



FLUOKIT M24

Installation - Commissioning
Operation - Maintenance

ALSTOM

ALSTOM at your service

Operation and maintenance operations have to be carried out by staff with the appropriate qualification in the operations and work involved. If

this is not the case in your company, check with our After-Sales Service or our training centre, DAFEP. Any lockout operation must be carried out

in accordance with the "General procedures for electrical safety" UTE C 18 510 (or its equivalent outside France).

Our After-Sales Service

places its expertise and thorough knowledge of our products at your disposal. It ensures that your high voltage and current installations are in perfect working order and achieve maximum service life. To meet this aim, it provides the following services:

- Warranty extension contracts on the sale of new equipment.
- Supervision of high voltage and current installations.
- Technical advisories, installation diagnoses, inspections.
- Maintenance contracts adapted to operating constraints.
- Systematical or conditional preventive maintenance.
- Corrective maintenance in part or total failure situations.
- Supply of spare parts.



- Renovation of equipment and requalification of installations in order to benefit from new techniques and extend the service life of your equipment by limited investments.

For these services, consult the ALSTOM Sales Representative in your region.

Diagnoses and information

during business hours:

Tel.: 33 (0)3 85 29 35 00

Fax: 33 (0)3 85 29 36 30

or 33 (0)3 85 29 36 43

Otherwise 7d/w, 24h/d

toll-free no. 0 800 40 27 62

DAFEP: ALSTOM Transmission and Distribution Training Centre

Organises training for the installation, maintenance and repair of all equipment, even the oldest. The full-scale practical work represents more than 50% of the training time. Scheduled training sessions are provided each year at the Mâcon centre. If asked, specific training can be organized in your premises. To obtain the catalogue of training programmes, to define a specific programme or register for a course, contact us at:



ALSTOM - DAFEP - 130, Rue Léon Blum - BP 1321 - 69611 Villeurbanne Cédex
Tél. : 33 (0) 4 72 68 33 86 or 33 (0) 4 72 68 33 85 Fax : 33 (0) 4 72 68 35 17

About these operating instructions

General remarks

Other Technical Operating Instructions to consult

- NT 018 AMT C10 Operating mechanism, C10M Electrical operating mechanism, Operation - Maintenance
- NT 019 AMT C12 Operating mechanism, Maintenance .
- NT 021 AMT C40 Operating mechanism, C40M Electrical operating mechanism, Operation - Maintenance

Reminder of the different levels of maintenance

Level 1 and 2 of NFX 60 010

Only operations recommended in the maintenance instructions, can be carried out by the customer.

Level 3 of NFX 60 010

Operations requiring a procedure with training recognised by ALSTOM

Level 4 and 5 of NFX 60 010

Renovation or large maintenance operations carried out exclusively by ALSTOM

Tools and lubricants required for the maintenance

- Open-ended spanners size 10 – 13 – 16 – 18 – 19 mm
- Ratchet handle socket spanner + extension with sockets of 10 – 13 – 16 – 18 mm
- Torque wrench with socket sizes 10 – 13 – 18 mm
- Flat blade screwdriver
- 3 mm magnetic screwdriver for hexagonal socket screws
- Clean dry cloth- Leather gloves
- Solvent (excluding chlorinated solvents)- Mobilgrease 28 Red grease by Mobil- Electrolube 2 GX grease by Comindus

Convention



ADVICE to make the installation or operation easier



ELECTRICAL DANGER: precautions to take to avoid electrical accidents



WARNING, failure to follow these instructions could result in equipment damage



MECHANICAL DANGER: precautions to take to avoid injury



WE DRAW YOUR ATTENTION to a particular point about the installation or the operation

Appendix A – M24 Fluokit Disposal Procedures

Fluokit Indoor Ring Main Units contain Sulphur Hexafluoride (SF₆) gas as an insulating medium which is contained inside hermetically sealed resin switchgear. SF₆ is a non-flamable, odourless, colourless and chemically inert gas with very low toxicity.

No maintenance is required on these sealed units, however in the event of a catastrophic failure resulting in SF₆ gas escape, the following should be noted:-

The gas is heavier than air and can collect in low areas such as cable trenches and thus provides a potential hazard of asphyxiation. SF₆ can be contaminated by electrical discharges such as arc faults and precautions should be taken if handling such contaminated SF₆ gas. Normal protective measures such as overalls and rubber gloves are considered adequate.

Fluokit Ring Main Units also contain other electrical insulating materials such as Cast Resins and PVC and in the event of fire, inert gas and dry powder extinguishing mediums can be used.

Normal precautions should be taken to avoid the hazards associated with the products of combustion of such materials.

Cast resin and other components should be disposed of in accordance with relevant local authority regulations.

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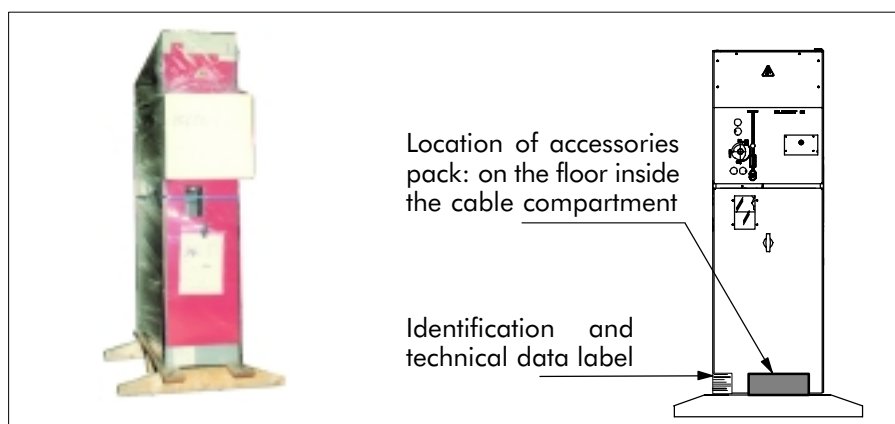
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1 Installation

1.1 State on delivery



- State of functional units on delivery: stretch wrapped under plastic film, with the storage and handling instructions on the front panel.

 The functional unit must remain on its baseplate until it reaches the installation site.

- State of switchgear on delivery:
 - Load-break switch "open".
 - Earthing switch "closed".
 - Main isolator "open".

1.2 Reception

On reception, ensure that the equipment is complete. Carry out a visual examination of the functional units and the moving parts. Check the contents of the accessories pack with the aid of the attached list.

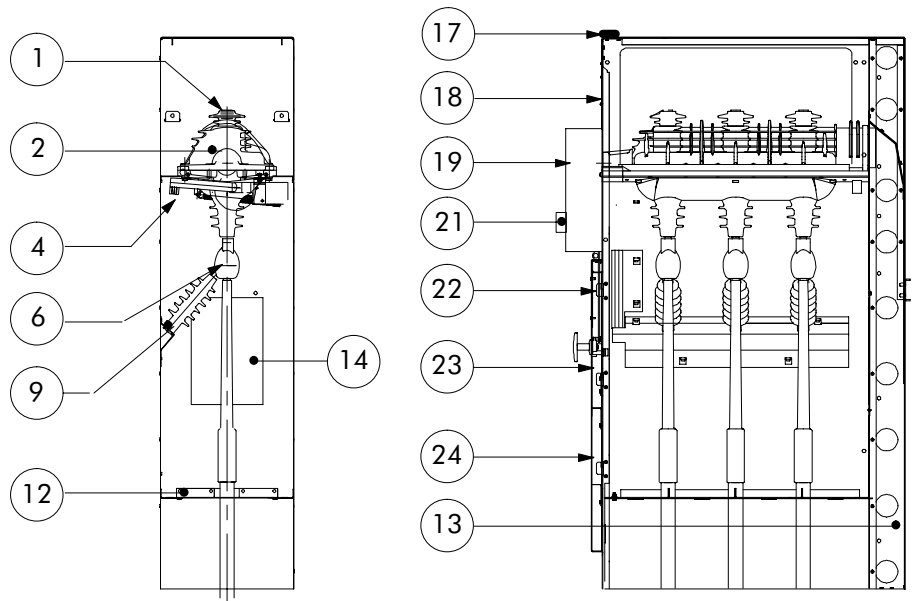
 If any **anomalies** are perceived, make the necessary **reservations** with the forwarder.

1.3 Presentation of the basic functional units

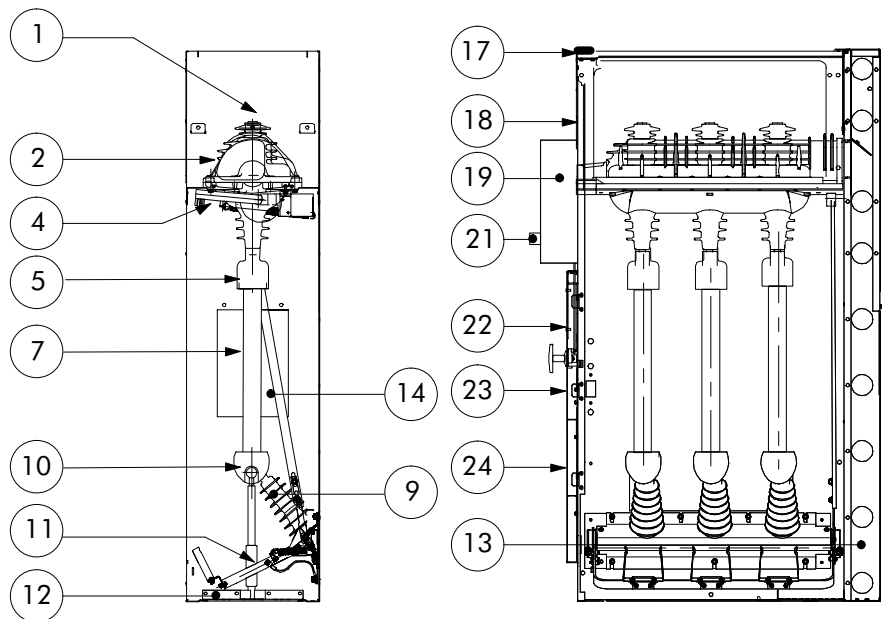
Légend

- 1 Busbars connection plate
- 2 Load-break switch ISR
- 3 Main isolator SR
- 4 Earthing switch on supply side (open position)
- 5 Fuse holder upper shell
- 6 Cable connection shell
- 7 HV fuse
- 8 ORTHOFLUOR FP (SF6) Circuit-breaker
- 9 VIGIA capacitive voltage divider
- 10 Fuse holder lower shell
- 11 Earthing switch on load side of fuses open position PF/PFA
- 12 Bottom plate made of 4 elements
- 13 Evacuation duct
- 14 Overpressure valve
- 15 Current transformers
- 16 Voltage transformers (TM)
- 17 Unit earthing bar
- 18 Busbars access panel
- 19 Load break switch ISR control
- 20 Main isolator SR control
- 21 Voltage presence indicator lamps
- 22 Position check window for earthing switch or main isolator
- 23 Test pin for installing the earthing block
- 24 Access panel to HV cable compartment (IS – PF – PFA), or to fuse and voltage transformers compartment (TM), or to circuit breaker and current transformer compartment (PGB)
- 25 Circuit-breaker control

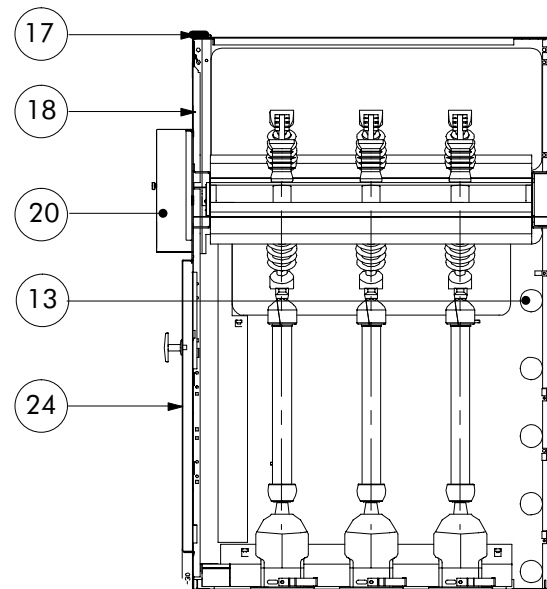
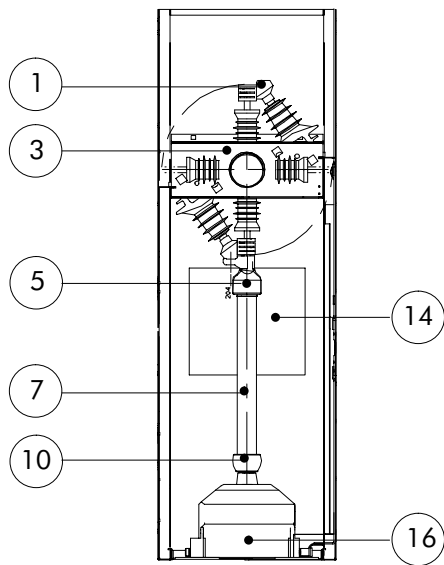
IS Functional unit (Switch disconnecter)



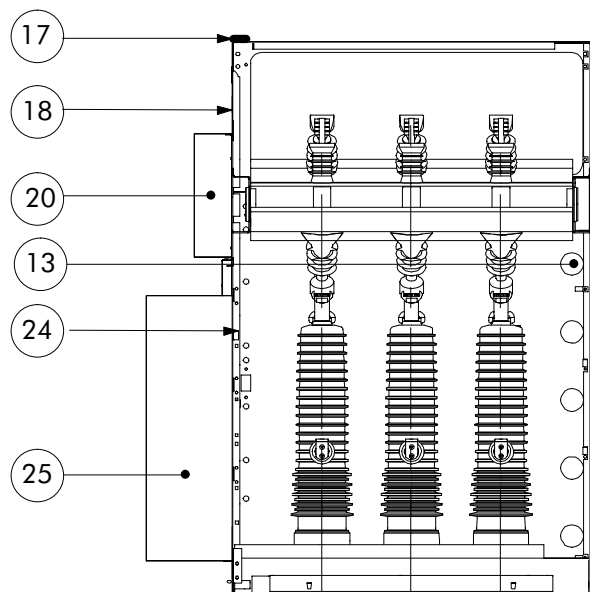
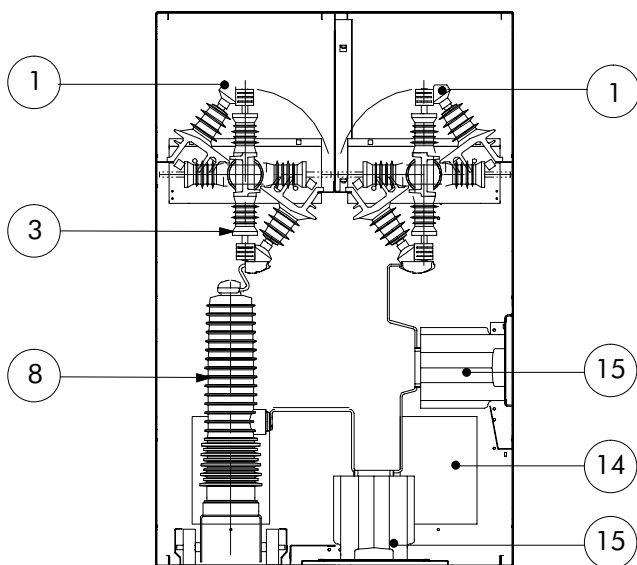
PF – PFA Functional unit (Fuse protection – Fuse Combination Unit)



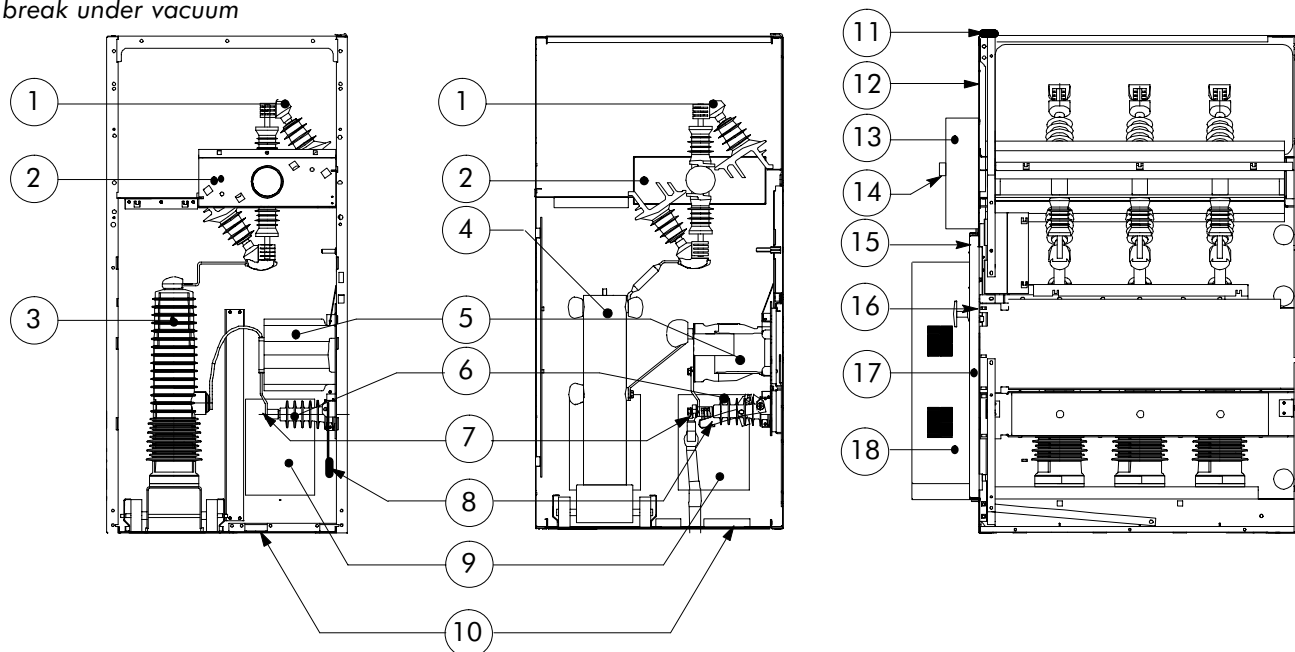
TM Functional Unit (Instrument Transformer)



PGB Functional Unit (Busbars overall protection)



PGC Functional Unit (Cables overall protection) with ORTHOFLUOR FP Circuit-breaker with load break under SF₆ gas or with VBL Circuit-breaker with load break under vacuum



Légend

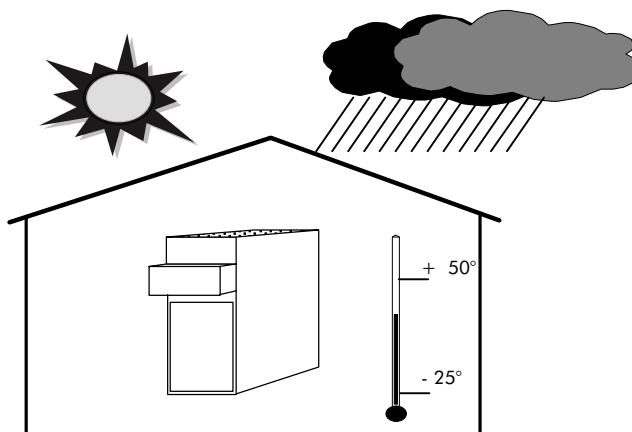
- 1 Busbars connecting plate
- 2 Main isolator SR
- 3 ORTHOFLUOR FP Circuit-breaker with load break under SF₆ gas
- 4 VBL Circuit-breaker with load break under vacuum
- 5 Current transformer
- 6 Capacitive voltage divider
- 7 Cables connection plate
- 8 Earthing switch
- 9 Overpressure valve
- 10 Cable fastening plate
- 11 Unit earthing bar
- 12 Busbars access panel
- 13 Main isolator control
- 14 Voltage presence indicator lamps
- 15 Position check window for main isolator
- 16 Test pin for installing the earthing block
- 17 Cable compartment access panel
- 18 Circuit-breaker control: BLR/M for ORTHOFLUOR FP Circuit-breaker, CRR1 or CRR 1000 for VBL Circuit-breaker.

1.4 Storage

The functional unit should be stored in a dry, ventilated place, sheltered from agents likely to cause deterioration such as:

- water
- water vapour
- salt water
- pollution of any type
- micro-organisms (NFC 13-101)

Consult ALSTOM for any derogation to these criteria.

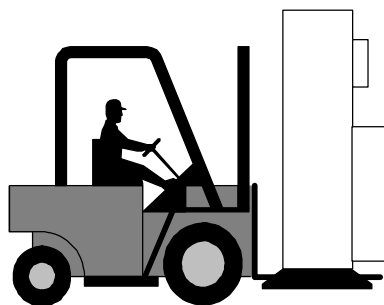


1.5 Handling

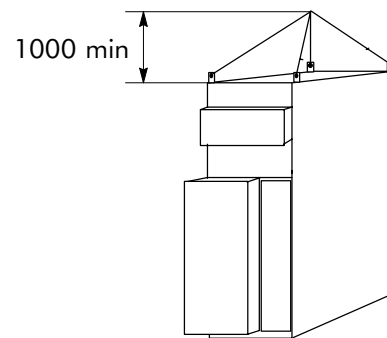
Unloading requires appropriate lifting equipment.

Approximate weight of the packaged functional units

IS depth 1100mm	: 140 kg
IS depth 850 mm	: 120 kg
PF depth 850 mm	: 170 kg
PF depth 1100mm	: 200 kg
TM	: 200 kg
PGB	: 450 kg
PGB with 2 LV boxes	: 490 kg
PGC	: 450 kg
PGC with 1 LV box	: 470 kg



Fork-lift truck



Slings

1.6 Installing the functional units

Parts required: see accessories pack

Tools required:

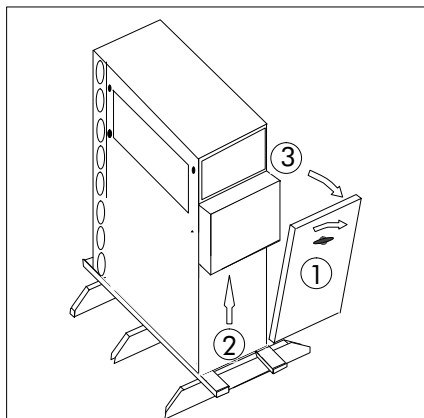
- 10, 13, 16, 18, 19 mm spanners
- 8 mm Allen key
- Flat faced screwdriver

Installation time: 0.30 h per functional unit

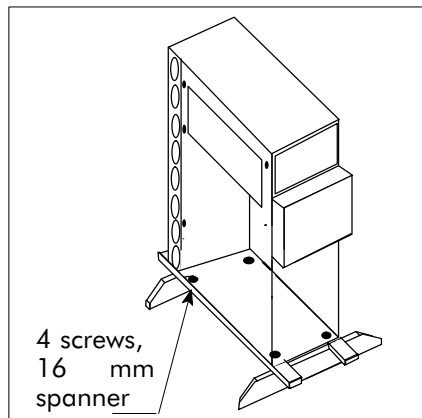


The premises should have a level floor to allow for easy assembly and correct presentation of all the functional units. The maximum permissible variation in the floor is 2 mm/m.

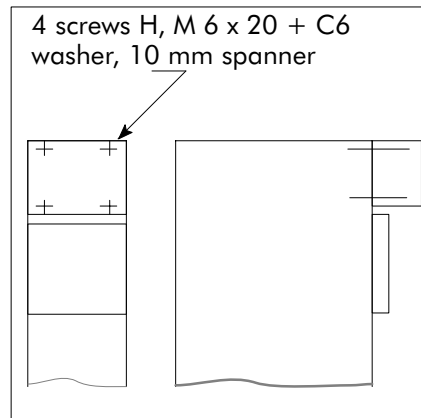
For detailed layout of the functional units refer to the civil engineering guide supplied within the scope of the contract.



- Remove the plastic protective cover then open the front panel:
1 – Turn the handle
2 – Lift the panel
3 – Remove it

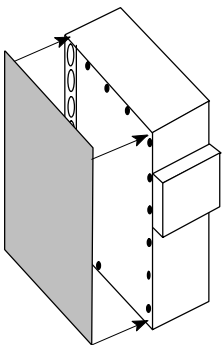


- Remove the 4 screws (16 mm spanner)
- Release the functional unit from the baseplate and place it on the floor.

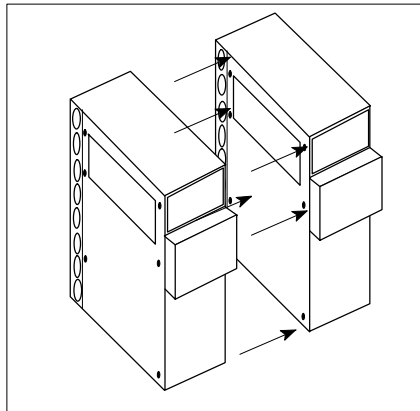


- If the functional unit is supplied with a low voltage cabinet on the front panel, it would perhaps, may be necessary to remove it so as to connect the functional units together, assemble the busbars and fix the far end side panels.

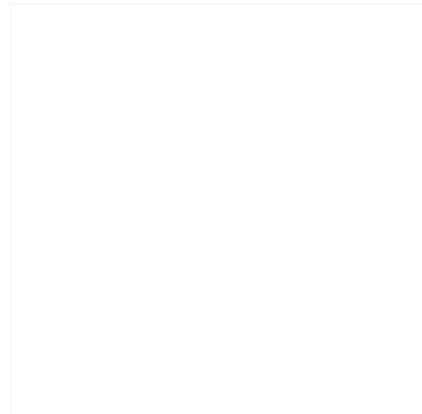
Depth 850 mm, 8 bolts and 6 screws in captive nuts.
Depth 1100 mm, 10 bolts and 6 screws in captive nuts



- On the far end side functional units, fix the end side panels.



- Place the first functional unit in position.
- Place the second functional unit next to it.



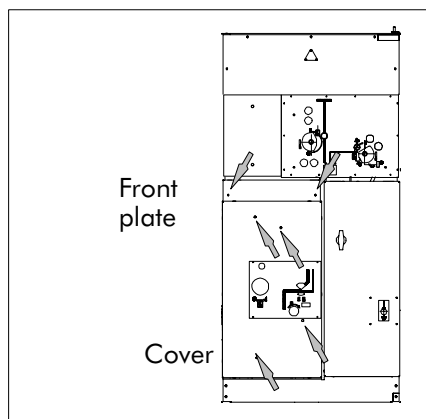
- Check the vertical straightness, wedge if necessary.
- Join them together (6 bolts, 13 mm spanner).

Case of PGB, PGC (SF6 Orthofluor FP circuit-breaker and VBL vacuum load break circuit-breaker functional units)

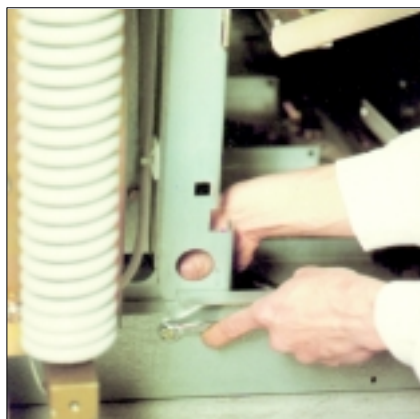


When dismantling, carefully mark the nuts and bolts corresponding to each part.

In order to carry out the installation of these functional units, disconnect and remove the circuit-breaker from its compartment as described below:



- Remove the protection cover and the front panel (6 "poelier" type screws).



- Remove the middle crossbeam retaining nut (10 mm spanner).



- Undo the middle crossbeam lower nut (10 mm spanner).



- Remove the operating mechanism cover (3 "poelier" type screws).



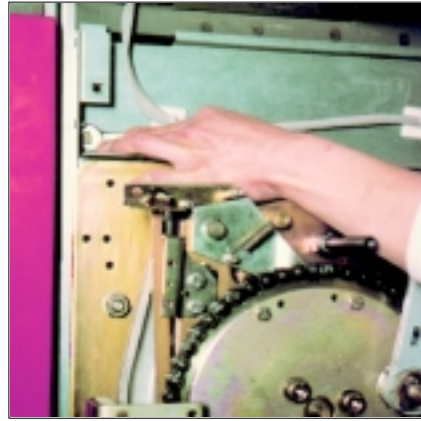
- Remove the 2 upper attaching nuts from the central crossbeam (10 mm spanner).



- Remove the lower crossbeam (4 screws, 10 mm spanner).



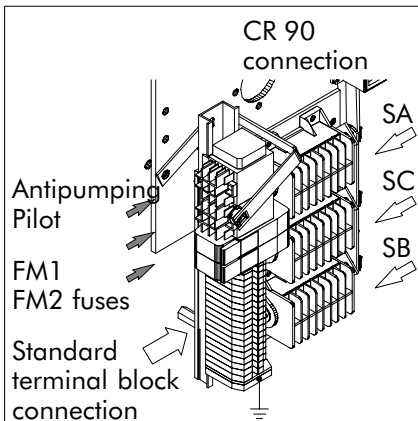
- Remove the central crossbeam inside nut (10 mm spanner).



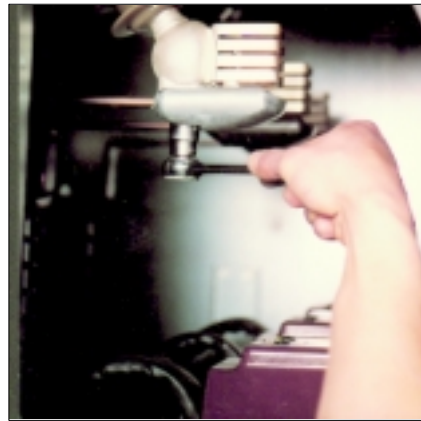
- Remove the circuit-breaker attaching nut (10 mm spanner).



- Disconnect the circuit-breaker earthing braid (13 mm spanner).



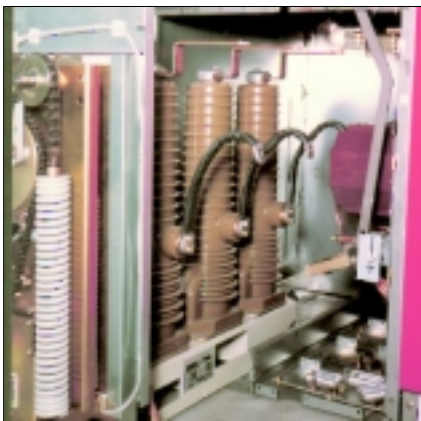
- Disconnect the wiring from the control mechanism's terminal block.



- Disconnect the 3 connection cables on the upper power supply sockets of the line disconnector (16 mm spanner).



- Disconnect the 3 connection cables on the current transformers (16 mm spanner).

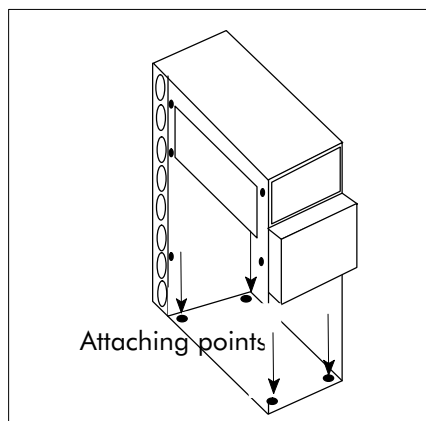


- Remove the circuit-breaker together with its connection cables.

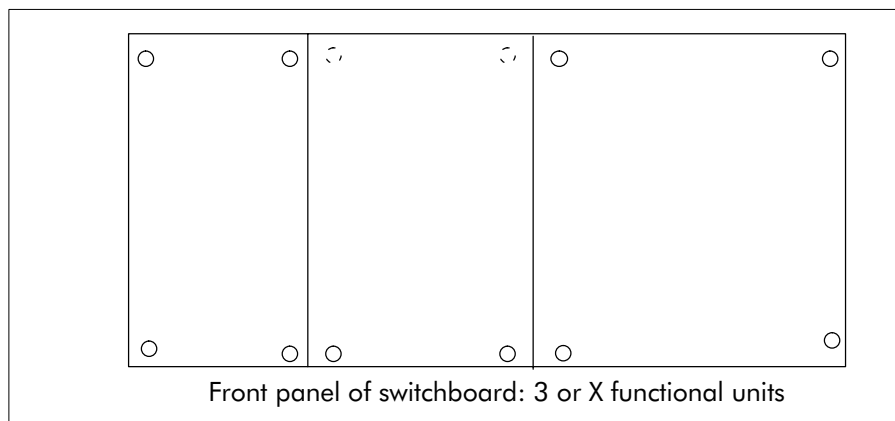
- Position the functional unit. Attach it to the floor. Re-install the circuit-breaker inside and connect it. Tightening torque for:
 - The line disconnector's connection cables on the upper socket side and the current transformers: 2daN.m.
 - The earthing braid: 1.5 daN.m.

- Reassemble the remaining components by reversing the preceding dismantling instructions.

1.7 Attaching the functional units to the floor

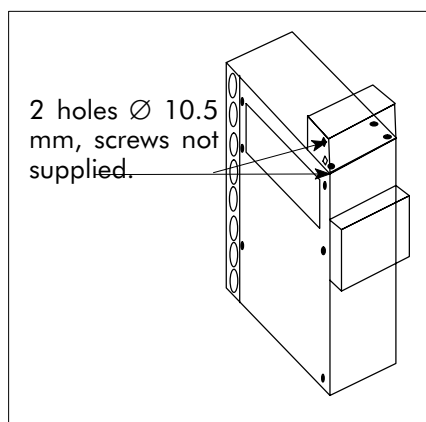


- Attachment with 4 H, M12 screws, 18 mm spanner, not supplied.

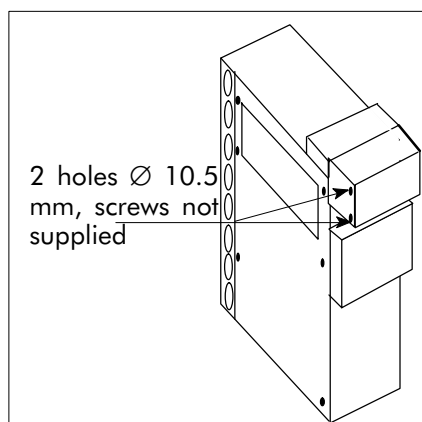


- We recommend that the functional units be attached by their 4 attaching points. It is acceptable, where there are no special demands (seismic withstand, vibrations) to only fix one functional unit out of every 2 on the rear side. The far end panel functional units must **imperatively be fixed by their 4 attaching points**

1.8 Coupling the low voltage box either on the roof or on the front panel



- On the roof

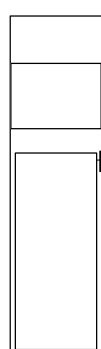
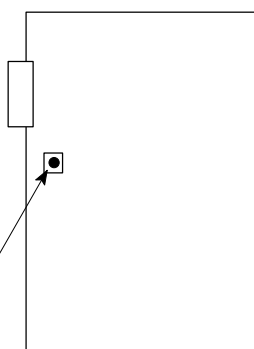


- To the front panel

1.9 Earthing the switchboard (only on the right side)

 Before fitting the earthing braid, remove the plastic blanking cap.

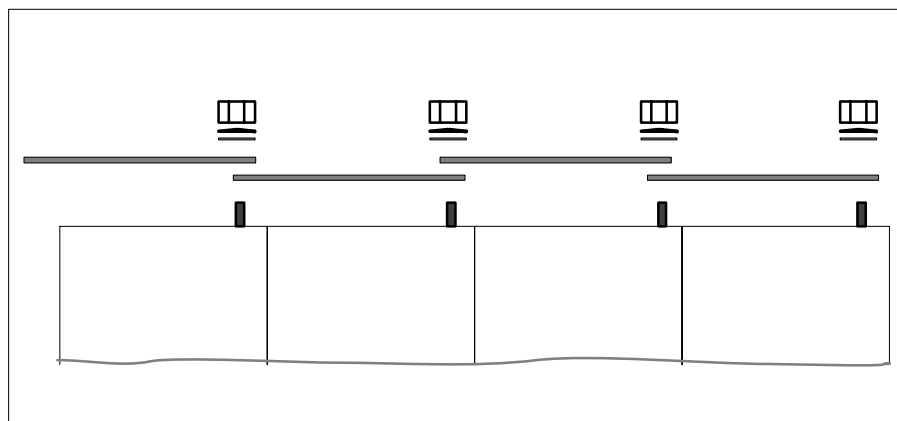
- Connect to the installation earth electrode via a copper conductor with a minimum cross-section of 25 mm², 18 mm spanner, tightening torque 4.9 daN.m (nuts and bolts not provided).
Plastic blanking cap to be removed



H, M 12 x 20 screws, flat washer, extra-locking washer, H, M 12 nut.

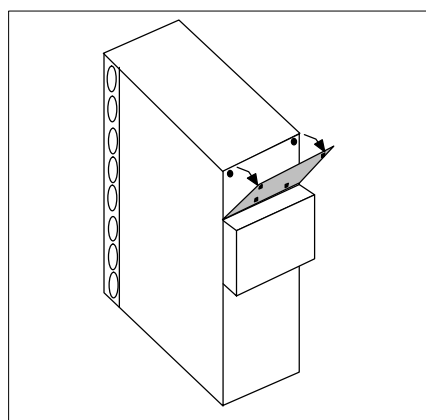
Minimum cross-section: 25 mm²

1.10 Connection of the switchboard earth bar

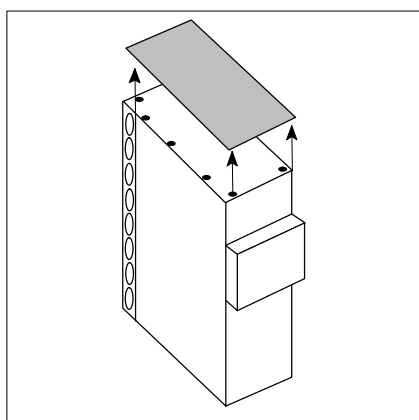


- Position the bars of the earth bar on the roof of the functional units with M8 washers, ES 8 washers, H, M8 nut, 13 mm spanner, tightening torque of 1.5 daN.m.

1.11 Access to the busbar compartment



- From the front
(4 screws, 10 mm spanner).



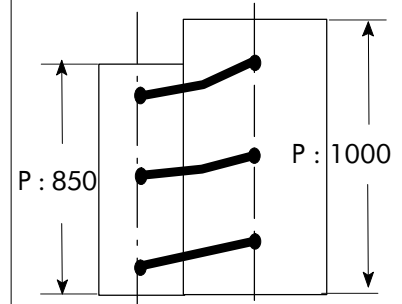
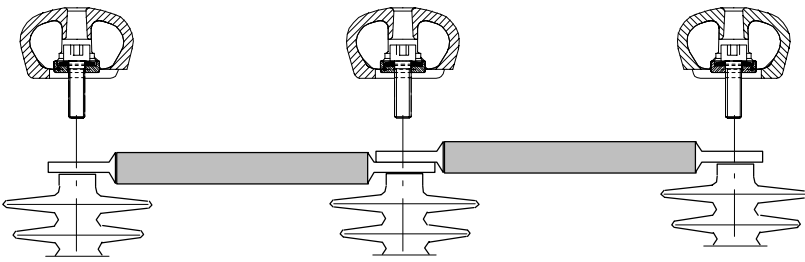
- From the roof:
 - depth 850 mm
(10 bolts, 13 mm spanner)
 - depth 1100 mm
(12 bolts, 13 mm spanner).

1.12 Connecting the busbars

No preparation of the contact surfaces is necessary. Simply remove all dust where required. If the busbars are stored for a long period, make sure that there were no traces of oxidation or shocks. Brush contact surfaces lightly, under a coating of vaseline, using a wire brush, if there is any oxidation on them.

Standard Positioning

Use of deflector with CHC, M 10 x 35 captive screw, 8 mm Allen key, tightening torque: 2 daN.m.

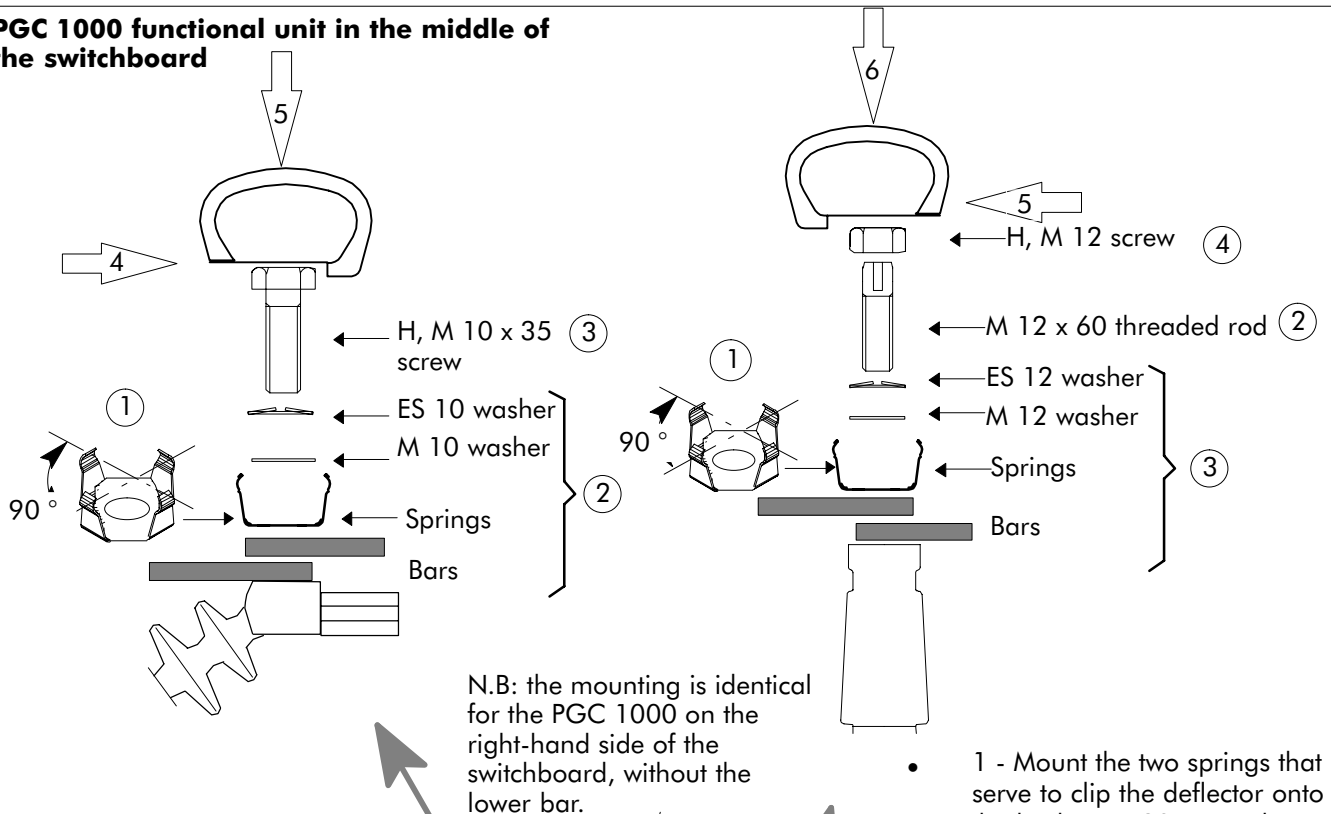


- Standard positioning of the socket outlets

- Busbars layout between a 850 mm deep functional unit and another one 1100 mm deep (PGB or PGC).

Other Positionings

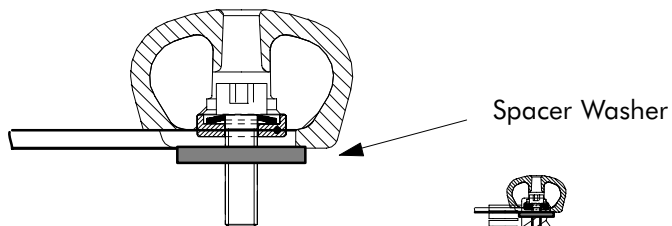
PGC 1000 functional unit in the middle of the switchboard



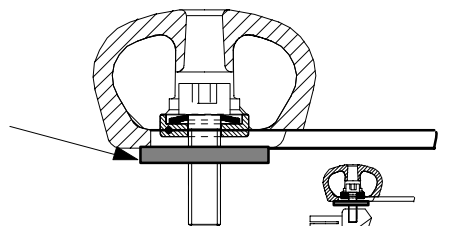
- 1 – Mount the two springs that serve to clip the deflector onto the busbar, at 90° to each other.
- 2 – Fit the bars, M 10 washer, ES 10 washer, H, M 10 x 35 screw.
- 3 – Tighten the H, M 10 x 35 screw, with a 16 mm spanner, tightening torque of 2 daN.m.
- 4 – Line up the deflector's indentation.
- 5 – Clip it in position.

- 1 - Mount the two springs that serve to clip the deflector onto the busbar, at 90° to each other.
- 2 - Screw the M 12 x 60 threaded rod onto the insulator.
- 3 – Fit the bars, M 12 washer, ES 12 washer and the H, M 12 screw.
- 4 – Tighten the H, M 12 screw, 16 mm spanner, tightening torque 3.1 daN.m.
- 5 – Line up the deflector's indentation.
- 6 – Clip it in position.

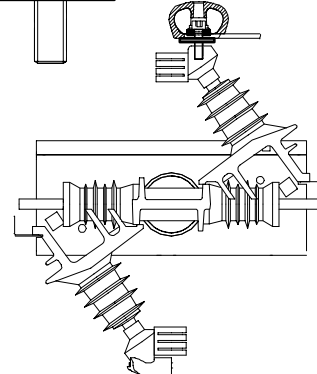
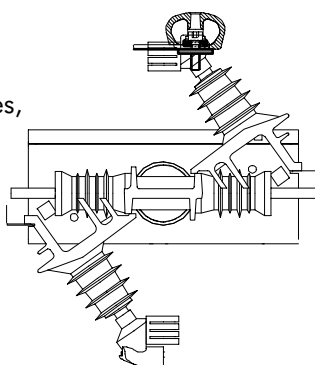
PGC 750, and TM functional units on the right-hand end of the switchboard



PGC 1000 functional units on the left-hand end of the switchboard



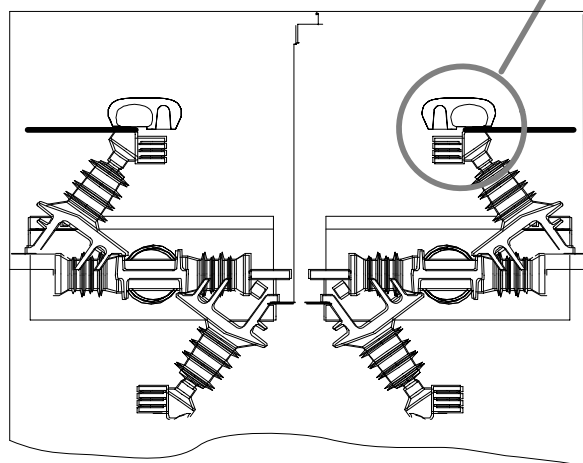
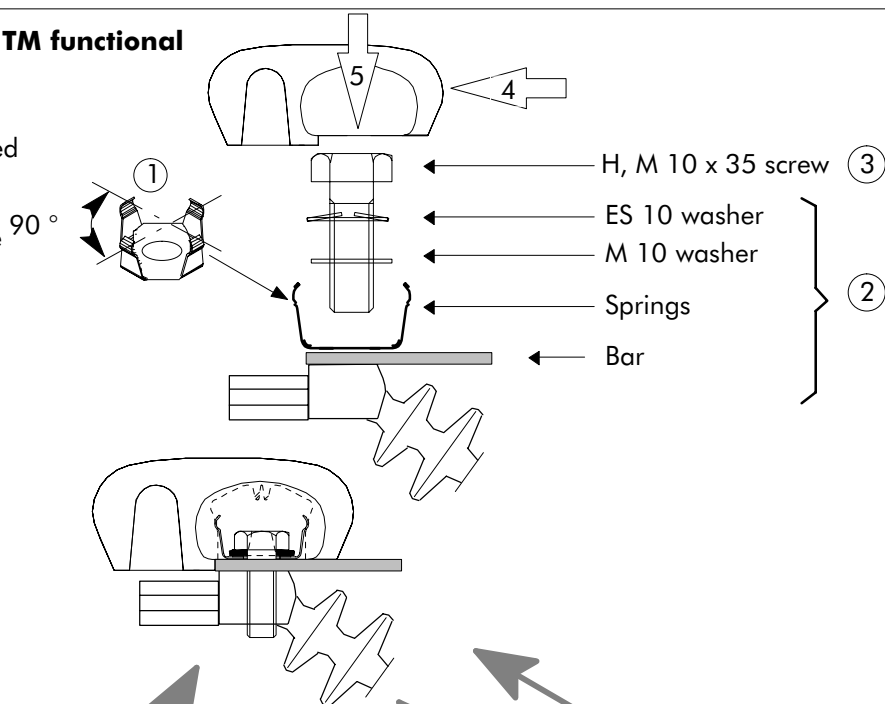
- For both of these assemblies, use the standard mounting deflector and fit the spacer washer supplied in the accessories pack under the bar.



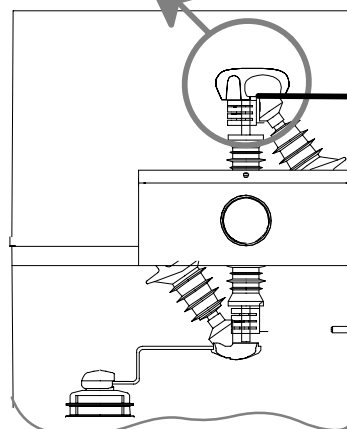
PGB, 750 mm wide PGC and TM functional units, on left-hand end

Use the oblong deflector supplied with the accessories pack

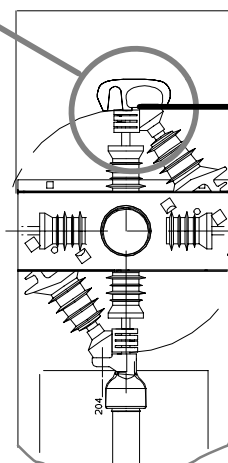
- 1 – Fit the springs, which serve to clip the deflector onto the busbar, at 90° to each other.
- 2 – Fit the bar, M 10 washer, ES 10 washer, H, M 10 x 35 screw.
- 3 – Tighten the H, M 10 x 35 screw, 16 mm spanner, tightening torque: 2 daN.m
- 4 - Line up the deflector's indentation.
- 5 – Clip it in position.



PGB



750 mm wide PGC on left-hand end



TM on left-hand end

1.13 Connecting the HV cables

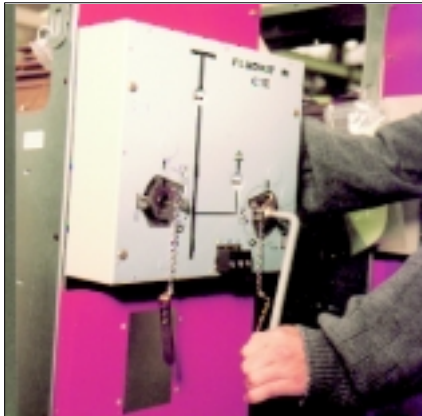


Leave 40 mm free on the lug barrel to fit the earth clamp and make sure that the contact is properly orientated. We recommend the use of skirted terminals (type EUIC).



Do not affix the cable phase markings on reassembly: there is a risk of **deteriorating the dielectric withstand strength** over the course of time.

IS functional unit



- Switch off the earthing switch.



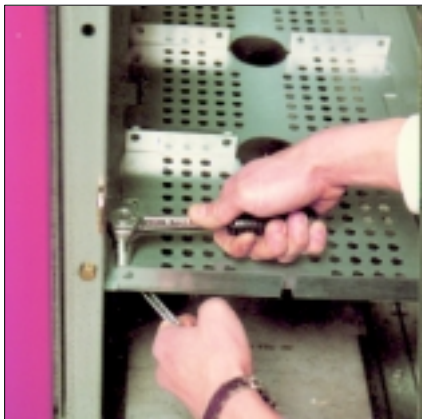
- Once the earthing switch is switched off, open the front panel.



- Remove the lower front crossbeam (4 nuts, 13 mm spanner).



The disk in the front crossbeam is used for inserting the sheath for HN33S23 cable earthing collector.



- Remove the 2 retaining nuts of the 1st deck element (10 mm spanner).



- Extract the first 3 deck elements.

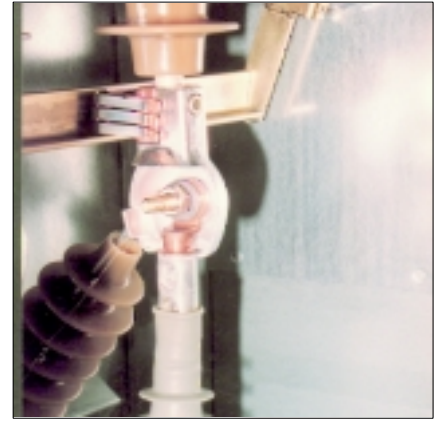


- Cut the cable grommet.

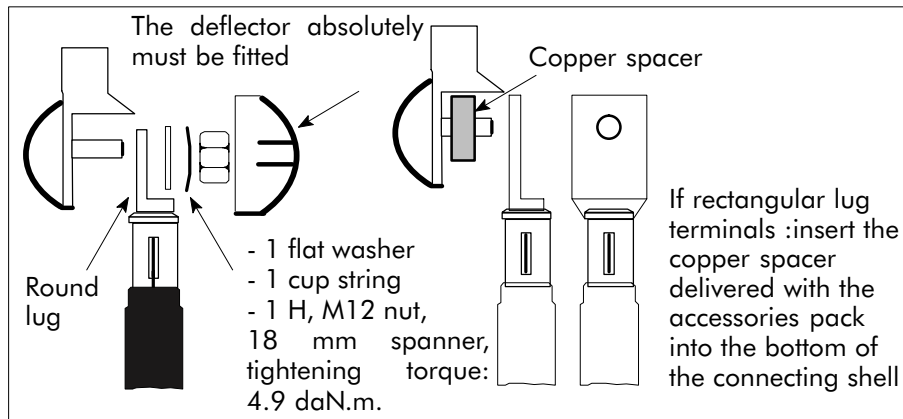


- Fit it onto the cable.

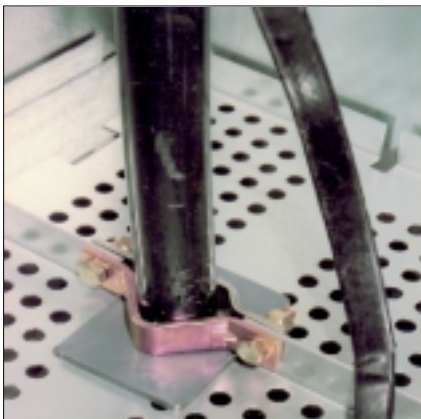
- Prepare the cable end (not within the scope of ALSTOM supply) according to the manufacturer's instruction manual.



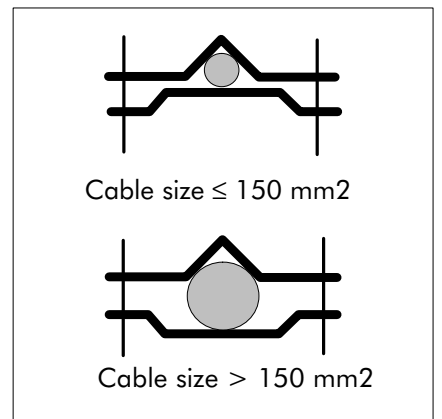
- Fit the first cable by hanging the cable lug terminal onto the connecting shell.



- Snap-on the deflector to the connection shell.



- Fit the second deck element earthing braid above the plate.
- Press-in the grommet on the two deck elements.
- Adjust the cable clamps and secure the nuts taking care not to apply excessive tightening torque (13 mm spanner).
- Repeat the procedure for the two other cables following the same principle.
- Refit the lower front crossbeam.

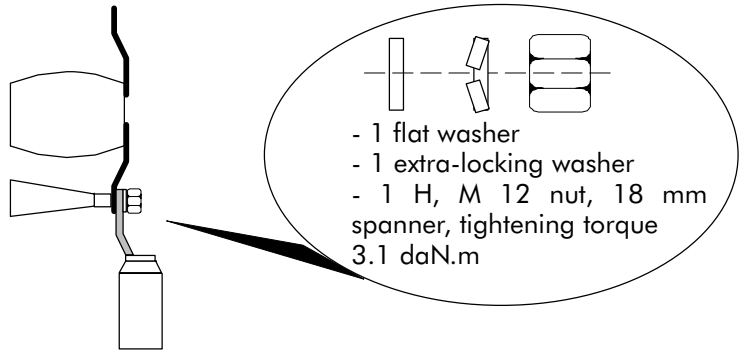
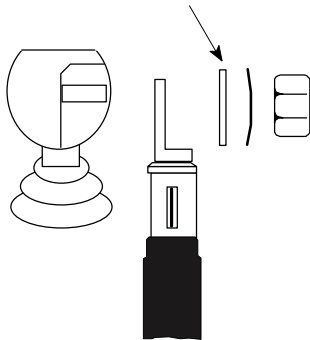


- Position of the clamps in relation to the cable size.

 No stress must be exerted on the cable.

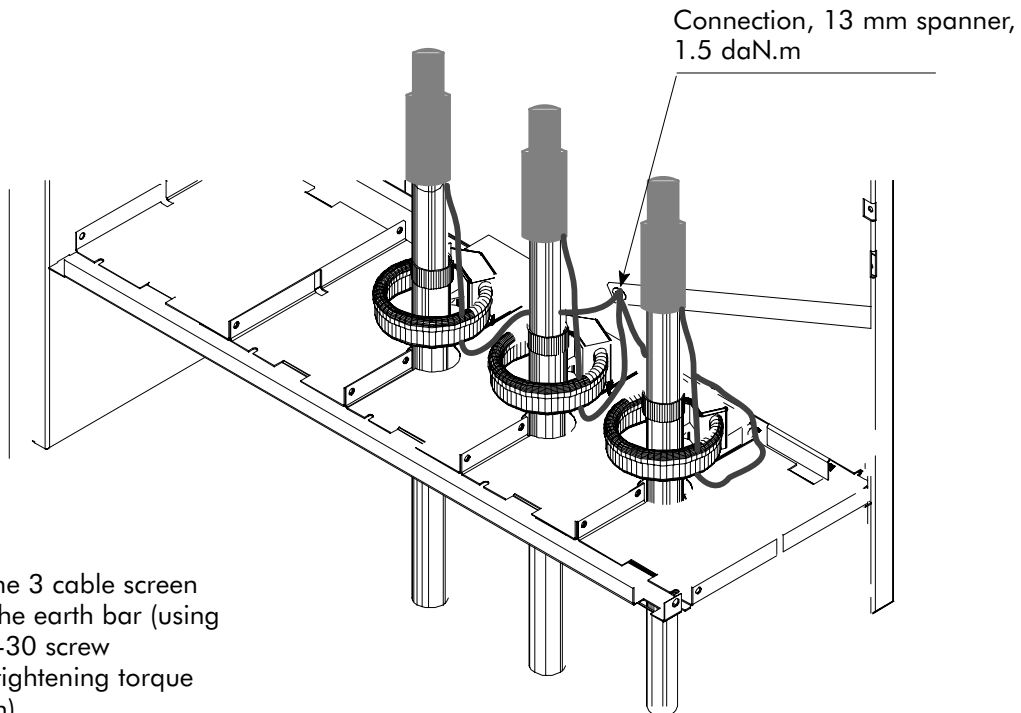
PF, PFA, PGC functional units

- 1 flat washer
- 1 cup string
- 1 H, M 8 nut, 13 mm spanner, tightening torque: 1.5 daN.m



- The same process applies to the PF and PFA functional units as for the IS functional units.
- IS or PGC functional units supplied with current transformers for energy measurement: same process as for IS, PF, PFA functional units.

Earthing the cable screen braids



- Connect the 3 cable screen braids to the earth bar (using the H, M8-30 screw supplied: tightening torque 1.5 daN.m).



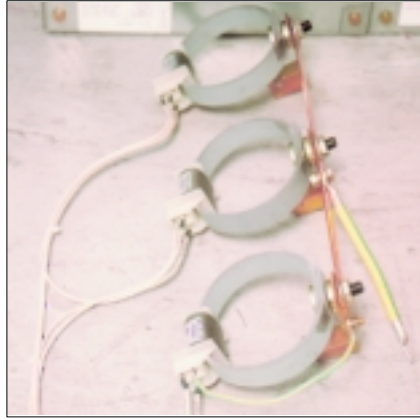
The cable **screen braids** absolutely must pass **through the cores** before being **connected** to the earthing collector.

Fitting the sensors for fault-detection devices

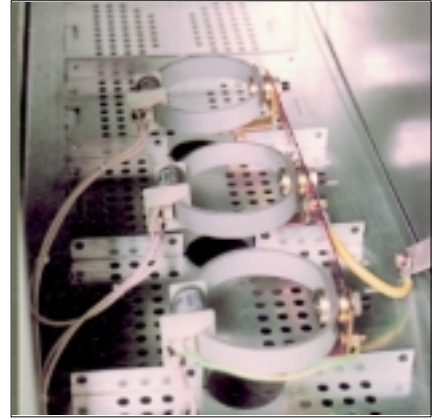
The matching and operation of these devices must comply with the directives given in the Standards HN 45M50 and HN 45 S50.



- Delivery state of the reed core type sensors.



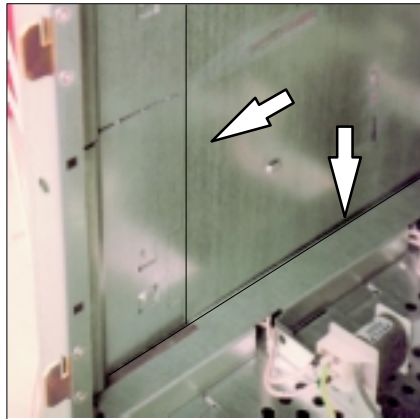
- Fit and wire them according to the manufacturer's instruction manual attached.



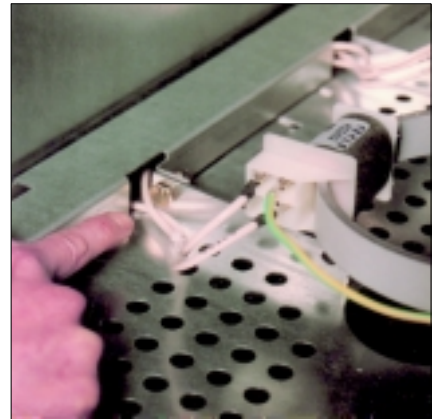
- Position the assembly inside the functional unit.



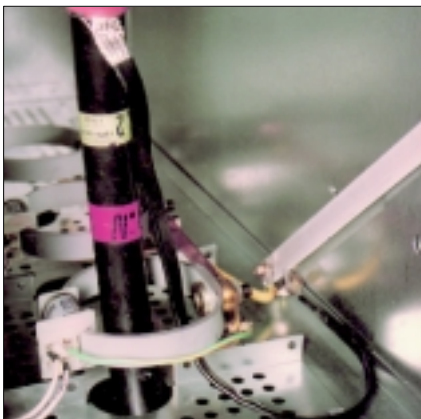
- Route the wires along the partition up to the roof, for connection to the terminal strip.



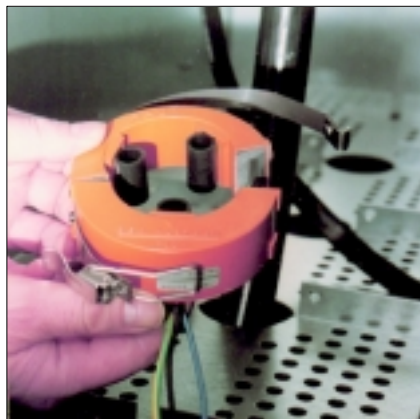
- Fit the lower and side trunking.



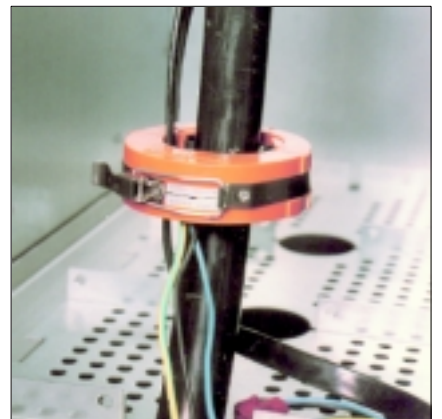
- Attach the lower trunking to the bottom plate 3 H, M 8 x 16 screws (13 mm spanner).



- Pass the cable through the core.



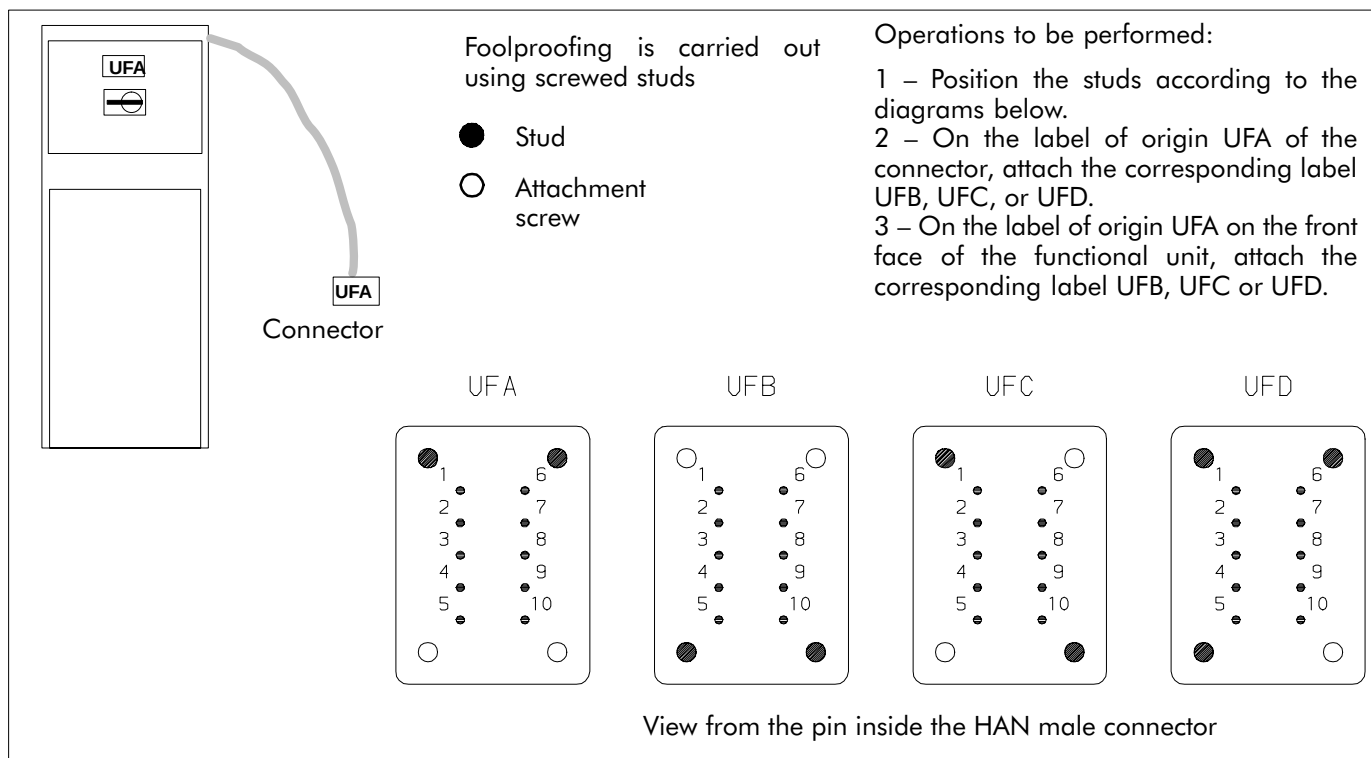
- "Opening" cores: open the core.



- Insert it onto the cable and close.

1.14 Low Voltage connections

Cable link for circuit breaker remote-control interface

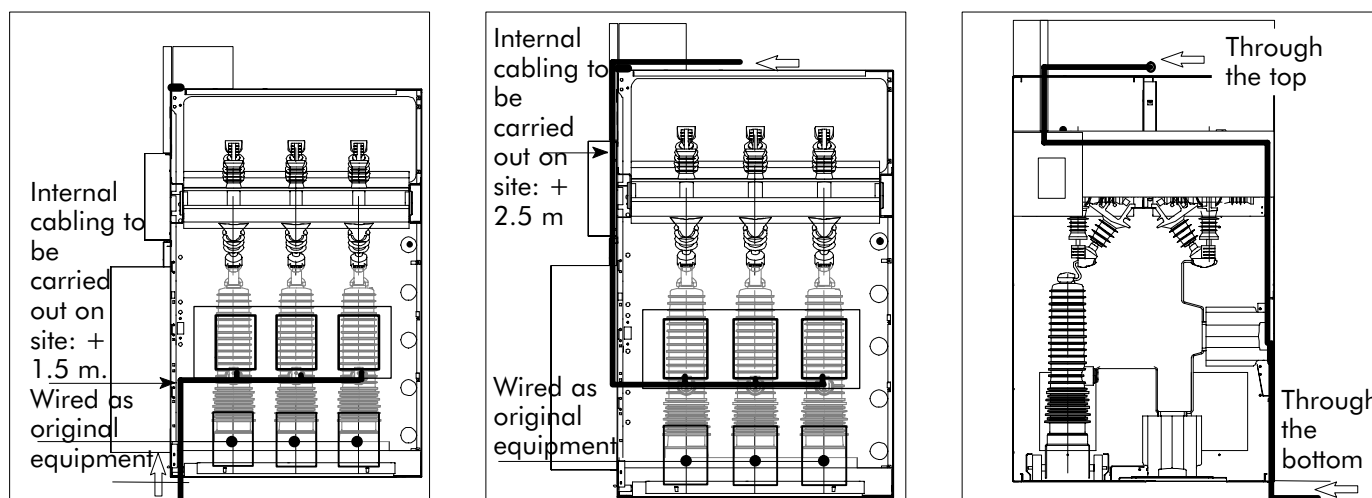


Connecting low voltage wiring on PGB and TM functional units

Lugs to be provided for 6 mm diameter hardware.

Recommended wire diameter:

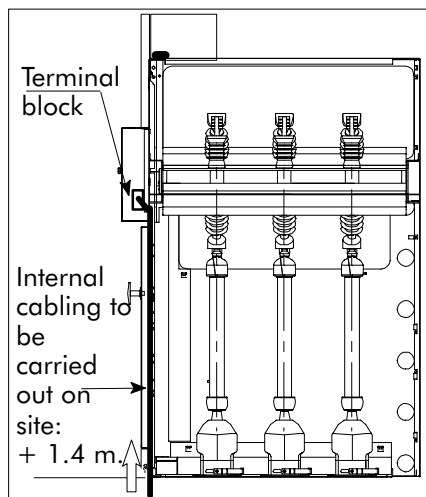
- PGB 2.5 mm² to 6 mm².
- TM, 1.5 mm².



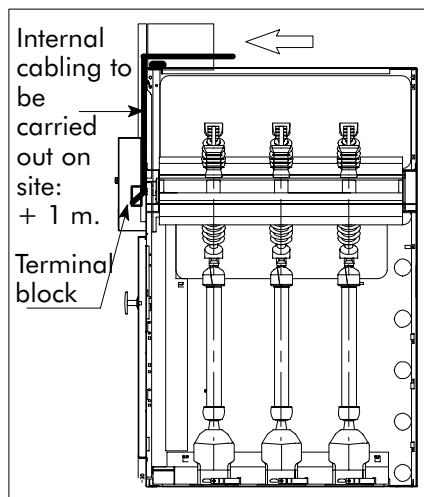
- PGB, profile view: in the case of cable exiting through the bottom of the installation by the cable trough on the right-hand side, allow 1.5 m of additional cable for the internal cabling.

- PGB profile view: cable exits from the top, installation at ground level: allow about 2.5 m of additional cable for the internal cabling.

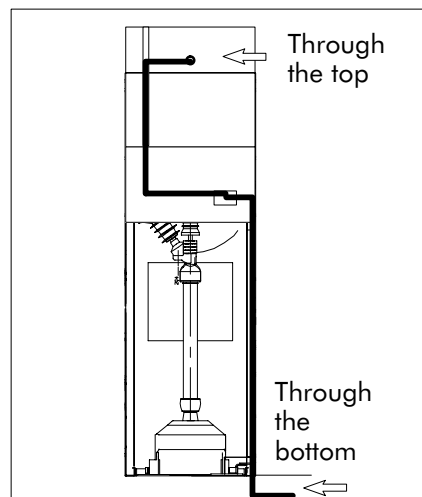
- Front view.



- TM, profile view: cable exits from the bottom through a cable trough on the right, allow 1 m of additional wiring for the internal cabling.



- TM, profile view: cable exits from the bottom through a cable trough on the right, allow 1 m of additional wiring for the internal cabling.



- Front view.

 An end blanking piece for the terminal block cover is supplied mounted to each IS functional unit. It can be removed then refitted to the functional units at the end of the switchboard, according to its layout in the substation.

1.15 Automatic transfer function

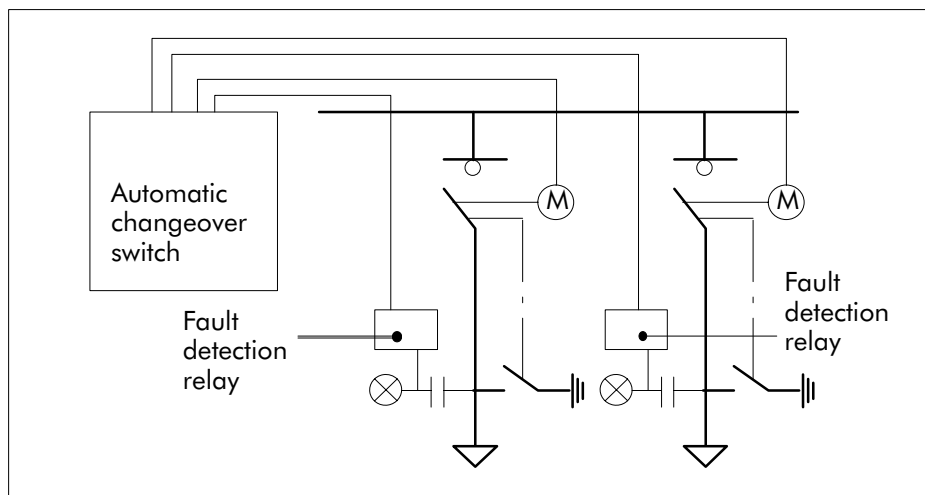
This function allows for the manual or automatic transfer of the load from one source chosen as the normal power supply (cable 1) to another source, thus ensuring emergency back-up (cable 2). The double by-pass function comprises two IS functional units equipped with C10M mechanism, and a voltage detection relay associated with (according to the type of

installation):

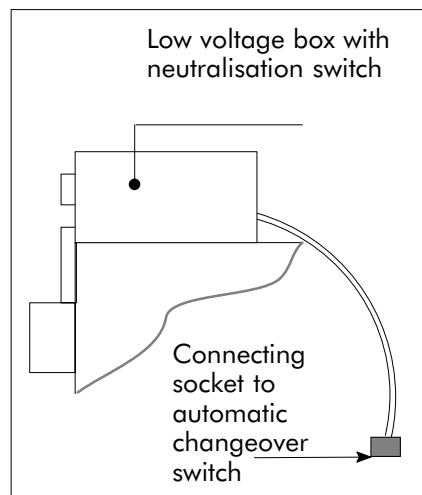
- a double by-pass function without HV fault detection including an automatic changeover switch box, 4 x 12 Volt batteries, 2 cables (5 or 10 metres long) marked as cable A and cable B.
- a double by-pass function with HV fault detection including 1 PASA automatic changeover switch, 4 x 12 Volt batteries, 2 cables (5 or 10

metres long) marked as cable A and cable B , 6 "bar-primary"CT's equipped with connectors, 2 cables (7 or 12 metres long) for the connection of the CT's equipped with connectors.

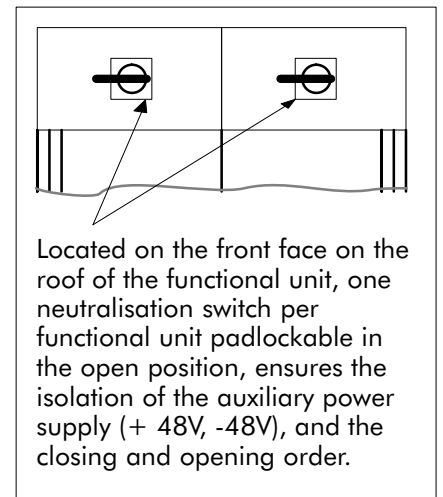
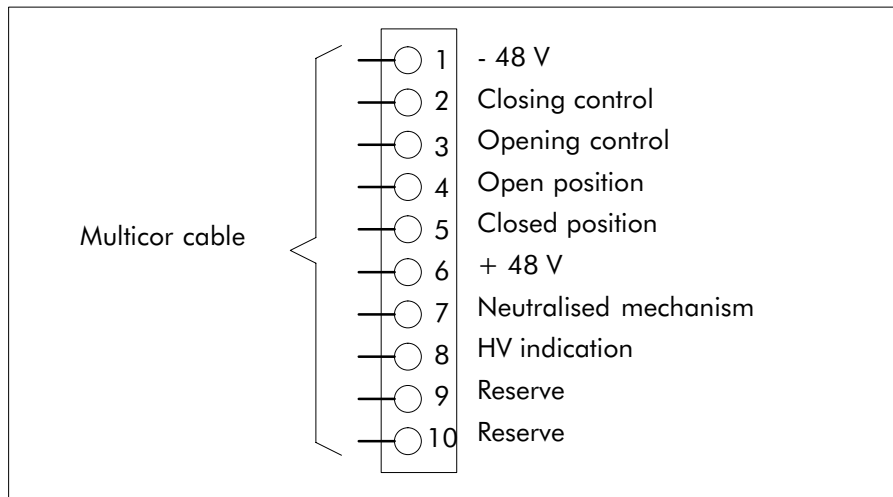
 For the installation of the automatic changeover switch , refer to the "PASA Box" manual, ALSTOM ref. N° 896 A.



- Schematic diagram of the automatic transfer function without fault detection.

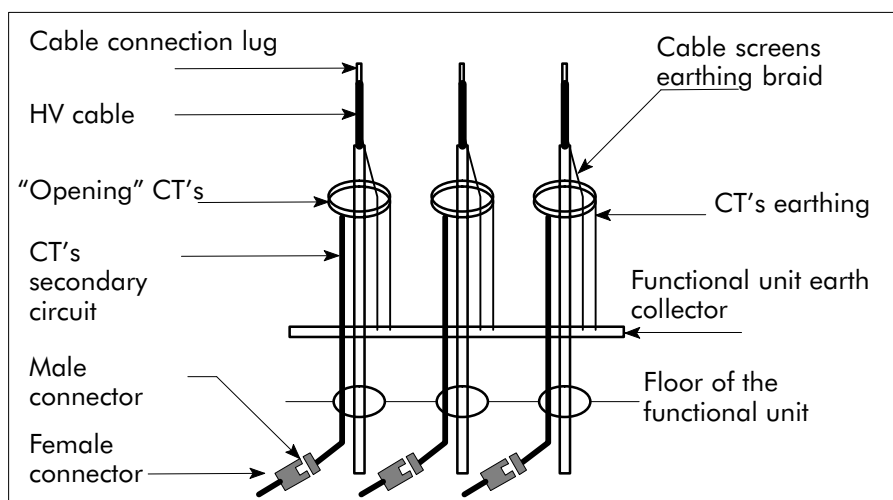


- Connection of the mechanism to the PASA box.



- Diagram of the connection socket with terminal markings.

- Neutralisation switch.



- Connection of the CT's

The CT's are mounted inside each functional unit. Feed the CT's secondary cable through the HV cable entry, and connect it beneath the functional unit to the male connector of the CT's connection cable on the automatic changeover switch. The cable screens earthing braid must pass through the CT's before being connected to the functional unit's earth collector.

1.16 Normal Function Emergency Back-up

This function enables the automatic transfer of the load from the "normal" power source (cable 1) to an "emergency" back-up source (cable 2) in case of voltage drop on the former, and to automatically cause the return to the normal circuit when the correct voltage has definitively returned to it. A system of mechanical interlocking forbids paralleling of the sources.

The normal function emergency back-up comprises two IS functional units equipped with C40M mechanisms, a voltage detection relay, an auxiliary relay system for automatic control, an auxiliary power supply with a 24 Volt battery, a 127 V/230 V charger and, as an option, a time-delayed relay of 0.2 to 20 seconds.

 On the installation of a normal function emergency back-up, it is recommended that checks are made to ensure that the two operating mechanisms are operating correctly and that their interlocking is also functioning correctly, by operating each of the mechanisms several times, whilst respecting the instructions given in the NT 021 AMT Operating mechanism C40, Electrical operating mechanism C 40 M Operation – Maintenance Manual.

1.17 Fitting the fuses on the PF – PFA and TM Functional Units



- In the event that an FN or FD type fuse with a striker pin is fitted, it is essential to remove the protective label.
- For fuses of the FNw and FDw type this label must remain in place.
- For other fuses, follow the manufacturer's instructions.
- In all cases, ensure that the striker pin is positioned at the top of the fuse.

 After any operations in the cable compartment, put the front panel back into position and lock it by turning the handle. Mandatory checks before commissioning.



- Lift the cover on the upper socket then, whilst holding the fuse by its upper part, fit it into the lower shell.

 Make sure that all the connections, coupling of busbars, cables, earthing circuits, instrument transformers, and low voltage circuits are carried out properly.



- Push the fuse firmly into the upper socket.
- Make sure that the cover is properly closed and that the fuse label is visible from the front.

 Make sure that all the fuses, the field deflector caps of the busbar and the internal access panels of the functional units are correctly fitted.

2 Commissioning



Commissioning may only be carried out by personnel who have received **suitable authorisation** for the **operations and manoeuvres** they are responsible for performing. If this is

not the case, please contact our **After-sales Service** or our training centre, DAFEP. All **locking out of operations** must be performed according to the **general safety instructions**

booklet for electrical applications "UTE C 18 510" and by following the special instructions for the portion of the circuit being operated.

2.1 Operating the switchgear

- Refer to the instruction manuals relevant to each mechanism.
- Operate the breaking devices several times to check that they are operating correctly.

After each operation, check its position on the block diagram.

- Check that the front panel is locked, using its handle.

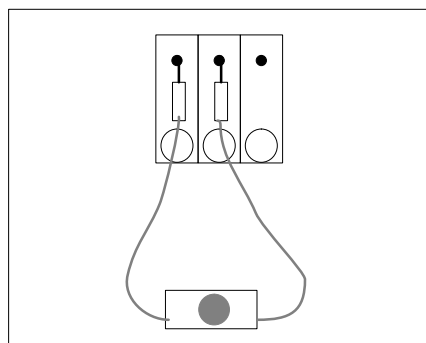
2.2 Energising the incoming feeder cables

Before energising the incoming feeder cables make sure that all the switches are in the "OPEN" position.

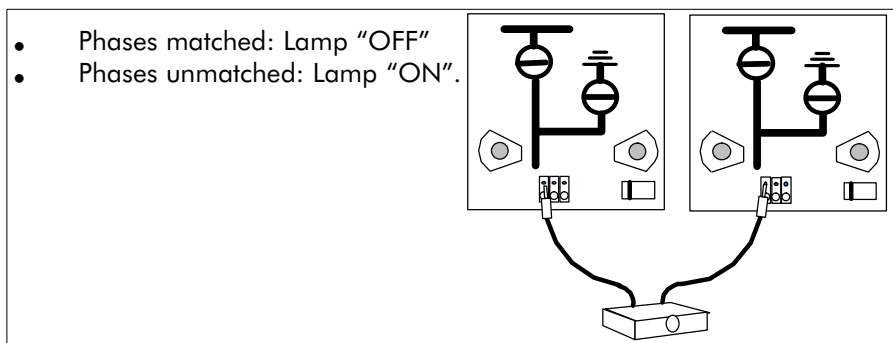
2.3 Checking voltage presence

After the cables have been energised, check that the indicator lamps light up on the voltage presence monitoring devices L1-L2-L3 located on the control mechanism cover.

2.4 Checking phase matching



- **Checking the phase matching device:** To ensure that the phase matching device is operating correctly, connect its 2 plugs to 2 phases on the same functional unit. The lamp should come on.

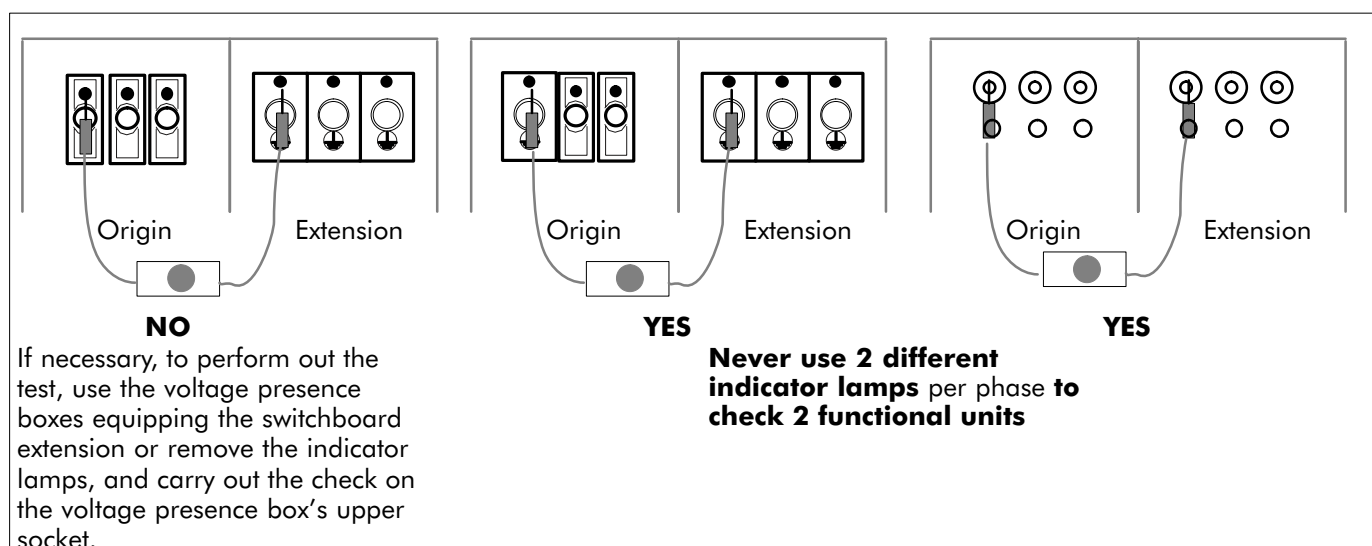
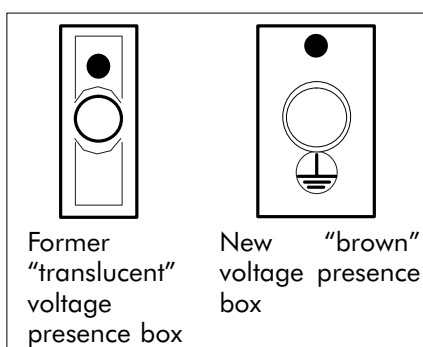


- Phases matched: Lamp "OFF"
- Phases unmatched: Lamp "ON".
- **Checking phase matching:** Check the phase matching with the removable device (optional). If there is a phase discrepancy check the cable connections.

Special case of switchboard extension

IMPORTANT

When checking the phase matching, use voltage presence boxes of the same model.



2.5 Energising the switchboard

Close the breaking controls of the "incoming" functional units. If necessary, close the disconnectors

and circuit-breaker of the "Busbar Overall Protection" functional unit. Energise the "Outgoing feeder and

the Overall Protection and Measurement transformers". Close the corresponding breaker controls.

3 Operation



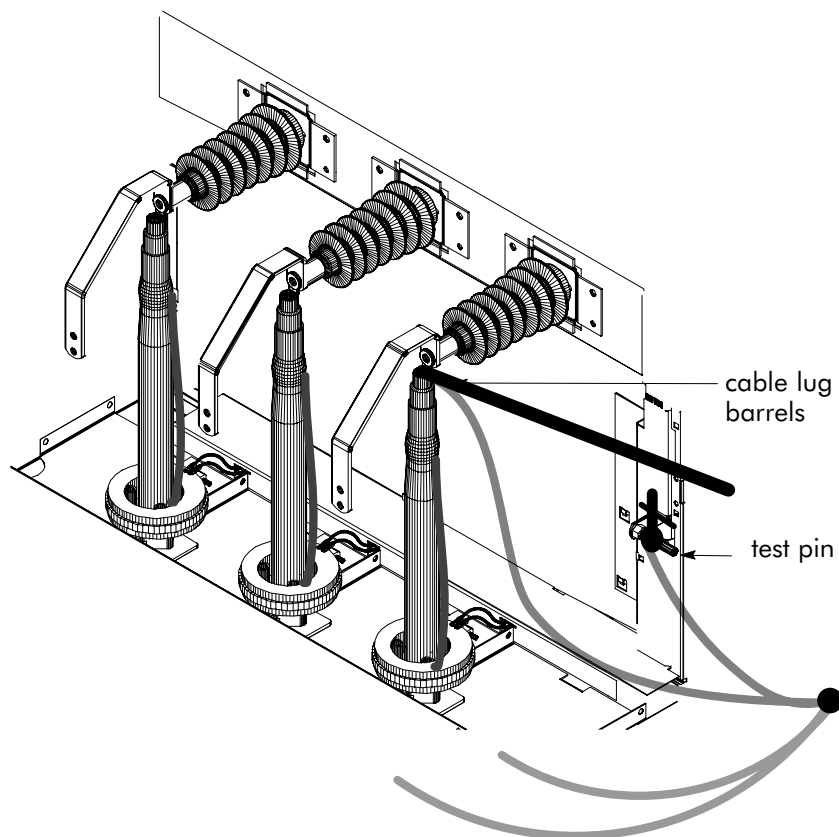
Insulate the compartments to operate and possibly earth them, if appropriate.

Before closing any earthing switch make sure that there is no voltage in the circuitry concerned.

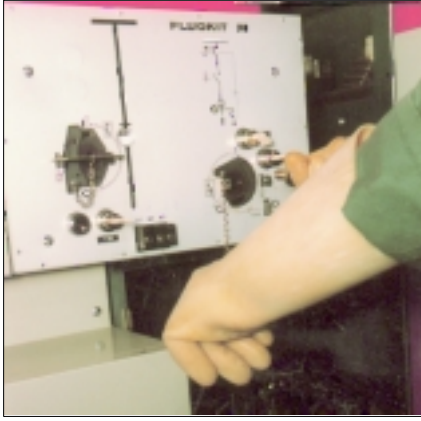
3.1 Installation of the earthing block

Case of IS, PF, PFA and PGC functional units delivered after the 15/05/95

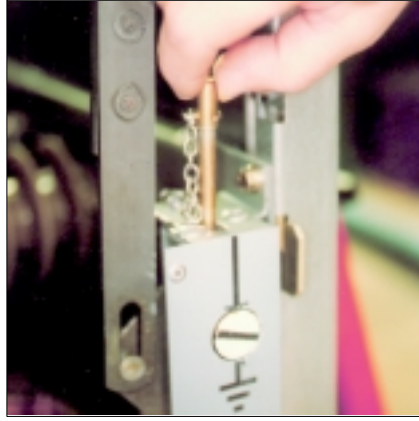
- With the earthing switch closed and the front panel removed, place the earthing block connecting clips on the test pin of the functional unit, then on the cable lug barrels on the 40 mm of free space provided.



Special case of PGC functional units delivered from 22/04/94 to 15/05/95



- The earthing switch may be partially opened for cable tests and then locked using the pin, via the earthing switch indicator.
After testing the cables exert a pressure on the operating lever in the opening direction.



- Remove the pin while holding the operating lever. Refit the pin in its housing. Pull back the operating lever to achieve a sudden closing of the earthing switch.



Once the above tests have been performed, close the earthing switch and refit the front panel.

It is essential to turn the handle to lock it in place.

3.2 Operation interlocks (by means of locks)

For all types of interlocks, refer to the standard interlock actuation Manual NT 006 AMT Operation, and the documents supplied with the order.

Case of TM functional unit

The Low Voltage disconnection is controlled by the High Voltage supply disconnection. Low Voltage disconnection is clearly indicated by the opening of the fuses.

4 Maintenance

4.1 Preventive maintenance



Any maintenance and servicing operations should only be carried out by **qualified personnel**. Otherwise, consult our **After-Sales Service**: see address at the beginning of this manual.

Operating mechanism

Level: 2	Locking out: Lock out and de-energise the functional units in accordance with the general safety instructions booklet for electrical applications UTE C 18 510	Duration: 0.50 h following locking out
Parts required: none	Products required: - Solvent (excluding chlorinated solvents) - Grease (Mobilgrease 28 red from Mobil)	Location: the front face of the functional unit
We recommend that the following operations be carried out once a year: check that the control mechanisms work correctly, and	visually inspect that the equipment is in good condition. For the latching mechanisms,	lubricate the latching rollers and catches with Mobilgrease 28 red grease from Mobil.

Earthing switches and line disconnectors

Level: 2	Locking out: Lock out and de-energise the functional units in accordance with the general safety instructions booklet for electrical applications UTE C 18 510	Duration: 0.50 h following locking out
Parts required: none	Products and accessories required: - Clean dry cloth - Solvent (excluding chlorinated products) - Grease (Electrolube 2 GX grease from Comindus)	Location: cable compartment

Clean off the old grease using a dielectric solvent.
Apply a film of Electrolube 2 GX grease from Comindus to the fixed contacts on the earthing switches and line disconnectors.

Insulators, transformers

Level: 2	Locking out: Lock out and de-energise the functional units in accordance with the general safety instructions booklet for electrical applications UTE C 18 510	Duration: 0.50 h following locking out
Parts required: none	Tools required: - Clean dry cloth- Torque wrench with socket sizes 10,13,18 mm	Location: cable compartment

Check that the insulating parts are clean. Dust them with a clean dry cloth. Check that the hardware is tightened to the correct torque.

4.2 Corrective maintenance

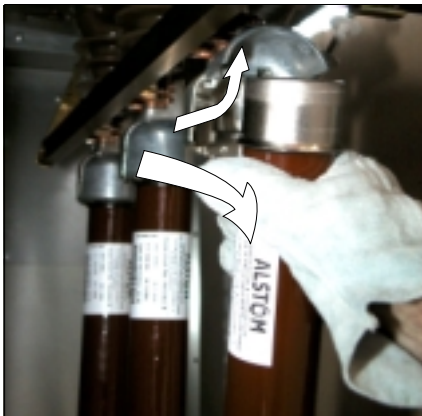
Replacing the 3 fuses

Level : 2	Locking out: Lock out and de-energise the functional units in accordance with the general safety instructions booklet for electrical applications UTE C 18 510	Duration: 0.50 h following locking out
Parts required: 3 fuses	Tools required: - Leather gloves	Location: cable compartment



Caution: after a short-circuit, the fuse body has a high temperature. Take handling precautions (wear gloves). All 3 fuses must be replaced.

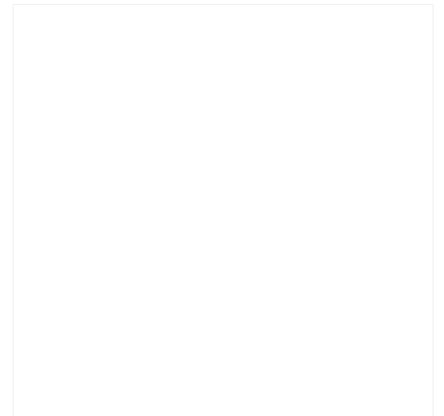
- Open the switch or line disconnecter.
- Make sure there is no voltage.
- Close the earthing switch.
- Remove the cable access panel.



- Hold the fuse by its upper part and pull it out towards you. This causes the shell of the upper socket to open. The shell remains open.



- Lift the fuse in order to release it from the lower socket and then remove it.



- Fit the replacement fuse by performing the operations in reverse order (see § 1.17).

Replacing a capacitive voltage divider on an IS functional unit

Level: 2	Locking out: Lock out and de-energise the functional units in accordance with the general safety instructions booklet for electrical applications UTE C 18 510	Duration: 0.50 h following locking out
Parts required: 1 capacitive voltage divider	Tooling required: - One 3 mm magnetic screwdriver for hexagonal socket screws.	Location: cable compartment

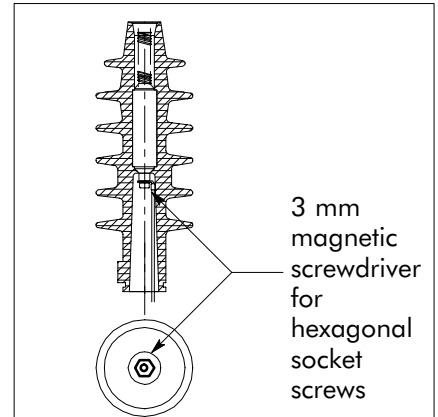
- Open the switch.
- Close the earthing switch.
- Remove the cable access panel.



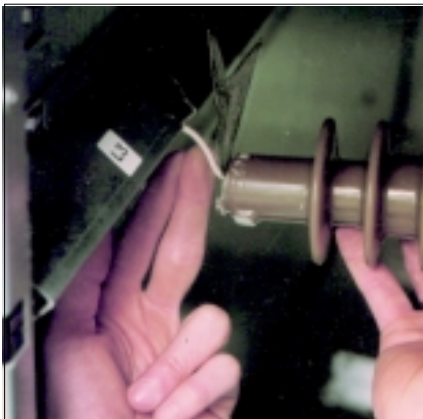
- Swivel the voltage divider in the lower socket access.
- Release it from its base by first pushing it upwards, then pulling it downwards.



- Remove the capacitive voltage divider from the contact block of the lower socket.



- Undo the screw at the bottom of the voltage divider so as to release the lug fitted with its conductor.



- To refit it, make certain that the conductor passes into the slot.
- Make sure that the contact spring, located in the upper recess of the voltage divider, is correctly positioned.

Replacing a capacitive voltage divider on a PF functional unit

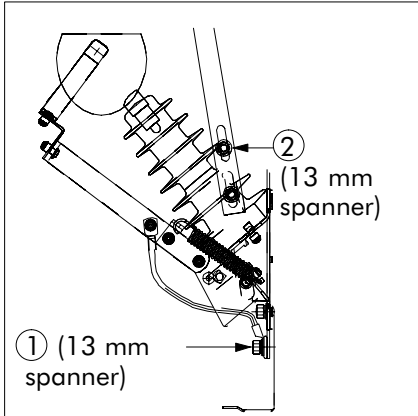
Level: 2	Locking out: Lock out and de-energise the functional unit(s) in accordance with the general safety instructions booklet for electrical applications UTE C 18 510	Duration: 0.75 h following locking out
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Parts required: 1 capacitive voltage divider	Tools required: - 13 mm spanner	Location: cable compartment
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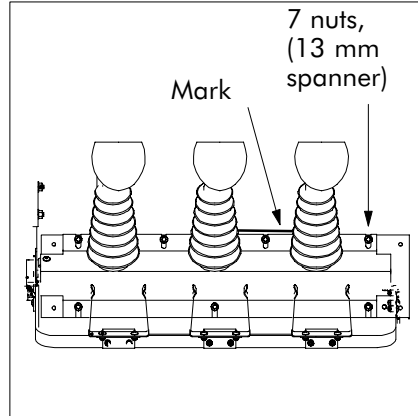
- Open the switch.
- Close the earthing switch.
- Remove the front panel.

- Remove the 3 fuses.
- Remove the 3 cables and their screen braids.

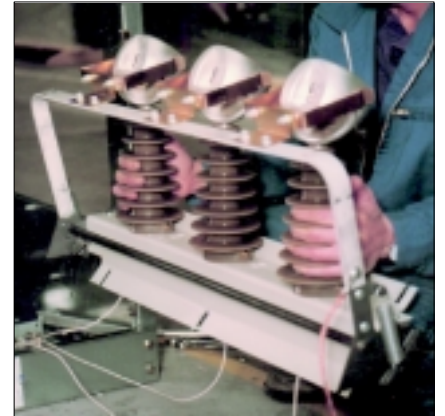
- Remove the 3 cables and their screen braids.



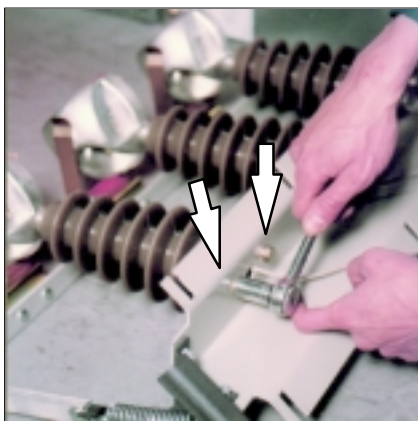
- 1 – Disconnect the earthing braid of the earthing switch from the earth bar (13 mm spanner).
- 2 – Uncouple the earthing switch linkage downstream of the fuses (13 mm spanner).



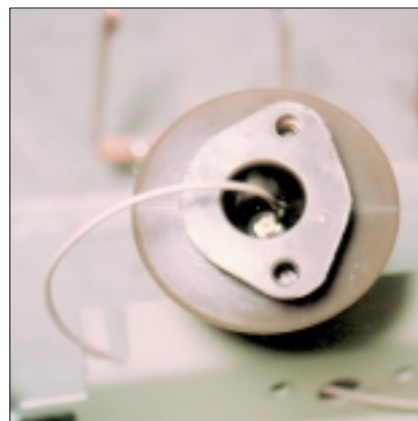
- **Make a mark** on the flange in order to reposition the crossbeam correctly.
- Undo the 7 nuts attaching the crossbeam to the partition.



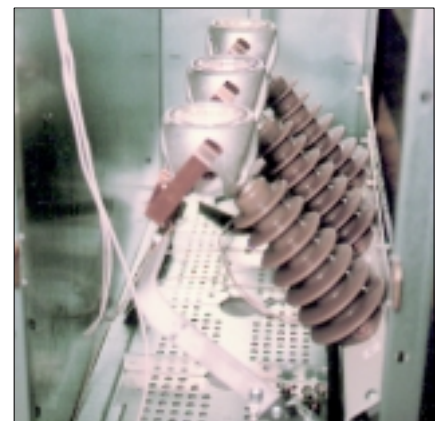
- Withdraw the crossbeam.



- Remove the defective voltage divider: 2 nuts (13 mm spanner).



- Disconnect the defective voltage divider and replace it with a new one with the same reference N° (tightening torque on the 2 fixing screws: 1 daN.m).

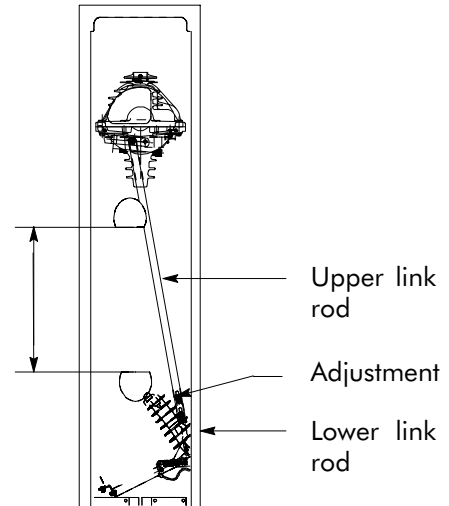


- Re-assembly: position the openings facing the mark and the studs welded in the flange and this **in accordance with the marks that were made beforehand**.
- Tighten the 7 nuts (tightening torque 2.1 daN.m).
- Couple up the earthing switch linkage downstream of the fuses.
- Refit the earthing braid.
- Remount the cables and fuses.

Operate the earthing switch several times in order to check its reach on the lower power sockets. If necessary adjust the position of the crossbeam by loosening the 7 nuts and making it slide in the openings. If necessary, make a fine adjustment with the upper link rod in accordance with the procedure below.

- Adjustment between the upper and lower link rods must be carried out with the upstream and downstream earthing switches closed.
- The lower link rod must be lowered as far as possible downwards.
- The distance between the base of the lower shell and the edge of the upper shell must be:

FN fuses: 487
FD fuses: 478



Replacing a capacitive voltage divider on a PGC functional unit

Level: 2

Locking out: Lock out and de-energise the functional unit(s) in accordance with the general safety instructions booklet for electrical applications UTE C 18 510

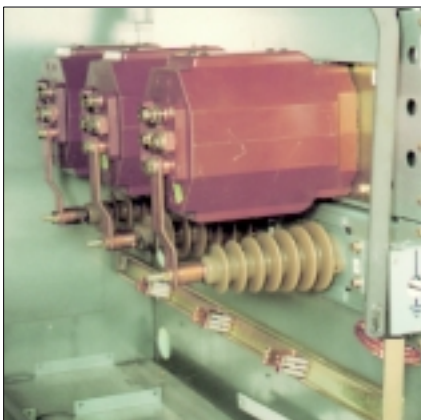
Duration: 0.75 h following locking out

Parts required: 1 capacitive voltage divider

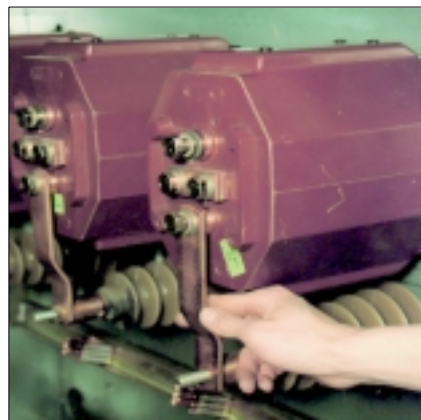
Tools required:
-13, 18 mm spanners

Location: cable compartment

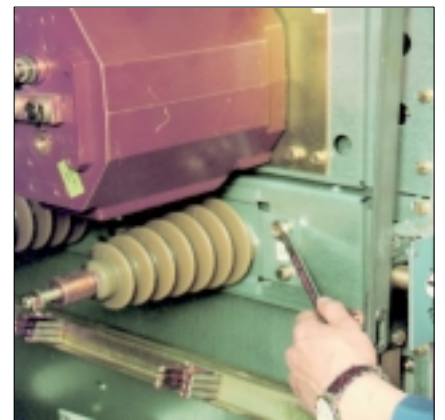
- After the front panel has been removed, remove the circuit-breaker (see § 1.6).
- Then remove the 3 cables (18 mm spanner).



- Open the earthing switch.



- Remove the connection linking the transformer to the voltage divider (18 mm spanner).



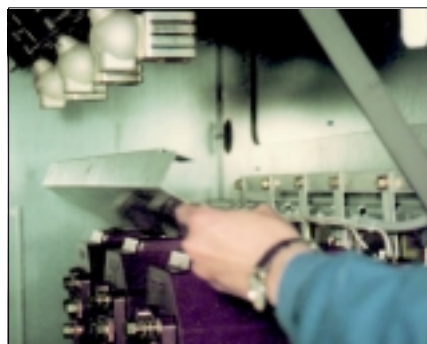
- Undo the 4 nuts attaching the voltage divider supports to the partition (13 mm spanner).

- Remove the defective voltage divider: 2 screws behind the support (13 mm spanner).
- Replace the voltage divider with a new one (tightening torque of the 2 screws: 1 daN.m).
- Reinstall the assembly.

Replacing a current transformer on a PGB or PGC functional unit

Level: 2	Locking out: Lock out and de-energise the functional unit(s) in accordance with the general safety instructions booklet for electrical applications UTE C 18 510	Duration: 1 h following locking out
Parts required: 1 current transformer	Tools required:- 10, 13, 18 mm spanners with extension.	Location: cable compartment

- First remove the front panel, then withdraw the circuit breaker (see § 1.6).
- Remove the 3 cables and the transformer/Vigia connection: see above.



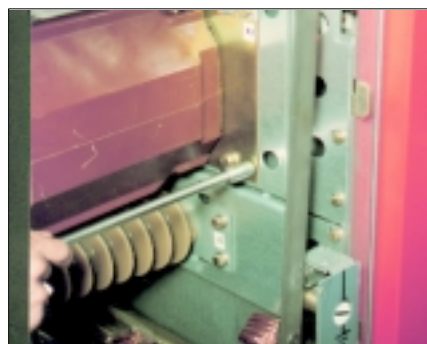
- Remove the lateral trunking for the low voltage wiring.



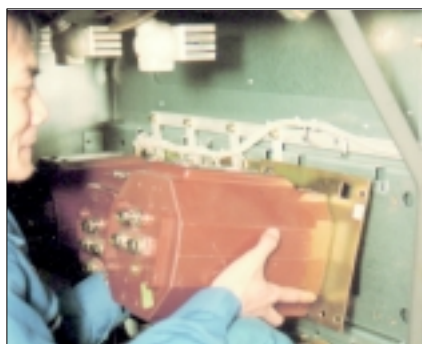
- Disconnect the transformer power supply wires, marking their position before loosening them (10 mm spanner).



- Dismount the 2 earthing bars (4 screws, 13 mm spanner).



- Remove the 2 nuts attaching the transformer support plate to the flange of the functional unit (13 mm spanner).



- Lift the assembly to release the two openings of the support catch, and remove it all from the functional unit.

- Remove the 4 screws attaching the transformer to its support plate (13 mm spanner). Fit the replacement transformer to the support plate and reinstall the assembly inside the functional unit (tightening torque on the support plate: 1.4 daN.m, tightening torque on the connections: 3.1 daN.m).

Replacing a control mechanism

Please refer to the instruction manuals for each control mechanism:
NT 018 AMT C10-C10M.
NT 019 AMT C12.
NT 021 AMT C40-C40M.

Replacement of an ORTHOFLUOR FP

See § 1.6.

4.3 Problems and remedies

SYMPTOMS	ELEMENT	PROBABLE CAUSE	REMEDIES
Abnormal noises under load, cracking, vibration	Voltage presence box.	"FASTON" plug improperly connected to the conductors	Check the connection
	Vigia capacitive voltage divider		Replace the voltage divider
	Insulating materials	Insulating parts contaminated or damaged	Clean the parts concerned or call our After-Sales Service: see the address at the beginning of this manual
	Cable ends	Cable ends damaged	
Abnormal force required to operate a control mechanism	Control mechanisms	Safety interlocks	Check the position of the operating controls
	Earthing switch		" "
	Line disconnecter		" "
Voltage presence indicator lamp "off"	Indicator lamp	Defective indicator	Replace it
	HV Fuses	Blown fuse	Replace the 3 fuses
	Voltage presence box	Component damaged	Replace the unit
Abnormal temperature rise at connection points	Connections	Poor tightening	1 – Clean the connection areas. 2 – tighten to the correct torque
Circuit-breaker not closing (on PGB and PGC units)	Unit switch or LV circuit-breaker	Switch or LV circuit-breaker open	Close the switch or LV circuit-breaker
	Protection	Protective action	Check the adjustments
	External connection	Improper connection	Check the circuit diagrams

4.4 Spare parts

- Control mechanisms
- Capacitive voltage divider
- Voltage presence indicator lamp
- 3 fuses



On all requests for equipment please indicate the contract number marked on the switchboard plate, the number and type of the order, the number and type of the switch indicated on the rating plate.

ALSTOM, Technical management, BP 4019 - 71040 Mâcon, cedex 9 - FRANCE - Fax 33(0) 3 85 29 36 36

