similar torque.

Make sure that the mounting position of the auxiliary switches is correct and they are moving normally after mounting by pushing them.

Earthing indication switches are located in the right hand side of cover plate.

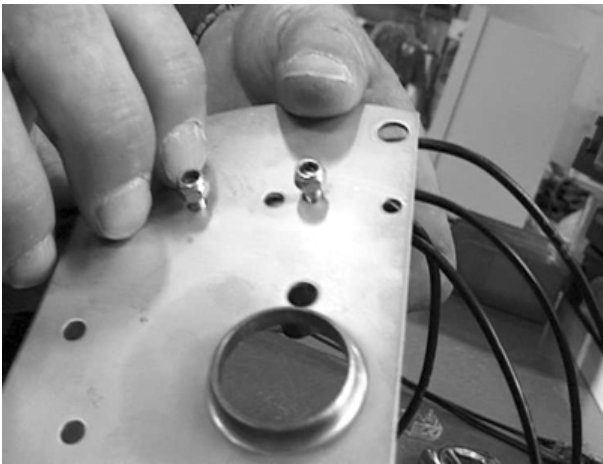


Figure 5.19
Removing the cover plate.

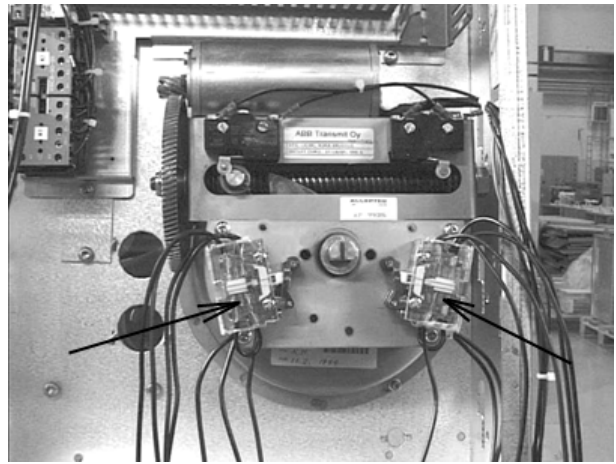


Figure 5.20
Location of indication switches.

5.4 Mounting of position indication and operation set

Instructions

The SFG switch-disconnector should be in the open position.

- 1) Lock the position indication and operation set with the locking ring.
- 2) Check that the location of position indication shaft and disc is in accordance with the figure below.

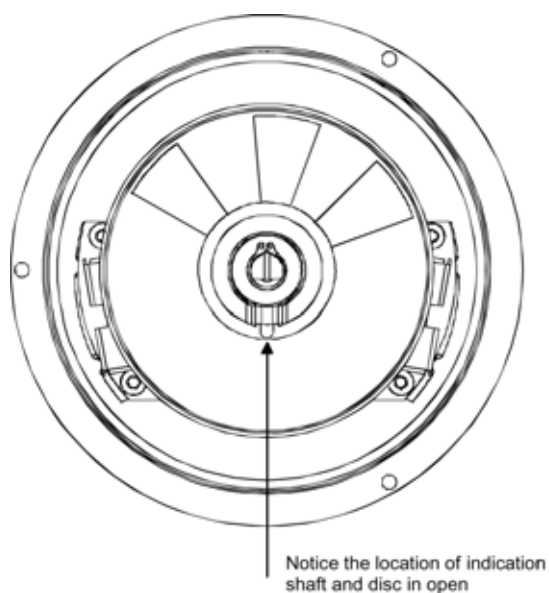


Figure 5.21

Location of position indication shaft and disc (open position).

5.5 Mounting of motor operating device for UES-A3M/2

Instructions

- 1) Mount the motor operating device for UES-A3M/2 by means of 3 screws and washers.
- 2) Mount the cover for the device by means of a screw and a washer.

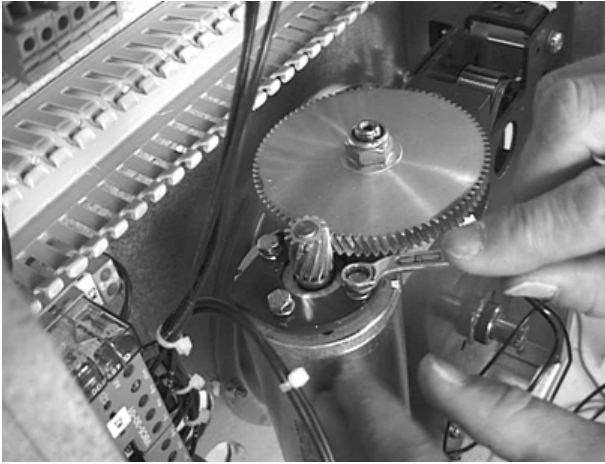


Figure 5.22
Mounting the motor operating device.

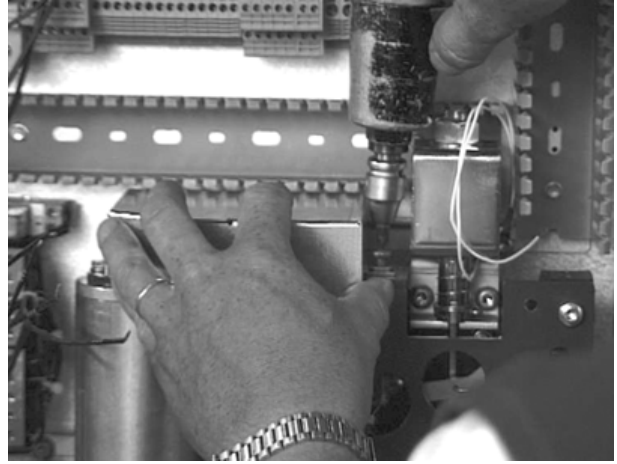


Figure 5.23
Mounting the cover for motor operating device.

5.6 Mounting of auxiliary switches for UES-A3(M)/2

Mount the auxiliary switches on the cover plate of UES-A3(M)/2.

1) Tighten the screws with a torque of max. 1.3 Nm.

Both screws must be tightened with a similar torque. Make sure that the mounting position of the auxiliary switches is correct and they are moving normally after mounting by pushing them.

Earthing indication switches are located on the right side of cover plate.

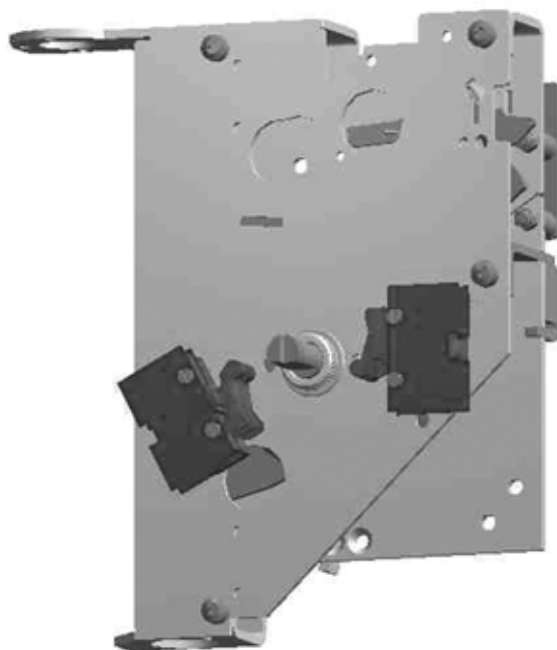


Figure 5.24
Auxiliary switch.

5.7 Mounting of shunt trip-coil

Mount the shunt trip-coil by means of 2 screws and washers.

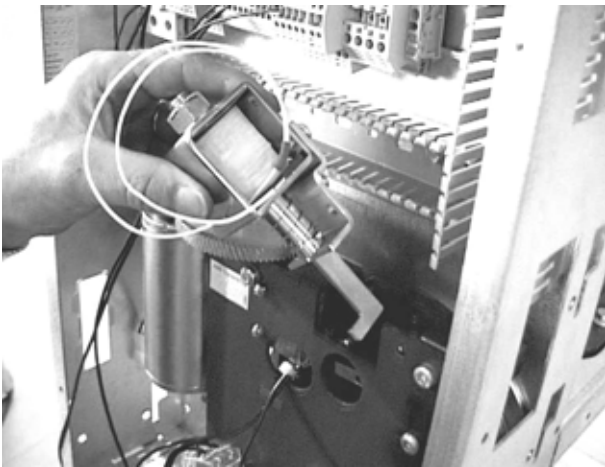


Figure 5.25
Shunt trip-coil.

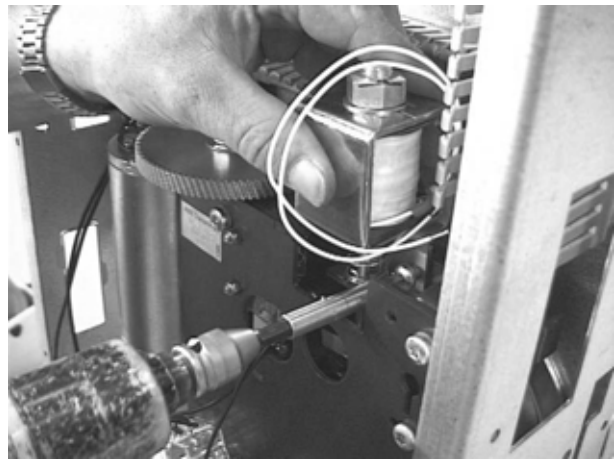


Figure 5.26
Mounting the shunt trip-coil.

5.8 Installation of indicating system for current transformers after main installation

General

Some of the customers use current transformers (CT) which are not manufactured by ABB. In such cases the CT's are usually installed by a customer. If voltage indication via CT's is needed, the following information should be taken into account:

- Voltage indicating system CL497/CL498 for CT's meets the requirements of IEC 61243-5, if the value of capacitive divider C1 in CT is according to Table 5.2 .

Table 5.2 The recommended values for capacitive dividers in CT's.

Operating voltage (kV)	Value of C1 (pF)
6...7.2	23...40
10...12	19...33
13.8...17.5	13...23
20...24	10...18

It is also recommended that the stray capacitance value of CT is between 20...90 pF.



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Information given in this publication is generally applicable to equipment described. Changes may be made in future without notice.