DISTRIBUTION SOLUTIONS

UniSec DY800 - Ed. 4 - to e-Distribuzione specifications

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Installation, service and maintenance instructions for 24 kV prefabricated assemblies with arc-proof metal enclosures and multi-function apparatus

For your safety!

- **Make sure that the installation room (spaces, divisions and ambient) is suitable for the electrical apparatus**
- **Make sure that all the installation, putting into service and maintenance operations are carried out by qualified personnel with suitable knowledge of the apparatus**
- **To ensure that the installations are built in accordance with the rules of good working practice and safety in the work place, make sure that the regulatory and legal requirements are complied with during installation, putting into service and maintenance. The personnel who access the switchgear must possess PES or PEI qualification in accordance with IEC EN50110 standards**
- **Strictly comply with the indications in this instruction manual**
- **Check that the rated performance of the apparatus is not exceeded during service**
- **Check that the personnel operating the apparatus have this instruction manual to hand as well as the necessary information for correct intervention**
- **Pay special attention to the danger notes indicated in the manual by the following symbol:**

Responsible behaviour safeguards your own and others' safety!
Please contact the ABB Assistance Service for any further requirements

I. Foreword

The instructions in this manual refer to UniSec DY800 standardized MV switchgear.
Please read the manual carefully to ensure that the product is used correctly.
Besides this manual, it is always necessary to consult the latest technical documentation (electric circuit and wiring diagrams, tables with overall dimensions, foundation project, etc.), especially regarding any variants requested in relation to the standard configurations.
Only use original spare parts for maintenance operations.

1. Packing and transport

Strictly comply with the indications on the pictograms and the instructions on the packaging

Each cubicle is protected by a plastic cover to prevent water from infiltrating if it rains when the loading and unloading operations are performed and to keep the dust off during storage.
The cubicles are placed on wooden pallets and fixed in place with four bolts, one per corner.
The loading platform of the vehicle that transports the cubicles must be no more than 1.5 m from the ground so that the overall height is 4 m maximum.
The surface of the loading platform must be non-slip with a high coefficient of friction.

The assemblies must be arranged cross-wise and back to back on the platform with suitable material in between so as to prevent them from touching and pressing against each other.
Frame members must be arranged on the platform so as to space out the units and prevent them from shifting in either the longitidunal or cross-wise directions.
The units must be fastened to the structure of the vehicle with ropes so as to avoid damage and prevent them from tipping over when the transport vehicle is driven round bends or is sharply braked.
The vehicle must also be covered by a tarpaulin.

2. Checking on receipt

The cubicles must be unloaded from the transport with the utmost care, as described in chap. 5.
Upon receipt, immediately check the condition of the pack, that the apparatus is undamaged and that the data on the nameplate on the outside of the packaging correspond to the information in the order confirmation and shipping note.
If damage or discrepancies are discovered, or the documents supplied with the goods fail to correspond, immediately inform ABB (either directly, or through your representative or supplier) and the haulage contractor that made the delivery.
The cubicles are supplied solely with the accessories specified at the time of order and validated in the order confirmation.
The following items are to be found inside the cubicles:

- instruction manual
- a packet containing screws, nuts, washers, busbars, etc. for joining the cubicles;
- operating lever
- the shipping documents.

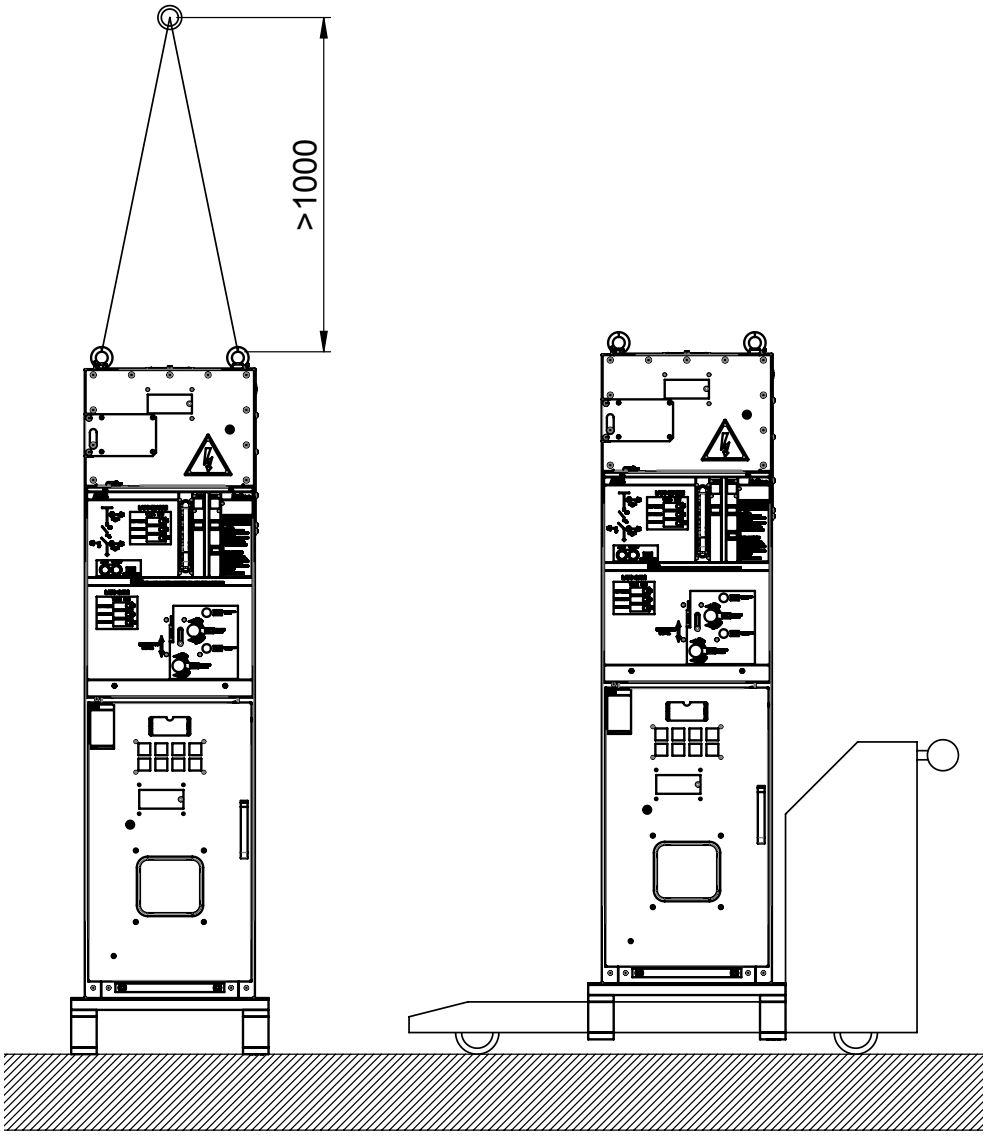
3. Storage

UniSec switchgear must be stored in a dry, dust-free place with a non-corrosive atmosphere at a temperature between -25 °C and +70°C, with 95% relative humidity or less and without condensation.
Please consult us if different requirements are involved.

4. Handling

Make sure that the insulating parts of the apparatus are not damaged when the cubicles are handled
Before proceeding with any operation, always make sure that the springs of the operating mechanism are not loaded and that the apparatus is in the open position
Keep the cubicles in the vertical position when using a lift truck for handling purposes

UniSec switchgear is normally placed on a wooden pallet and fastened with four bolts, one per corner. For handling purposes the switchgear can be lifted by crane, using ropes with snap hooks conforming to the safety standards inserted through the eyebolts on the top of the units, or by fork lift truck. In this case, the forks must be inserted at the sides where the cubicle is joined, for improved stability during the handling operations.
The center of gravity of the cubicles is high.
To prevent them from tipping over, proceed very slowly and with extreme caution when handling them with a forklift truck.



Lifting by crane

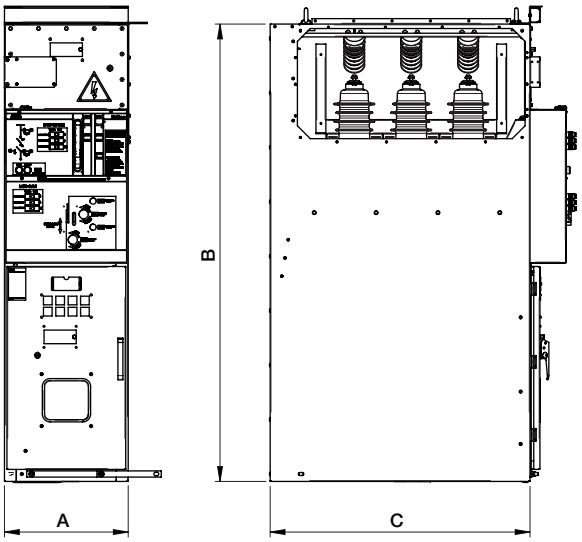
Handling with a lift truck

5. Description

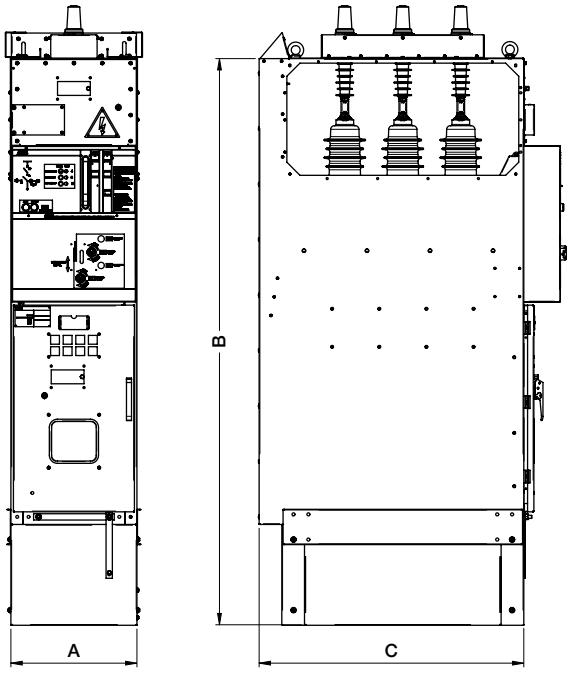
5.1 Rating

Cubicle	UniSec DY800
Maximum insulation voltage	24 kV
Rated insulation level, withstand voltage:	
- with lightning impulse to earth and and line-to-line	125 kV
- with power-frequency to earth and line-to-line	50 kV
- with power-frequency between open contacts of disconnector	60 kV
Rated frequency	50 Hz
Continuous duty rated current for busbars	630 A
Admissible short-time withstand current for busbars and branch lines	16 kA
Admissible short-time peak current value for busbars and branch lines	40 kA
Rated short-circuit duration	1 s
External protection class	IP3X
Internal arc withstand value:	
- IAC classification	AF DY800/116/316 - AFL DY800/216
- test voltage	24 kV
- test current	16 kA
- test duration	0.5 s
Multi-function apparatus type HySec – Integrated circuit-breaker	
Rated voltage	24 kV
Rated insulation level	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated frequency	50 Hz
Rated thermal current	630 A
Admissible rated short-time withstand current	16 kA
Electrical life class (ref. IEC 62271-100)	E2
Admissible short-time peak current value	40 kA
Rated short-circuit duration	1 s
Rated short-circuit breaking capacity	16 kA
Rated operating sequence	O - 0.3 sec - CO - 30 sec - CO
Mechanical life	10000 operations Class M2
Rated breaking current values:	
- circuit mainly active	630 A
- vacuum transformer	6.3 A
- no-load line	10 A
- no-load cable	31.5 A
- capacitor bank	400 A class C2
Integrated three-position disconnector – Line Side	
Rated insulation level	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated impulse withstand voltage between open contacts of disconnector	145 kV
Rated current	630 A
Admissible rated short-time withstand current	16 kA
Rated short-time peak current	16 kA
Admissible rated short-circuit duration	1 s
Mechanical life	2000 operations Class M1
Electrical life class (ref. IEC 62271-102)	E0
Integrated three-position disconnector –Earth Side	
Admissible rated short-time withstand current	16 kA
Rated short-time peak current	40 kA
Rated short-circuit making capacity	40 kA
Admissible rated short-circuit duration	1 s
Mechanical life	2000 operations Class M1
Electrical life class (ref. IEC 62271-102)	E2

5.2 Overall dimensions

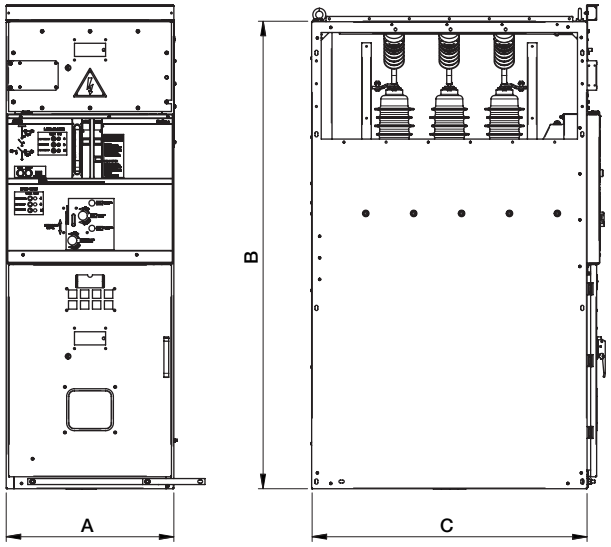


DY800/116



DY800/216

	Dimensions (mm)			Weight (kg)
	A	B	C	
DY800/116	500	1850	1050	275
DY800/216	500	2250	1050	302
DY800/316	700	1950	1150	305



DY800/316

5. Description

5.3 Construction characteristics

5.3.1 Cubicles

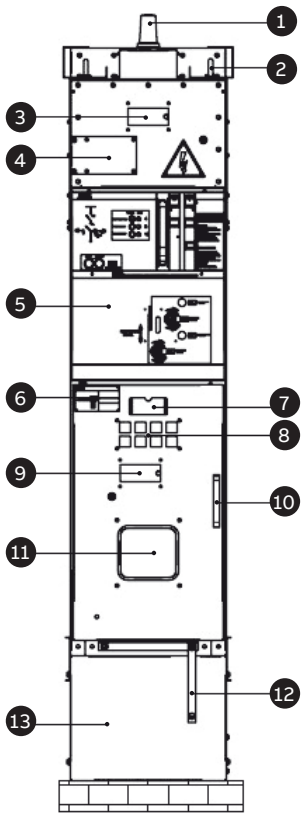
UniSec DY800 switchgear is internal arc-proof and suitable for secondary distribution requirements.
UniSec DY800 switchgear uses a multi-function apparatus with vacuum circuit-breaker and SF_6-insulated 3-position disconnector (line, isolated and earth).
The new integrated apparatus is made of: expoxy resin for the top part where the vacuum interrupters are housed, so as to guarantee the required degree of insulation, and steel for the bottom part, thereby providing metallic segregation and earthing between the busbar compartment and cable compartment.
This guarantees maximum safety for operators working in the line compartment, even when the main busbars are energized. Thanks to this technical solution, panel classification is LSC2A-PM, in accordance with IEC 62271-200.
All live parts of the integrated apparatus are SF_6-insulated to guarantee higher-level protection over time against strongly agressive outdoor environments.
The new technology featured by the integrated apparatus possesses the following advantages:

- it is the only disconnector apparatus with 3 positions and circuit-breaker
- small size
- low amount of SF_6 used for insulation
- ease of use.

All the cubicles are internal arc-proof in accordance with the provisions established by standard IEC 62271-200.
The IAC classification of the various types, restricted to authorized persons alone (class A), complies with the 5 criteria established by the standard.
The 3 types of UniSec DY800 cubicles are classified in the following way:

- AF on the front side for DY800/116 AirPlus and DY800/316 units
- AFL on the front side and on the two sides for DY800/216 units.

Key
1 External taper bushings (only for DY800/216)
2 Eyebolts for lifting
3 Opening for gauging temperature in busbar compartment (Thermovision)
4 Fixing plate for troubleshooting apparatus (RG)
5 Circuit-breaker and disconnector control box
6 Cubicle rating plate
7 Card holder
8 MV cable inspection window
9 Opening for gauging temperature in cable compartment (Thermovision)
10 MV door opening handle
11 MV cable test panel
12 Earthing busbar
13 Lower structure for MV cable side outlet (only for DY800/216)



The internal arc-proof characteristic is guaranteed with the panels assembled, the doors closed and the screws tightened

5.3.2 Protection classes

UniSec DY800 switchgear is designed with the following protection classes:

- IP2X protection class inside the switchgear with the door open
- IP3X protection class for the external enclosure.

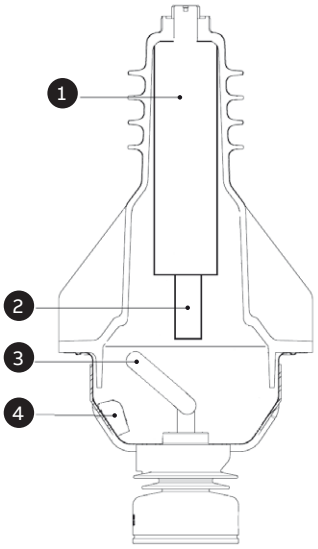
5.3.3 Main components

All three UniSec DY800 cubicles use the same, previously described, multi-function apparatus comprising the following functional components:

- **3-position disconnector (line, isolated, earth)**

This is an SF_6-insulated disconnector; in the open position, the moving contacts guarantee that the isolated position is maintained.
In the line closed position, the moving contacts fit into the fixed upper contacts installed in the lower part of the vacuum interrupter of the circuit-breaker.
In the closed earthed position, the moving contacts fit into the fixed lower contacts in the metal structure.

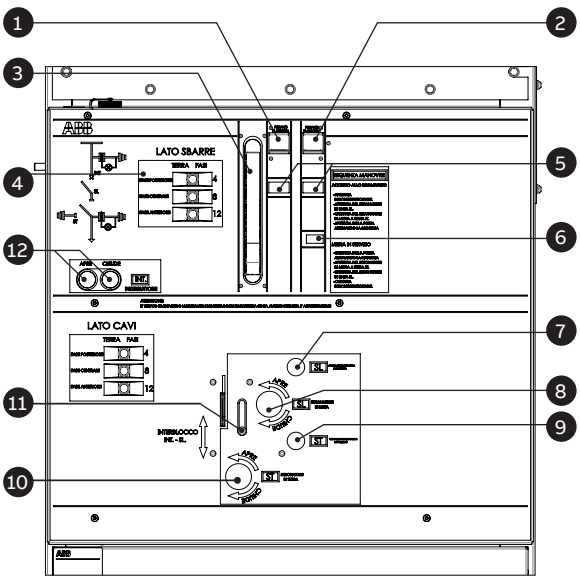
Key
1 Vacuum interrupter
2 Fixed contact of feeder disconnector SL
3 Moving contact of disconnector
4 Fixed contact of earthing switch ST



5.3.4 Characteristics of the 3-position disconnector operating mechanism

The disconnector is equipped with a three-position stored energy operating mechanism operated by a dedicated lever.

Key
1 Mechanical opening pushbutton
2 Mechanical closing pushbutton
3 Circuit-breaker spring loading lever
4 Voltage detectors
5 Circuit-breaker state
6 Circuit-breaker operation counter
7 SL position state
8 ST operating seat
9 ST position state
10 ST operating seat
11 Circuit-breaker - Disconnector interlock
12 Electrical pushbuttons of circuit-breaker



5.3.5 Characteristics of the circuit-breaker operating mechanism

The circuit-breaker is equipped with a three-pole operating mechanism with the following circuits and devices:
- a three-pole voltage start-up closing circuit;
- a three-pole voltage start-up opening circuit;
- an anti-pumping device to prevent further closings other than the first when opening occurs during the initial closing request. This device must not be deactivated by functional inhibitions.

Operating energy storage occurs in two ways:
1) by means of a DC-powered electric motor with the following characteristics:
   – Rated auxiliary power supply voltage: 24 VDC
   – Maximum consumption (excluding inrush) 300 W
   – Spring reloading time max 30 s
2) by means of a mechanical device operated in the manual mode by the operator.

The multi-function apparatus has a mechanical lock that prevents the three-position disconnector from moving when the circuit-breaker is closed.
With the circuit-breaker closed and the electric circuit of the operating power restoration motor disconnected, the energy stored by the system described above must be able to allow the circuit-breaker to accomplish the operating sequence:
O - 0.3 sec - CO.

5. Description

The connections to the remote control extension unit, the type of connector and the pinout conform to DY1050 specifications.
The closing and opening remote controls and the remote state signals refer to the circuit-breaker.
The opening (green) and closing (red) pushbuttons are installed on the front of the cubicle, where the state indicators of the circuit-breaker are also displayed.
The opening and closing pushbuttons are protected against being accidentally pressed and are equipped with labels indicating their relative function.
The rapid auto-reclosing cycle O - 0.3 - CO is not required in the absence of voltage.

5.4 Reference standards

DY800	e-Distribuzione Technical Specification and indicated references
IEC EN 60447	Man-Machine Interface. Actuating principles
IEC EN 60529	Protection classes of enclosures. Classification
IEC EN 62271-200	Metal-enclosed factory-built switchgear and controlgear for rated voltage above 1 kV and up to and including 52 kV
IEC EN 62271-100	Alternating current circuit-breakers for rated voltage values above 1 kV and up to and including 52 kV
IEC EN 62271-102	Disconnectors and earthing switches for rated voltage above 1000 V
IEC EN 62271-1	Common specifications for high voltage switchgear and controlgear

5.5 Interlocks

- **The operations must be performed by applying a moment of force (< 200 Nm)**
  If the operations are obstructed, do not force the mechanical interlocks but check that the operating sequence is correct
- **The locks are sized to withstand maximum 400 Nm actuating force without permanent deformation or breakage occurring**

Mechanical and electrical locks are used in the compartments.
The mechanical locks include:
- forcing locks
- inhibiting locks
- safety locks (padlocks/keys)

The electric locks feature microswitches that ensure continuity of service or break an electrical circuit.

The interlocks on UniSec DY800 units perform the following functions:
1) It must only be possible to operate feeder disconnector SL and earthing switch ST with the circuit-breaker in the open position.
   This condition is achieved with an interlock of the mechanical type.
2) Earthing switch ST must only be able to close with feeder disconnector SL in the open position and the moving contacts locked. This condition is achieved with an interlock of the mechanical type.
3) It must only be possible to electrically operate the circuit-breaker when the lever is not inserted into any lever seat and in the presence of the following conditions:
   – feeder disconnector SL in the closed position and earthing switch ST in the open position, both with moving contacts locked at end stop.
   – feeder disconnector SL in the open position and earthing switch ST in the closed position, both with moving contacts locked at end stop. This interlock is created electrically by cutting off the electrical controls of circuit-breaker I.
4) It must only be possible to open the cubicle door in conditions of safety, i.e. with feeder disconnector SL open and earthing switch ST closed. This condition is obtained with a padlockable interlock of the mechanical type.

5.5.1 Interlock between feeder disconnector SL and earthing switch ST
This is a mechanical lock created by the reciprocal rotation of the two operating shafts, which prevents the operating lever from being inserted into the corresponding lever seat if the conditions are not correct.
Earthing switch ST can only be closed if feeder disconnector SL is open.
Feeder disconnector SL can only be closed if earthing switch ST is open.

5.4.2 Interlocks between the door and earthing switch ST
This is a mechanical lock, one of the forcing type that prevents the door from opening if the earthing switch is open, while the other is the inhibiting type that prevents the operating lever from being inserted into the lever seat of the earthing switch, closed when the door is open.
Inversely (inhibiting lock), the earthing switch cannot be opened unless the door is closed and locked with the handle.

5.5.3 Interlock between the lever seat of feeder disconnector SL and the opening and closing controls of circuit-breaker I
This is an electrical lock that inhibits the electrical controls of circuit-breaker I when the operating lever is in the lever seat of feeder disconnector SL.
Insertion of the operating lever acts on a micro-switch which cuts off the power supplied to the control circuits of circuit-breaker I.

5.5.4 Interlock between the lever seat of earthing switch ST and the opening and closing controls of circuit-breaker I
This is an electrical lock that inhibits the electrical controls of circuit-breaker I when the operating lever is in the lever seat of earthing switch ST. Insertion of the operating lever acts on a micro-switch which cuts off the power supplied to the control circuits of circuit-breaker I.

5.5.5 Interlock between feeder disconnector SL and circuit-breaker I
This is a mechanical lock of the inhibiting type that prevents the operating lever of feeder disconnector SL from being inserted into its seat if circuit-breaker I is closed.

5.5.6 Electrical interlock between feeder disconnector SL and circuit-breaker I
This is an electric lock that prevents circuit-breaker I from closing when feeder disconnector SL is in the open position (the circuit-breaker can always be closed in the mechanical mode).
The position of the shaft of feeder disconnector SL acts on a micro-switch which cuts off the power supplied to the closing coil of the circuit-breaker, thereby preventing it from functioning.

5.5.7 Electrical interlock between earthing switch ST and circuit-breaker I
This is an electric lock that prevents circuit-breaker I from closing when earthing switch ST is in the open position (the circuit-breaker can always be closed in the mechanical mode).
The position of the shaft of earthing switch ST acts on a micro-switch which cuts off the power supplied to the closing coil of the circuit-breaker, thereby preventing it from functioning.

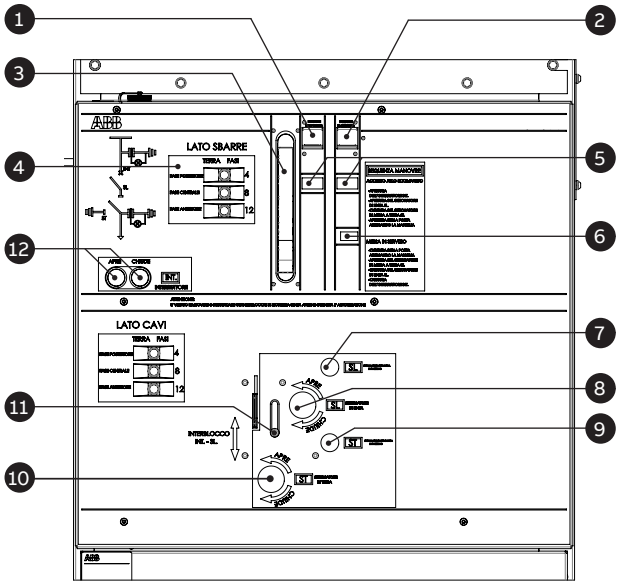
5.5.8 Door lock for thermovision
This is a key lock (responsibility key) which is not part of the supply and which only allows authorized persons to open the door.

5.5.9 Padlock on the lever seat of earthing switch ST
This system allows a padlock to be fitted onto the operating shaft of earthing switch ST. When the padlock is in place, the operating lever cannot fit into the seat and earthing switch ST cannot be opened.

6. Instructions for the operating sequence of all UniSec DY800 cubicles

- **Only use the supplied operating lever**
- **Once started, all the operations must be completed and the lever removed from its operating seat**
- **The operations must be performed by applying <200 Nm actuating force. If they are obstructed, do not force the mechanical interlocks but check that the operating sequence is correct**
- **The locks are sized to withstand maximum 400 Nm actuating force without permanent deformation or breakage occurring**
- **Before opening the door, always check the position of feeder disconnector SL and earthing switch ST by means of the mechanical signals and through the window**
- **The procedure for accessing the busbar compartment is at the charge of those who run the installation because it depends on the relative circuit diagram**

Key
1 Mechanical opening pushbutton
2 Mechanical closing pushbutton
3 Circuit-breaker spring loading lever
4 Voltage detectors
5 Circuit-breaker state
6 Circuit-breaker operation counter
7 SL position state
8 SL operating seat
9 ST position state
10 ST operating seat
11 Circuit-breaker - Disconnector interlock
12 Electrical pushbuttons of circuit-breaker



Access to the cubicle

1) Open circuit-breaker I
   - Press green opening push-button (1) or press green opening push-button (12) (electrical).
   - Check to make sure that the indicator (5) confirms that opening has occurred by displaying the letter O in black on a white background in the relative window.
2) Open feeder disconnector SL
   - Move the interlock (11) between feeder disconnector SL and circuit-breaker I in the upward direction.
   - Fully insert the operating lever into the seat (8) of feeder disconnector SL.
   - Turn the operating lever counter-clockwise until the operation has been completed.
   - Remove the operating lever.
   - Check that the indicator (7) confirms that opening has occurred by displaying letter O in black on a green background.
3) Close earthing switch ST
   - Move the interlock (11) between the disconnector and circuit-breaker in the upward direction. Fully insert the operating lever into its seat (10) in earthing switch ST.
   - Turn the operating lever clockwise until the operation has been completed.
   - Remove the operating lever.
   - Check that the indicator (9) confirms that closing has occurred by displaying letter I in black on a yellow background.
4) Open the door by pulling the handle up.

Putting into service

1) Shut the door by pushing the handle down.
2) Open earthing switch ST
   - Move the interlock (11) between the disconnector and circuit-breaker in the upward direction. Fully insert the operating lever into its seat (10) in earthing switch ST.
   - Turn the operating lever counter-clockwise until the operation has been completed.
   - Remove the operating lever.
   - Check that the indicator (9) confirms that opening has occurred by displaying letter O in black on a grey background.
3) Close feeder disconnector SL
   - Move the interlock (11) between the disconnector and circuit-breaker in the upward direction.
   - Fully insert the operating lever into the seat (8) of feeder disconnector SL.
   - Turn the operating lever clockwise until the operation has been completed.
   - Remove the operating lever.
   - Check that the indicator (7) confirms that closing has occurred by displaying letter I in black on a red background.
4) Close circuit-breaker:
   - Press red closing push-button (2) or press red closing push-button (12) (electrical).
   - Check that the indicator (5) confirms that closing has occurred by displaying the letter I in black on a white background in the relative window.

7. Voltage and phase correspondence indicator

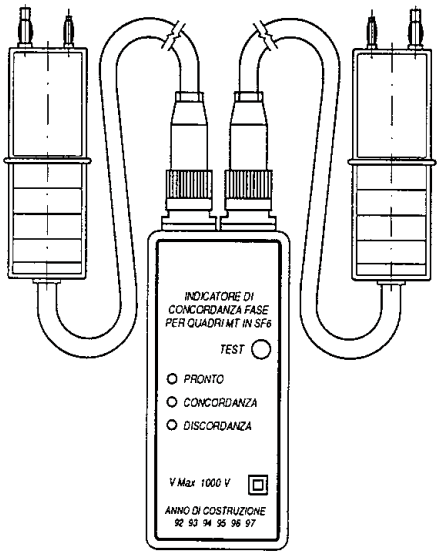
7.1 Voltage indicator

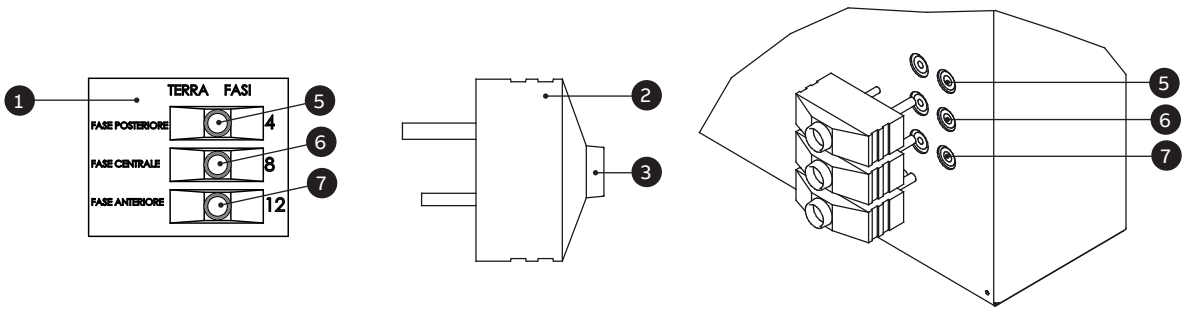
These devices conform to the indications in the e-Distribuzione DY 811 and DY 1811 specifications. They are installed in UniSec DY800 cubicles and signal the presence-absence of voltage in the MV lines of secondary substations.
UniSec DY800 panels are equipped with a voltage indicator powered by a capacitive coupling situated in the lower insulator of the cable compartment.
The device is indicated on the mimic plate as “CABLE SIDE”. A voltage indicator powered by a capacitive insulator situated in the busbar compartment and indicated on the mimic plate as “BUSBAR SIDE” can also be supplied.
The signals are displayed by three led lamps (3) in the signaling devices (2).
Make sure that the cable compartment is not live and that the earthing switch is closed before accessing the base of the detector (1), where the shielded cables are connected.
The signaling devices (2) can be connected and disconnected in the base (1) when the cubicle is live.
Make sure that the enclosure of the signaling device is earthed while the signaling devices are being connected and for as long as they remain in that position.
When the signaling device is disconnected, a circuit-breaker per phase ensures that the source from the M.V. system is earthed.
Correspondence between the cubicle phases and the cells (5-6-7) in the base of the detector (1) is as follows:

- the bushing (5) of the upper lamp is connected to the rear capacitive post insulator, phase on the bottom of the cubicle;
- the bushing (6) of the central lamp is connected to the central capacitive post insulator, central phase of the cubicle;
- the bushing (7) of the lower lamp is connected to the front capacitive post insulator, on the door side of the cubicle.

7.2 Phase correspondence check

Consult the instruction manual supplied with the apparatus for a description of the operating method.





Indicator plug-in

8. Installation

8.1 General information

- **Installation must be performed by our personnel or by the customer's personnel so long as they possess detailed knowledge about the apparatus**
- **Correct installation is of prime importance. The manufacturer's instructions must be carefully studied and followed**
- **It is good practice to wear gloves for handling the components during installation**
- **Make sure that circuit-breaker I and feeder disconnector SL are open and that the springs of the operating mechanism are discharged before removing the cover of this latter**
- **Do not walk on the switchgear. Keep away from the area overlooking the fumes exhaust stacks and do not install apparatus in that area**

8.2 Normal installation conditions

- Maximum ambient air temperature: +40 °C
- Minimum ambient air temperature: -15 °C
- Relative humidity %: < 95% without condensation
- Altitude: < 1000 m

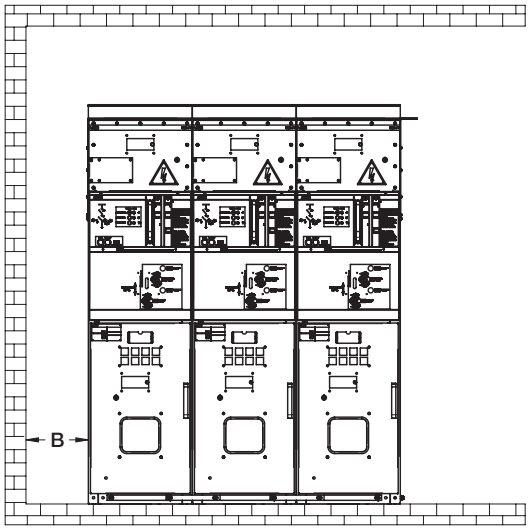
Comply with the indications in the product standards if other installation conditions are involved. Please consult us for special installation requirements.
The areas through which power conductors or auxiliary circuit conductors are routed must be protected against the access of animals, as this could lead to damage or disservice.

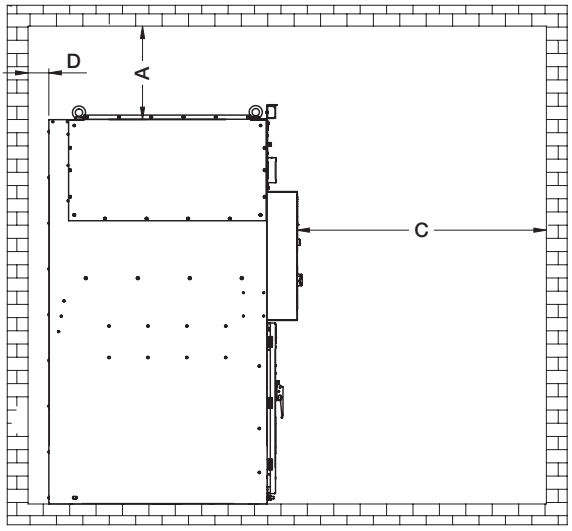
8.3 Installation room

- **The zone where gas is exhausted from the room must be studied when the installation is designed**
- **The utmost attention must be paid to the overpressure that may be created inside the substations**
- **The area over the fumes exhaust stacks situated in the rear part of the cubicles must be free from all obstructions. Comply with the indicated distances from the ceiling and walls**

A (mm)	≥ 450
B (mm)	≥ 100
C (mm)	≥ 1200 (*)
D (mm)	≥ 100

(*) Dimension C represents the space required to withdraw the cubicle

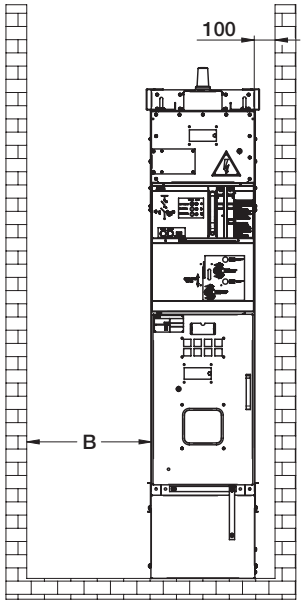


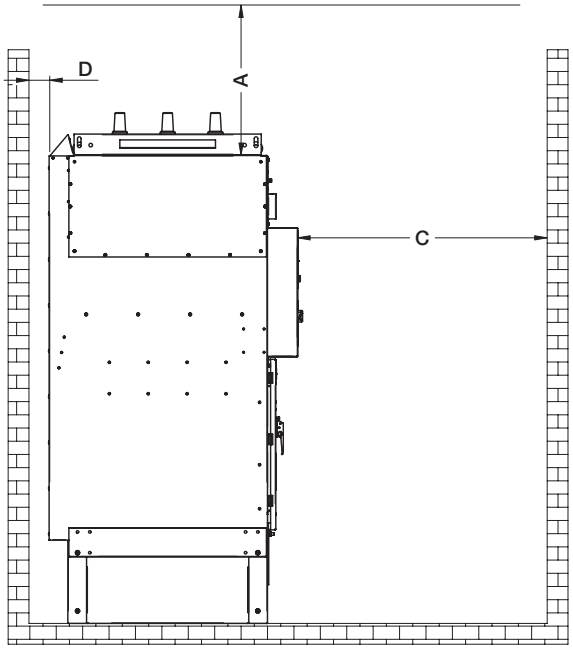


DY800/116

A (mm)	-
B (mm)	-
C (mm)	≥ 1200 (*)
D (mm)	≥ 100

(*) Dimension C represents the space required to withdraw the cubicle



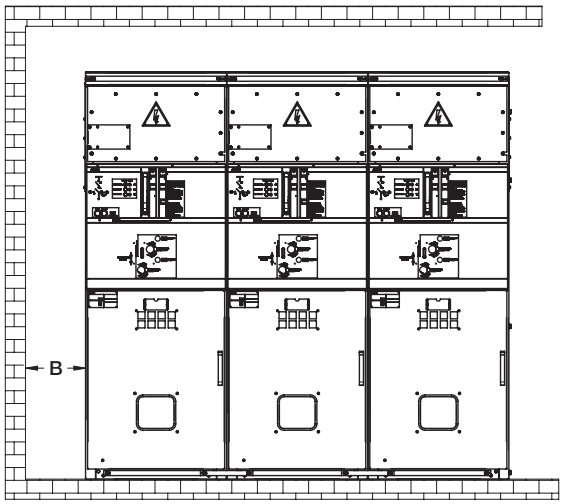


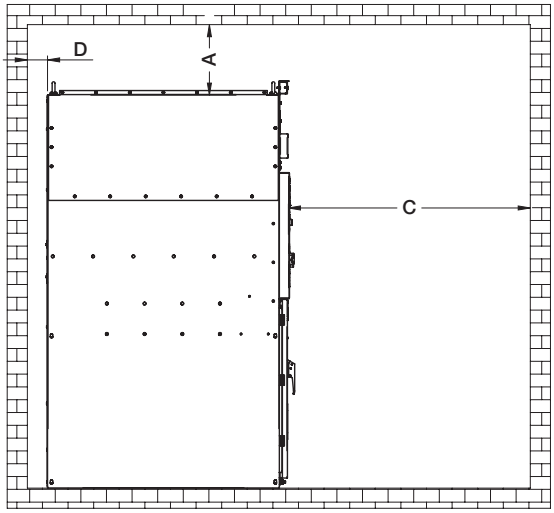
DY800/216

8. Installation

A (mm)	≥ 350
B (mm)	≥ 100
C (mm)	≥ 1200 (*)
D (mm)	≥ 100

(*) Dimension C represents the space required to withdraw the cubicle





DY800/316

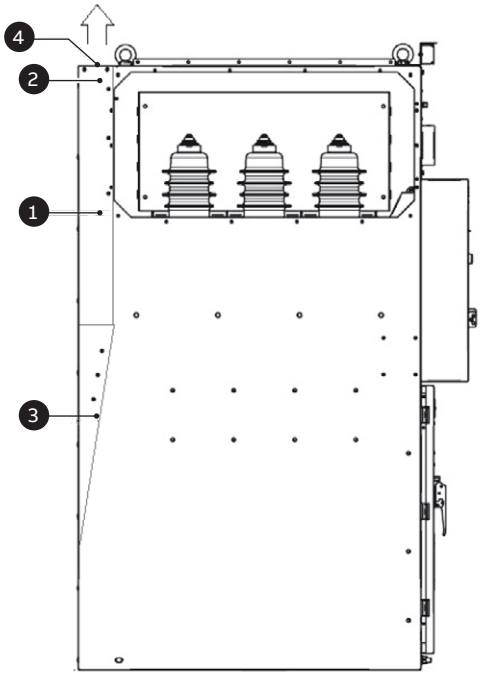
8.4 Duct for exhausting fumes due to overpressure

- **Do not touch the exhaust vents of the fumes exhaust stack when the switchgear is live**
- **Do not install apparatus in the area where fumes are exhausted**
- **Do not walk on the switchgear and keep away from the area over it when the switchgear is live**

The possibility of an electric arc occurring inside the cubicle is very remote.
If it should occur, proceed as described below to eliminate the fumes:

UniSec DY800/116 and 216

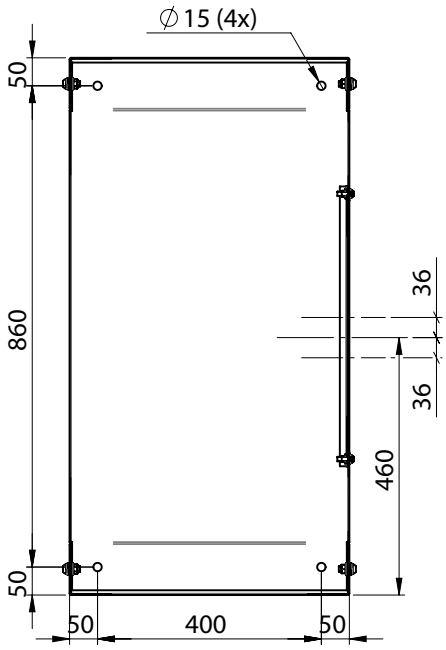
- Internal arc in the busbar duct
  – open the flap (1) to allow the fumes to flow into the stack (2)
  – the cable compartment flap (3) remains closed
  – fumes escape from the exhaust vent of the stack (4).
- Internal arc in the cable compartment
  – open the flap (3) to allow the fumes to flow into the stack (2)
  – flap (1) remains closed;
  – fumes escape from the exhaust vent of the stack (4).



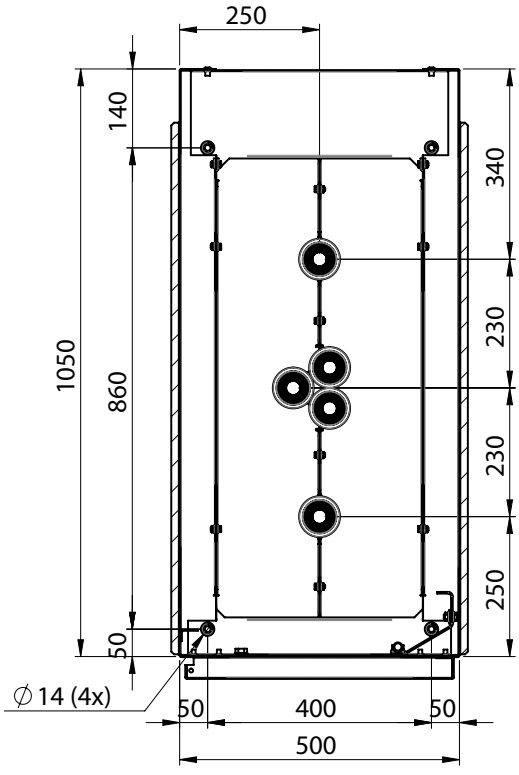
8.5 Foundations and fixing bed

The cubicles are normally pre-engineered for connection of the medium voltage circuit from the bottom.
The front part of the roof of UniSec cubicles has a duct for routing the auxiliary circuit cables. Make the relative routing holes under each cubicle before it is installed.
The foundation layout is shown in the figure.
The switchgear can be fastened straight to the floor by inserting expansion plugs into the fixing holes.
The fixing surface must be horizontal and well levelled, with 2 x 1000 flatness tolerance.

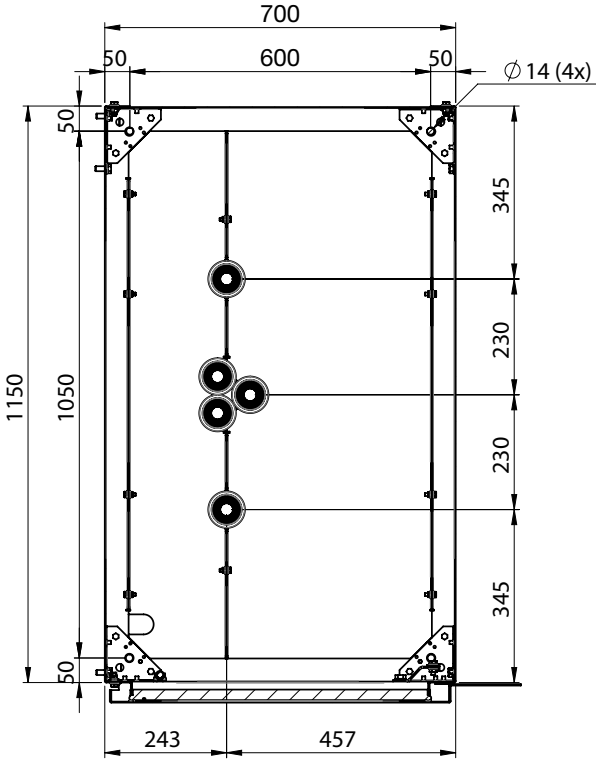
Holes in the floor for fixing the cubicles



DY800/216



DY800/116



DY800/316

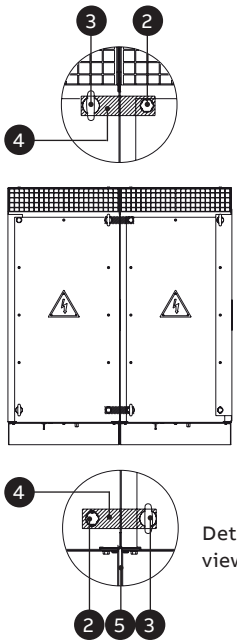
8. Installation

8.6 Joining and fastening the cubicles

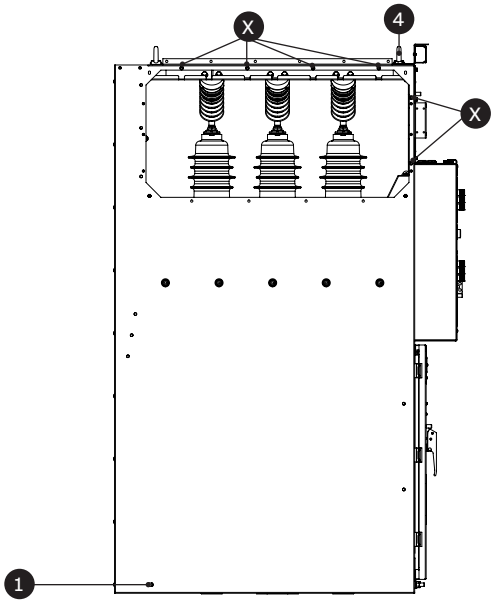
Make sure that the floor is flat before joining the cubicles.
The cubicles must be joined in the following way:

DY800/116 cubicles

– unscrew the screws (2) and eyebolts (3) from the roofs of the cubicles
– position the first cubicle on a level with the holes in the floor
– fit the fastening bolts into the floor and screw them in but without fully tightening them;



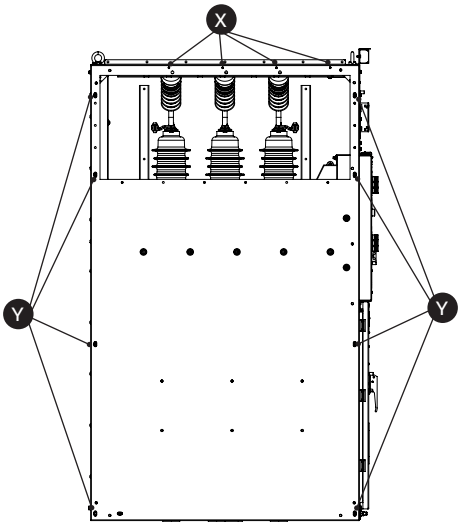
Detail of junction viewed from above



– move the second cubicle close to the first so that their sides touch each other;
– fit the M4 screws into the holes marked X and fully tighten the bolts into the adjacent cubicle;
– fit the fastening screw into the slot (1) and into the adjacent cubicle, then fully tighten the bolt.

Repeat these operations for the successive cubicles and after they have been joined together, fix the cubicles to the floor and fully tighten the screws.
Make sure that the sides of the cubicles are right up against each other and that there are no gaps at the front towards the busbar compartment (5).

DY800/316 cubicles



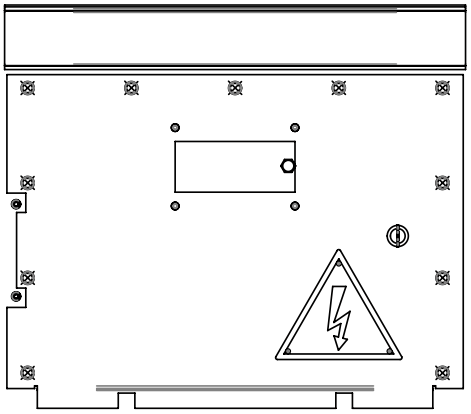
– position the first cubicle on a level with the holes in the floor;
– fit the fastening bolts into the floor and screw them in but without fully tightening them;
– move the second cubicle close to the first so that their sides touch each other;
– fit the M4 screws into the holes marked X and fully tighten the bolts into the adjacent cubicle;
– fit the M10 screws into the holes marked Y and fully tighten the bolts into the adjacent cubicle;
– Repeat these operations for the successive cubicles and after they have been joined together, fix the cubicles to the floor and fully tighten the screws.

Make sure that the sides of the cubicles are right up against each other and that there are no gaps at the front towards the busbar compartment.

In the case of end panels, the screws and nuts must still be fitted into the indicated points to ensure the IP3X protection class

Front panel that closes the busbar compartment

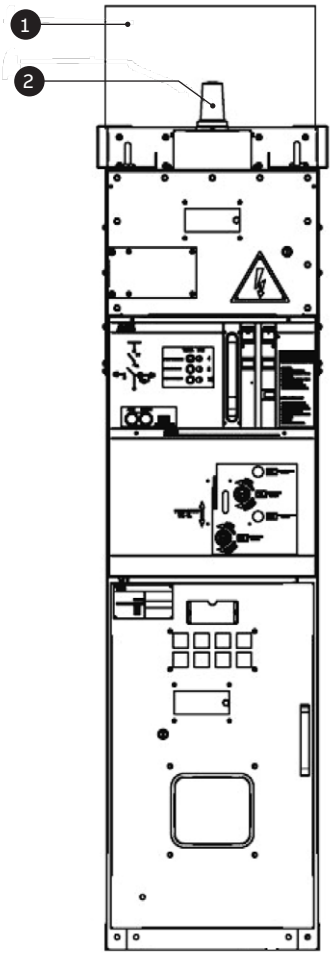
To fasten the panels, fit all the screws marked X into the holes and fully tighten them.



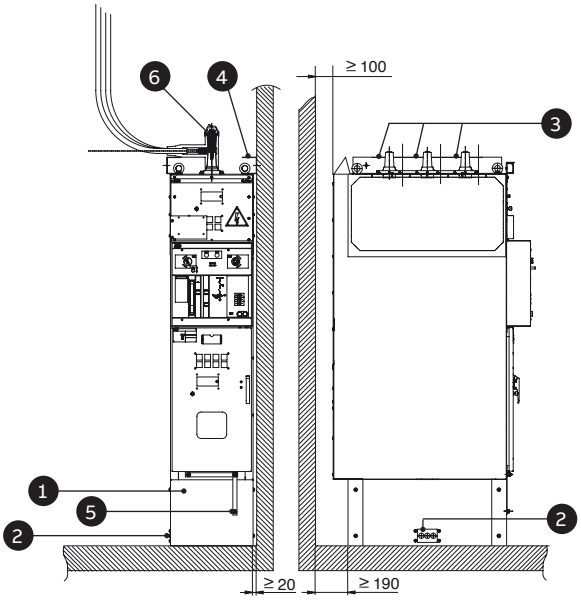
How to fasten DY800/216 cubicles

When the DY800/216 unit arrives, the base (1) is fixed to the roof in an overturned position. Comply with the following instructions to install the unit in a raised substation:

- unbolt the base (1) from the roof. Lift it with a crane using belts and, taking care to prevent the upper bushings (2) from being damaged, place it on the ground and turn it upside down
- make sure that the floor of the raised substation is horizontal and well leveled with 2/1000 maximum flatness (2 mm with respect to a square meter)
- place the base in the substation 20 mm from the right-hand wall and 190 mm from the rear wall and mark the positions of the holes;
- drill the floor, insert 4 expansion plugs and fix the base in place. Make sure that the cable outlet (2) in the base is on the left. It the unit must be positioned in the left-hand corner of the substation, turn the base through 180° and fix it at the same distances with respect to the left-hand wall:
- remove the unit from the pallet and take it into the substation. Make sure that the upper bushings (3) are not damaged when the unit passes through the substation door and place it on top of the base (see detail A). Fasten it with the screws removed when the base was disassembled from the roof
- set the bracket (4) (see detail B) back on the roof, on the right or left. Move it near to the wall and mark the positions of the holes. Drill the wall, insert 2 expansion plugs and fix the bracket against the wall. Lock the bracket in place by tightening the eyebolt and M16 screw
- set the earthing busbar (5) in the vertical position and fix it to the base with the supplied M12 screw and washer.
  After having inserted the internally tapered terminals (6) into the upper bushings (3), the bracket holes can be used to lock the cables with straps or clamps before they curve upwards.



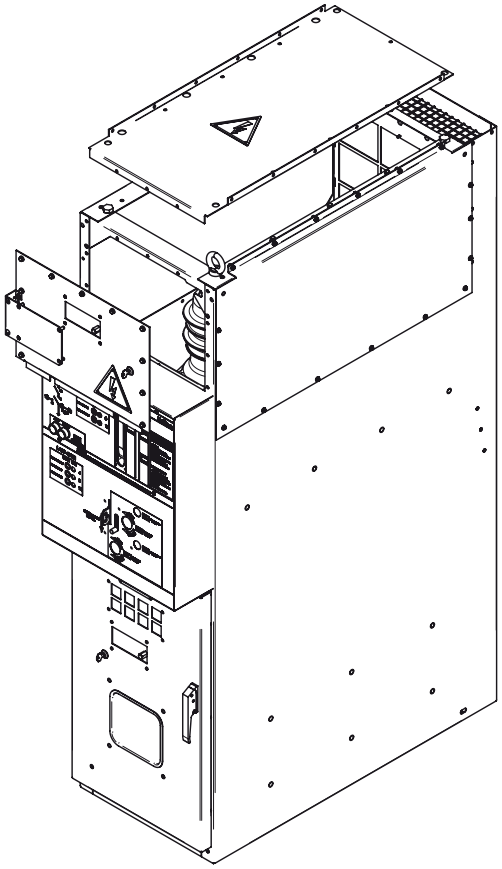
8. Installation

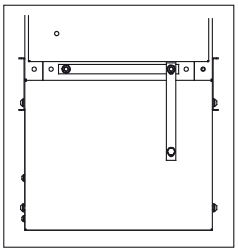


Panel assembly sequence

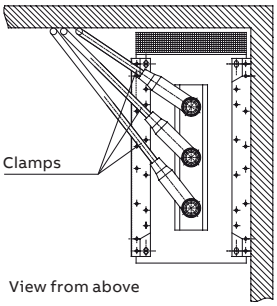
Comply with the numbered sequence in the figures below to assemble the panels.

DY800/116 panel

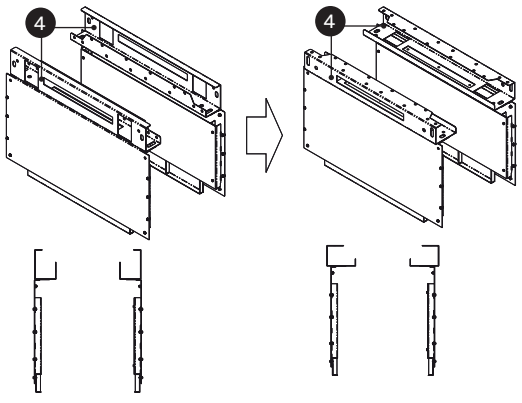




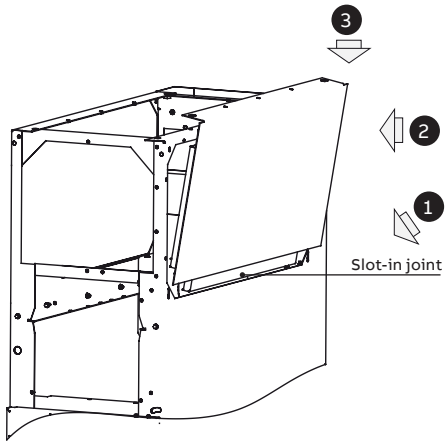
Detail A



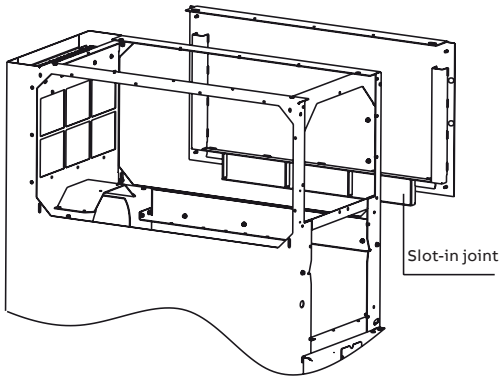
View from above



Detail B

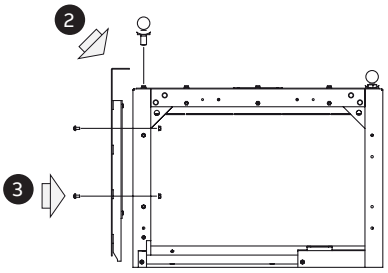


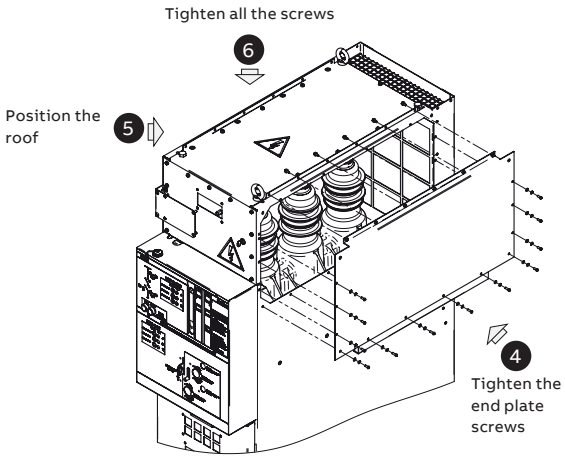
End panel



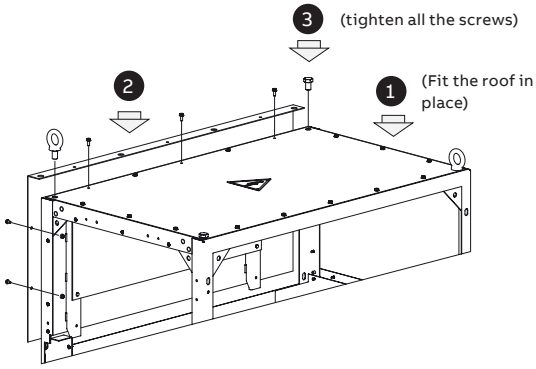
End panel fixing points

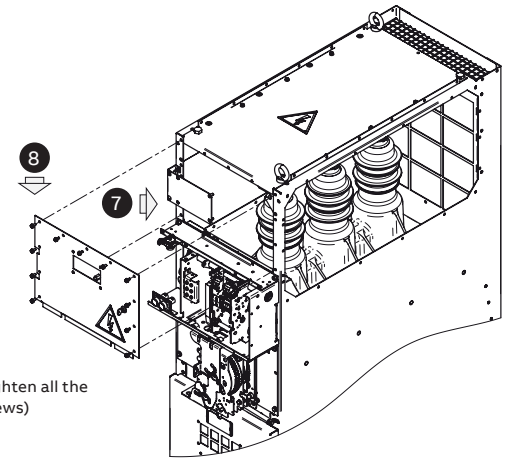
DY800/316 panel



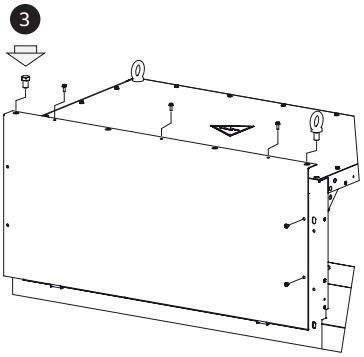


Upper cover panel





Front panel



8. Installation

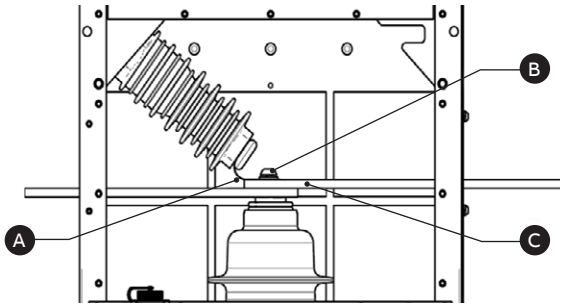
8.7 Connections

GENERAL WARNINGS
Make sure that the fixed couplings of the switchgear and the connections (cable terminals, busbar connections) are clean and free from any deformation caused by shocks received during transport or storage.
Eliminate all traces of oxidation with a fine file or emery cloth.

8.7.1 Power circuit

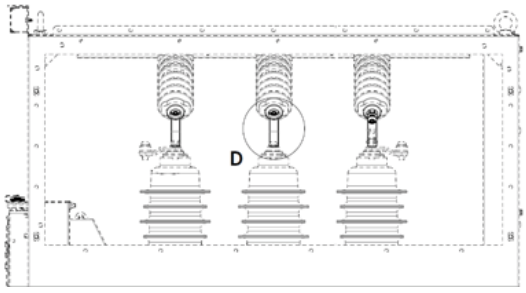
Main busbars for UniSec DY800 units coupled to mixed cubicles. Make sure that the contact zone of the busbars and bearing insulators is perfectly clean and degreased. Assemble the busbars (C) as indicated in the drawing, by placing them on the contact area of the apparatus. Position the strip (A) on the upper surface of the busbar (C). The holes in the two components must match. Tighten all the screws (B) by hand. Remember to use the relative washers and to also include the strip (A), as shown in the drawing. After this, tighten the screws with a torque wrench. Apply max. 60 Nm tightening torque. Repeat the operation for all three phases.

Tightening torque
60 Nm max



Main busbars for UniSec DY800/316 units coupled to open-type cubicles

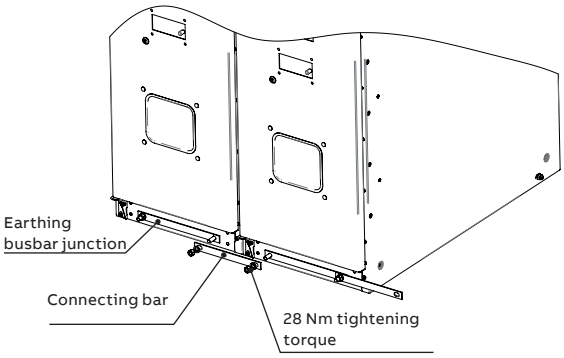
Make sure that the contact area of the busbars and supporting insulators is perfectly clean and degreased. Repeat the operations described in the previous paragraph for the central phase (detail D). Make sure that the strip (A) is also connected.



Only couple the busbars for the remaining phases, since the strips are already connected (comply with the previously described procedure).

8.7.2 Earthing busbars

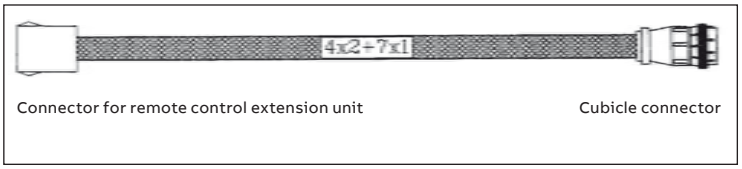
The earthing busbar is routed longitudinally along the lower part of the switchgear. There are copper alloy bolts at its end for connecting to the earthing network of the installation.
The screws and bolts must be tightened to the prescribed tightening torque value (28 Nm) so as to prevent vibrations during operation from working them loose.
The earth conductor must be sized to withstand the forecast maximum earth fault current. Generally speaking, the section of the earth conductor must not be less than that of the earthing busbar of the switchgear. All cubicles are normally equipped with an earthing busbar whose section guarantees > 200 A/mm^2 current density.
The earthing busbar junction must be made on a level with the points in which the switchgear cubicles join together. Remove any traces of oxidation from the contact surface of the busbars beforehand, using emery cloth.
Lock the earthing busbar junction in place with its screws, flat and spring washers and with the nut and its respective washer.
Fix the busbars as shown in the figure.



8.7.3 Connection of the auxiliary circuits

There are auxiliary circuits in all UniSec DY800 cubicles.
The wiring inside the switchgear is installed in the factory. The conductors are routed from a fixed connector on the switchgear panel.
The external connection between the motor-operated control and telecontrol extension unit is made with multicore cable equipped with flying connectors.
The figure below illustrates the route inside the cubicle of the cables that connect the current transformers, the toroidal transformer for homopolar protection and the RG apparatus.

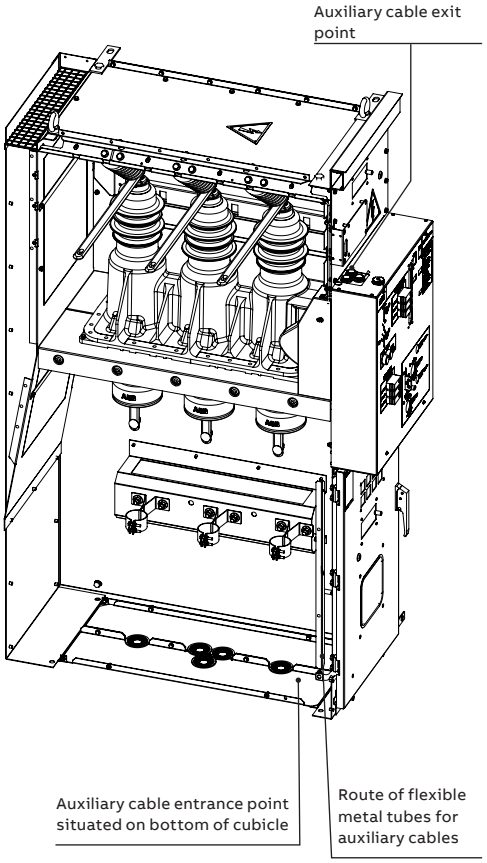
Fixed connector on the cubicle



External multicore connection cable

Cable route inside the cubicle

Flexible metal tubes inside the cubicles allow the auxiliary cables to be routed from the cable compartment to the upper part of the housing of the operating mechanism near the support of the protection device.



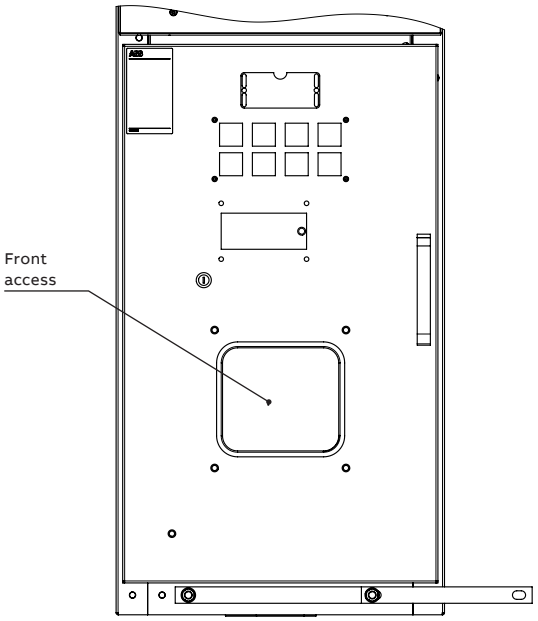
9. Cable tests

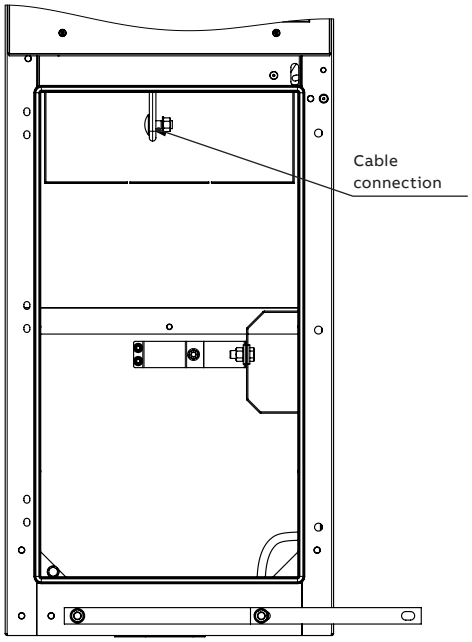
- **Before proceeding, ensure that the part of the installation in which the work must be performed is in a safe condition**
- **Connection of cables for test purposes (applied voltage and troubleshooting) alters the characteristics of the switchgear. Those who do this must ensure compliance with the correct procedures in order to guarantee safe conditions for the workers**
- **Obligatory conditions when performing voltage tests on the cables or troubleshooting:**
  - **– earthing switch ST must be open**
  - **– feeder disconnector SL must be open (isolated position)**
  - **– the circuit-breaker must be open**

NOTE

The isolating distance is not guaranteed with feeder disconnector SL in the closed position and the circuit-breaker open

The maximum voltage applicable in the point in which the cables connect to the switchgear for the insulation test or for locating faults in the cables, is 50 kV DC.
The tests must be performed with the door closed, by routing the cables from the front shutter on the door.
Check compliance with the safety distances from live parts, taking into account the value of the test voltage applied.





10. Putting into service

- **Only use the supplied operating lever**
- **All the operations for putting into service must be carried out by our personnel or by the customer's sufficiently qualified personnel with detailed knowledge of the apparatus and installation**
- **If the operations are obstructed, do not force the mechanical interlocks but check that the operating sequence is correct**
- **Before opening the door, always check the position of the feeder disconnector and earthing switch by means of the mechanical signals and through the relative windows**
- **Only energize the switchgear with the apparatus open and the doors closed**
- **Do not put the equipment into service if the test result is negative. Consult us if necessary**

The inspections are only acceptable if all the listed tests have terminated with a positive result

Perform the operations in the following table before putting the switchgear into service.
After the operations described above have terminated, make sure that everything has been restored to its original conditions.

Inspections prior to putting into service

Inspected part	Operations	Notes
Cubicles	Visually check inside and outside the cubicle to make sure that there is no evident damage. Remove any foreign bodies (e.g. tools, test connections inadvertently left in place after installation).	
	Carefully clean the insulating parts. Remove all traces of moisture and dust with a clean, dry cloth.	
	Make sure that all screws have been properly tightened.	
	Check that all end plates and those included in the configuration have been installed correctly.	
	Make sure that all panels for protection against accidental contact have been installed correctly.	
	Check that the interlocks function correctly and that the keys (if any) are correctly joined with a welded ring if they are required for the interlocks.	
	Check that the mechanical operating mechanisms can be operated by applying ≤ 200 Nm moment of force.	
	Check the mechanical signals and through the windows to make sure that the apparatus is positioned properly.	
	The force interlocks withstand 400 Nm maximum moment of force.	
Power circuit connections	Make sure that the connections are well tightened.	
Earthing busbar and relative connections	Check tightness and continuity.	Check earthing efficiency in accordance with the accident-prevention regulations
Insulation	The applied voltage test is performed in the factory. After installation, it is not required by the CEI 17-6 Standards. If the user considers it necessary, it must be performed at a value equal to 80% of the value indicated in point 8.1. of Standard IEC 62271-1 and only in alternating current. Keep the MV cables disconnected during the test.	Example: – 24 kV rated voltage of switchgear – Required test voltage 50 kV for approx. 1 min (performed in factory) – Test voltage after installation 0.8 x 50 = 40 kV for 1 min.
Circuit-breaker, feeder disconnector, earthing switch and operating mechanism	Carry out several operations on each apparatus to make sure that this latter and the interlocks operate correctly.	Make sure that the apparatus and locks function correctly (see sect. 5.4 - sect. 6.0)
Auxiliary circuits	Check that the spring loading motor and opening and closing coils function correctly.	

11. Routine inspections

- **The routine inspections must be performed by our personnel or by the customer's personnel so long as they are sufficiently qualified and possess detailed knowledge about the apparatus**
- **Before proceeding with any operation, always make sure that the apparatus is in the open position with the springs discharged**
- **Before opening the door, always check the position of the feeder disconnector and earthing switch by means of the mechanical signals**
- **The apparatus is guaranteed to be maintenance-free for the first 36 months from delivery**

11.1 General information

During normal service, the switchgear is maintenance-free. Any interventions required basically depend on the severity of the service conditions, i.e. on various different factors such as the frequency of the operations, the interrupted current values, the relative power factor and the installation site.
For precautionary reasons, an inspection schedule is given in the table in the following section, along with the frequency with which the equipment must be checked. It is advisable to comply with the indications in the table for the first interventions. Optimal time limits for carrying out successive operations can be established on the basis of the results obtained during the routine inspections.
It is advisable to record all the operations performed in detail on a maintenance card and service book, along with the date, description of the fault and reference data allowing the device to be identified (see chap. 2).
Refer to article 11 of standard IEC 62271-1 if further details are required. Do not hesitate to call us if problems arise. It is always a good idea to inspect the apparatus (screw and bolt tightness - abnormal heating, etc.) a few months after it has been put into service.
The following table gives the indicative frequencies with which inspections should be made.

Do not put the apparatus into service if the test result is negative.
Call us if necessary

11.2 Inspection schedule

Part liable to inspection		Inspection frequency	Operation required
1	Perform a few mechanical closing and opening operations	3 years	Make sure that the operating and transmission levers function correctly. The apparatus must operate regularly without stopping in intermediate positions and the applied torque must not exceed 200 Nm
2	Visual examination of the insulating parts	3 years, or depending on the degree of pollution in the environment	The insulating parts must be free from any built-up dust, dirt, cracks, traces of surface discharges or damage Remove the dust and dirt with a vacuum cleaner and clean, dry cloths
3	Auxiliary contacts	5 years	Make sure that operation and the signals are correct
4	Auxiliary circuit conductors	5 years	Check whether any of the wiring fasteners is slack or broken and make sure that the connections are well tightened
5	Interlocks	5 years	Make sure that the devices function correctly (sect. 5.4 - 6.0)
6	Measurement of the insulation resistance	5 years	See sect. 10 (table)
7	Operating mechanism	3 years	Check that the operating mechanism is clean

12. Quality of the products and environmental protection

UniSec DY800 cubicles are manufactured in accordance with the requirements established by the international standards governing quality and environmental management systems.
The level of excellence achieved in these fields is testified by ISO 9001 and ISO 14001 certificates, which are available when required.

12.1 End of life of the products

ABB undertakes to comply with the environmental protection requirements and laws, as laid down by Standard ISO 14001.
ABB offers its skills and assistance to facilitate product recycling and disposal at the end-of-life stage.
Compliance with the local regulations when disposing of products is always mandatory.

12.2 Disposal methods

The products can be disposed of by means of heat treatments, in incineration systems or by storage in dedicated areas.

Material	Recommended disposal method
Metals (Fe, Cu, Al, Zn, W, other)	Separation and recycling
Thermoplastics	Recycling or disposal
Epoxy resin	Separation of metal parts, disposal of resin parts
Rubber	Disposal
Dielectric oil (transformer oil)	Recovery, recycling or disposal
Wood for packaging	Recycling or disposal
Aluminium foil for packaging	Recycling or disposal

13. SF_6 gas

SF_6 gas has the following characteristics:

- non-flammable
- non toxic
- If the overpressure valve fails due to events involving high arc-energy levels, persons must not enter the area before it has been subjected to intensive ventilation
- A suitable filter (class FFP3) is required for filtering the nanoparticles during the cleaning and disassembly operations following failure of the overpressure valve due to high arc-energy levels

Notes

For more information please contact:

More product information:
abb.com/mediumvoltage
Your contact center:
abb.com/contactcenters
More service information:
abb.com/service

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