FBX - CB Function

Installation
Commissioning
Operation
Maintenance

Instructions

AMTNoT170-02

AREVA

Table of Contents

1 AREVA at your service

Operations and maintenance may only be carried out by personnel who have received suitable authorisation for the operations and manœuvres they are responsible for performing.

If this is not the case, please refer to our Service Unit or Training Centre.
All locking-out operations must be performed according to the "General Safety Instructions booklet for Electrical Applications"
UTE C 18 510
(or its equivalent outside FRANCE).

1.1 Our Service Unit: our specialists, and suitably adapted services...

- Guarantee extension contracts in relation to the selling of new equipment,
- Supervision of HVA switchgear installations,
- Technical advice, diagnoses of the facilities, expertise,
- Maintenance contracts adapted to operational constraints,
- Systematic or conditional preventive maintenance,
- Corrective maintenance in case of partial or complete failure,
- Supply of spare parts,
- Overhauling of equipment and requalification of installations in order to benefit from new technologies and extend the life of your switchgear by limited investments.

Contact the AREVA Service Unit for diagnoses and advice:
Working hours

☎ 33 (0)3 85 29 35 00
🖷 33 (0)3 85 29 36 30
or 33 (0)3 85 29 36 43

1.2 AREVA T&D Technical Institute: together, let us develop our skills etc.

We can place at your disposal all of our trainers' expertise, our teams' pedagogical experience and the wealth of our equipment, to help you face the challenge of encouraging the personal development of each individual through the optimisation of their skills.

From a few hours up to several weeks, AREVA T&D Technical Institute has the control over all of the teaching processes in order to meet the needs of each customer.

- Specific training, directly operational with practical work on real machines.
- Small groups to facilitate communication.
- A balance between theory and practice.
- Evaluation and management of the skills: measurement and optimisation of the trainees' knowledge.

Faced with the direct and indirect training costs of the operational stoppages and shutdown, training is a real investment

AREVA T&D Technical Institute Aix-les-Bains
1 rue Paul Doumer - BP 601 - F-73106 Aix-les-Bains Cedex
☎ 33 (0)4 79 34 76 70 🖷 33 (0)4 79 34 76 76 ✉ training.aix@areva-td.com

2 With regards to this User Manual

2.1 Responsibilities

Our devices are quality controlled and tested at the factory in accordance with the standards and the regulations currently in force.

Apparatus efficiency and apparatus life depend on the compliance with the installation, commissioning and operation instructions described in this user manual. Non respect of these instructions is likely to invalidate any guarantee.
Local requirements especially about safety which are in accordance with the indications given in this document, must be observed.

AREVA declines any responsibility for the consequences:
- due to the non respect of the recommendations in this manual which make reference to the international regulations in force,
- due to the non respect of the instructions by the suppliers of cables and connection accessories during installation and fitting operations,
- of any possible aggressive climatic conditions (humidity, pollution, etc.) acting in the immediate environment of the materials that are neither suitably adapted nor protected for these effects.

This user manual does not list the locking-out procedures that must be applied. The interventions described are carried out on de-energized equipment (in the course of being installed) or locked out (non operational).

2.2 Reminder concerning normal service conditions (in accordance with the IEC62271-1 standard)

***** Permissible ambient temperature

The ambient air temperature should be comprised between - 5° C (on option 15 or -25°C) and + 40° C.

The mean measured value for a 24 hour period must not exceed 35°C.

* Installation altitude

Items of HV equipment are defined in accordance with IEC Standards and can be used up to an altitude of 1000 m.

Above this, you may have to take into account the reduced atmospheric pressure.

For these specific cases, contact the AREVA Sales Department

* Atmospheric pollution

The ambient air must not contain any dust particles, fumes or smoke, corrosive or flammable gases, vapours or salts.

* Permissible atmospheric humidity level

The average atmospheric relative humidity level measured over a 24-hour period must not exceed 95%.

The average water vapour pressure over a period of 24 hours must not exceed 22 mbar.

The average atmospheric relative humidity value measured over a period of one month must not exceed 90 %.

The average water vapour pressure over a period of one month must not exceed 18 mbar.

Condensation may appear in case of any sharp variation in temperature, due to excessive ventilation, a high atmospheric humidity level or the presence of hot air. This condensation can be avoided by an appropriate lay-out of the room or of the building (suitably adapted ventilation, air driers, heating etc.).

Whenever the humidity level is higher than 95 %, we recommend that you take appropriate corrective measures. For any assistance or advice, contact the AREVA After-Sales department (See § 1.1).

2.3 Particular instructions for operations and interventions on energized equipment

When commissioning and operating the equipment under normal conditions, the General safety instructions for electrical applications must be respected, (protective gloves, insulating stool, etc.), in addition to standard operating instructions.

All manipulations must be completed once started.

The durations (for completing the operations mentioned) given in the maintenance tables are purely an indication and depend on on-site conditions.

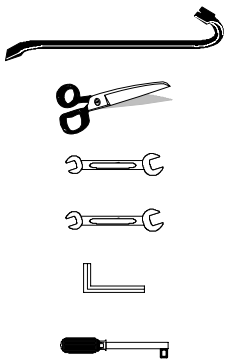
2.4 Other technical notices to be consulted

For all operations relating to the installation and use of the switchboard, see the manuals listed below.

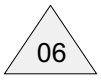
- AMTNoT110-02 FBX Guide to Civil Engineering Work
- AMTNoT131-02 FBX Installation - Commissioning
- AMTNoT132-02 FBX Operation - Maintenance

2.5 Tools and products *(not supplied)* required for the operations described in this user manual

- Crowbar
- Scissors
- Open-ended spanners sizes 8, 10 and 13
- 2 x open-ended spanners - size 7
- Allen key - sizes 3, 4 and 5 mm
- Ratchet handle + extension with socket sizes 8, 10, 13 and 16 mm
- Torque wrench
- Cutting pliers



2.6 Symbols & conventions



- Code for a product recommended and marketed by AREVA

- Tightening torque value
  Example: 21 **Nm**

- Mark corresponding to a key

CAUTION! Remain vigilant!
Precautions to be taken in order to avoid accidents or injury

FORBIDDEN! Do not do it!
Compliance with this indication is compulsory, non compliance with this stipulation may damage the equipment.

INFORMATION - ADVICE
Your attention is drawn to a specific point or operation

2.7 Tightening torque values [Nm] for standard assemblies (nut + bolt)

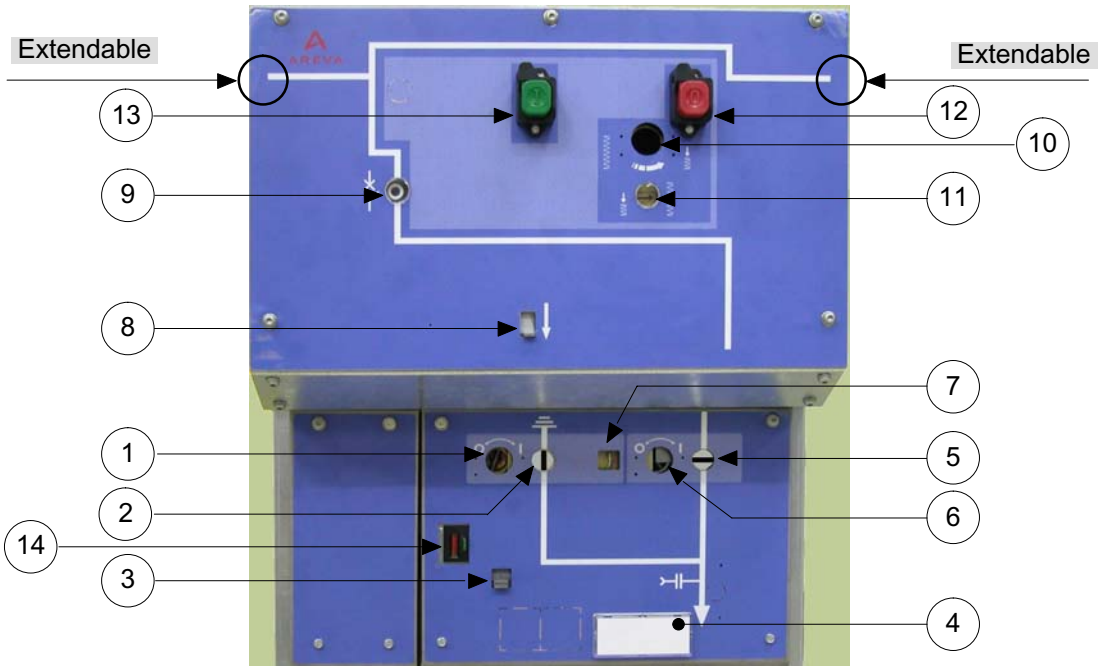
Diameter	Plastic (PA 6.6)	Steel Class < 8.8	Steel Class ≥ 8.8 ≤ 10.9	Threaded fasteners with grease A2-70
M 6	0.8	4.3	8.8	6.6
M 8	1.8	10.5	21.0	15.8
M 10	3.5	14.0	42.0	35.0
M 12	6.0	-	70.0	60.0
M 16	12.0	-	170.0	134.0

3 Presentation of the 630 A CB Functional Unit

This manual only covers the 630 A CB Function. It is complementary to the General Manual AMTNoT131 (See Section 2.4).

The 630 A CB Functional Unit is fitted with a C150 mechanical control mechanism.

3.1 Presentation of the CB Functional Unit's mimic diagram



Key

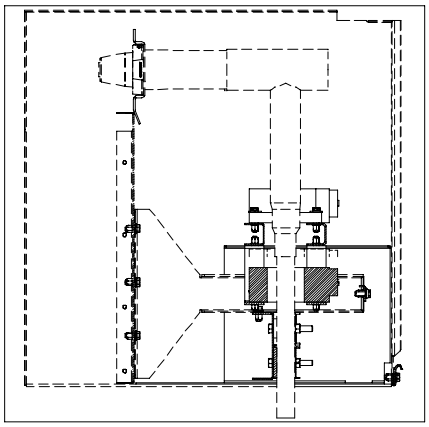
- *1 Lever socket for the earthing switch*
- *2 Earthing switch position indicator*
- *3 Cable compartment cover latch*
- *4 Descriptive plate*
- *5 Disconnector position indicator*
- *6 Lever socket for the disconnector*
- *7 Interlock between disconnector and earthing switches*
- *8 Interlock between disconnnector and circuit breaker*
- *9 Circuit breaker position indicator*
- *10 Lever socket for the circuit breaker*
- *11 "Primed-released" indicator light showing position of the spring*
- *12 Push button for tripping*
- *13 Push button for closing*
- *14 Fault indicator (optional)*

4 Connection of the HV cables

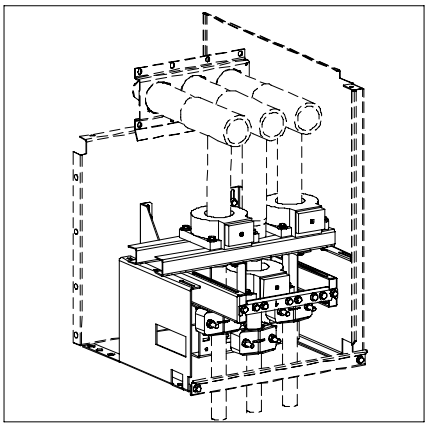
4.1 Standard equipment for the FBX - up to 24 kV

For all installation and connection operations see the corresponding manual (See Section 2.4).

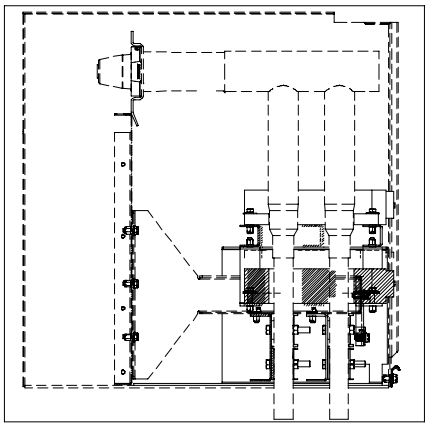
4.2 Fitting of a metering torus on one or two cables per phase (optional)



- The fitting of the torus must be completed at the same time as the connections to the withdrawable plugs.
- The tightening of the fixings is completed after the plugs are connected.

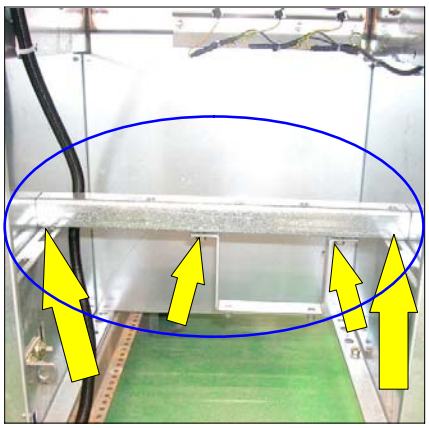


- Phase L2: The torus is fitted below the two others.



- Installation of a torus, with 2 cables per phase.

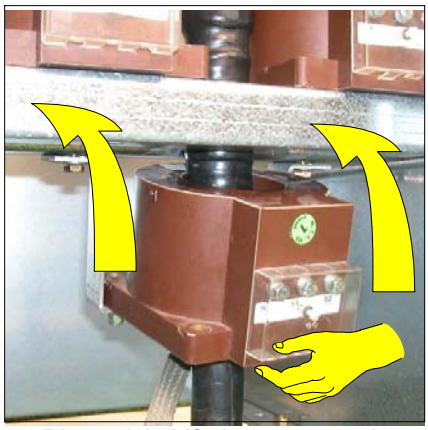
4.3 Example of cable connections with a single torus per phase



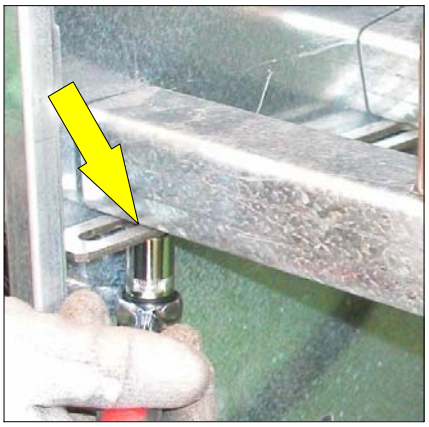
- Fit the rear crossmember torus mounting (with rear cradle) to hold the central torus in place.
- Screw in, but do not tighten, the 4 screws.

- Pass the HVA cables through the opening in the cable run.
- Fit the toruses onto the cables, making sure they are the right way round.
- Put together the plug-in connectors.

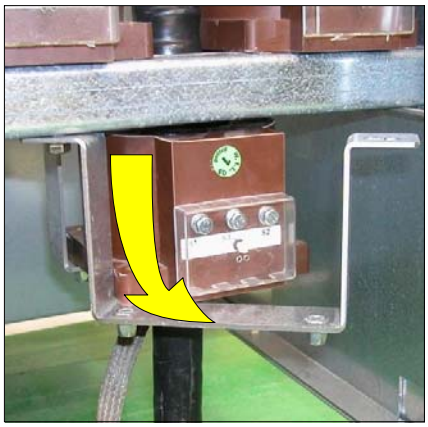
- Phases L1 and L3: Lift the torus to place it above the rear crossmember whilst attaching the socket to the crossmember.



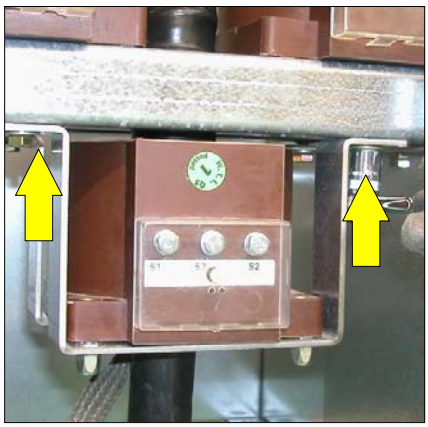
- Phase L2: Lift the torus to place it in the rear cradle whilst attaching the socket to the crossmember.
- Position the front crossmember.



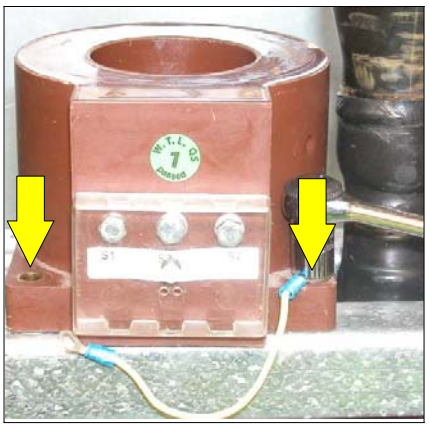
- Attach the front crossmember using 2 screws without tightening them.



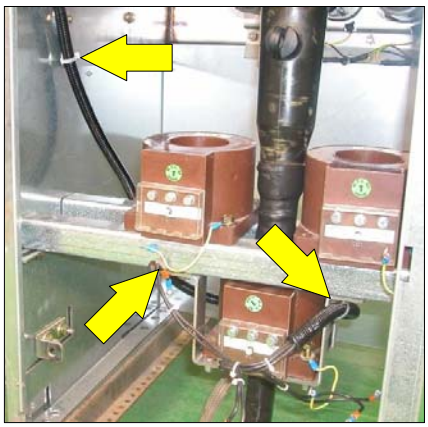
- Refit the front cradle for the Phase L2 torus.



- Tighten the 2 screws on the front cradle.

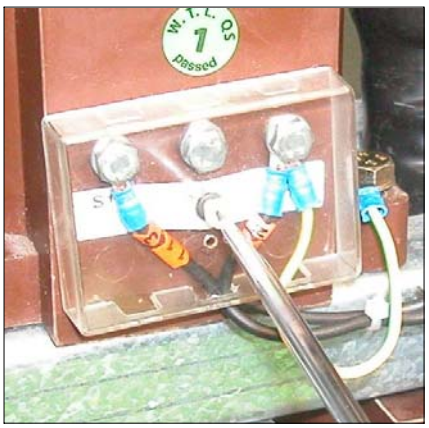


- Attach all toruses (4 screws per unit).
- Attach the earthing wire using the front right hand side mounting screw.



- The three toruses are shown in place, without the phase L1 and L3 cables.
- Pass the LV wiring through, as shown.
- Attach this wiring bundle in three places.

- Remove the protective cover.
- Connect the secondary torus circuits as per the identification marks and diagrams.



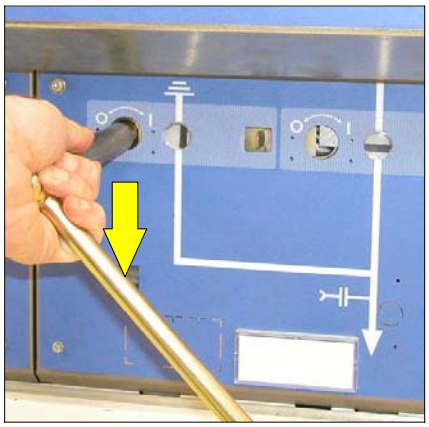
- Refit the protective cover.

- Tighten all fixing bolts.

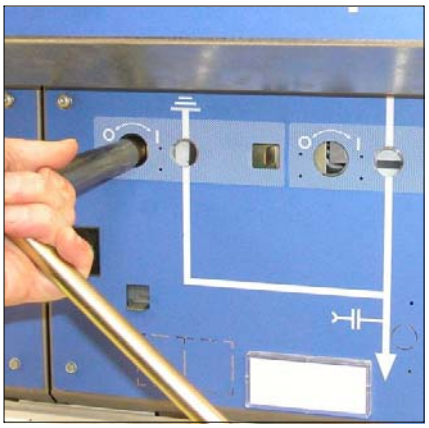
Complete connection by clamping the cables (See the corresponding manual - Section 2.4).

5 Use of the CB function

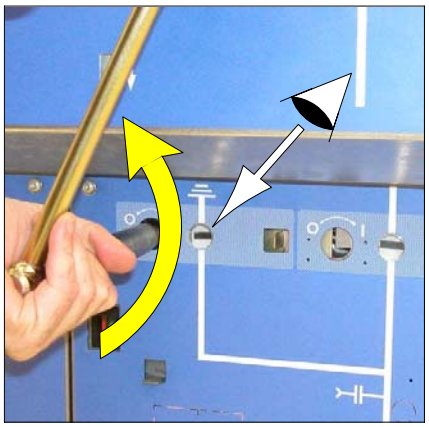
5.1 Opening the earthing switch



- Check that the tag is fully lowered.
- Insert the appropriate lever (red end) into the earthing switch socket.



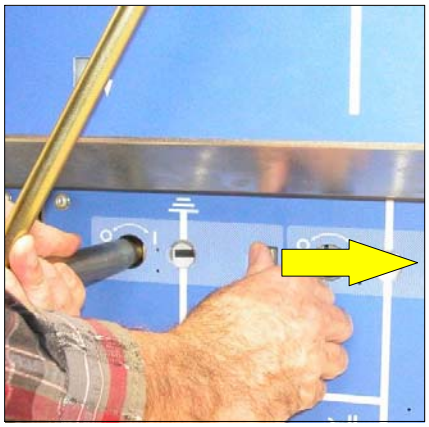
- Grasp the lever with both hands.



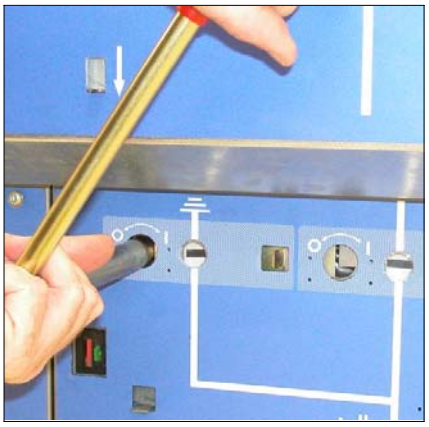
- Lift the lever: the earthing switch is now in the open position.
- Remove the lever.

5.2 Closing the earthing switch

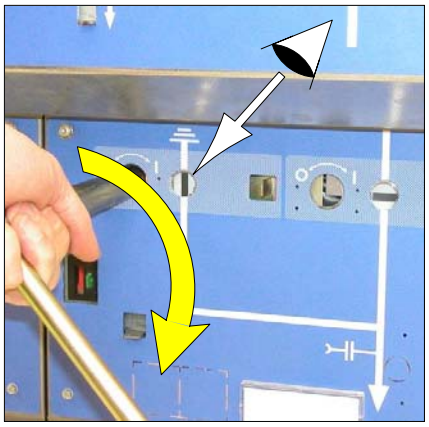
Before closing the earthing switch, ensure there is no voltage across the indicator units (see corresponding manual - § 2.4).



- Hold the locking tab open to the right.
- Insert the appropriate lever (red end) into the earthing switch socket.

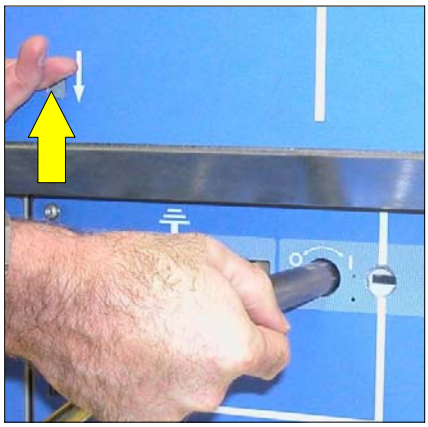


- Grasp the lever with both hands.



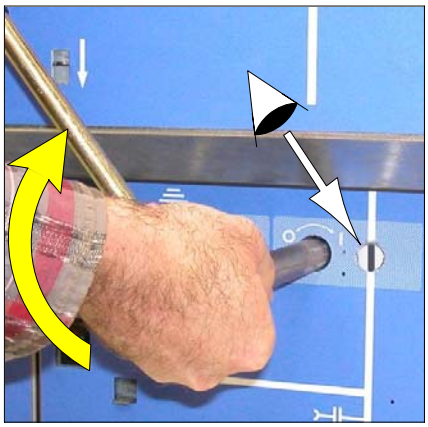
- Pull the lever down: the earthing switch is closed.
- Remove the lever.

5.3 Closing the line isolating switch [earthing switch open - circuit breaker tripped]



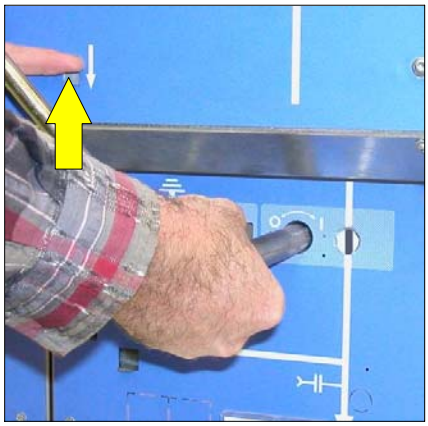
- Lift the locking tab.
- Insert the lever (black end) into the disconnector switch socket.

- Grasp the lever with both hands.



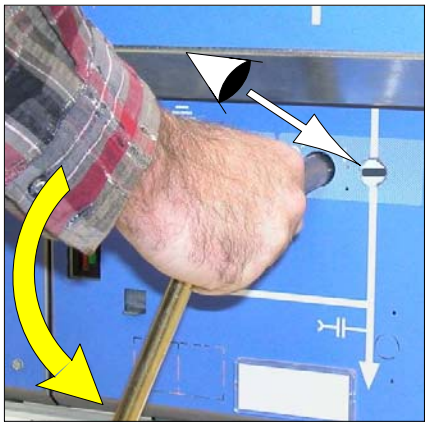
- Lift the lever:
  The line isolator is now closed.
- Remove the lever.

5.4 Opening the line isolating switch [circuit breaker tripped]



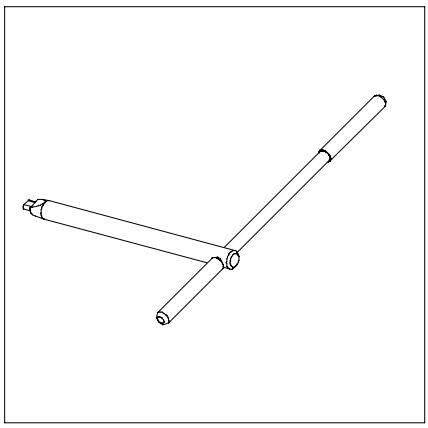
- Lift the locking tab.
- Insert the lever (black end) into the disconnector switch socket.

- Grasp the lever with both hands.

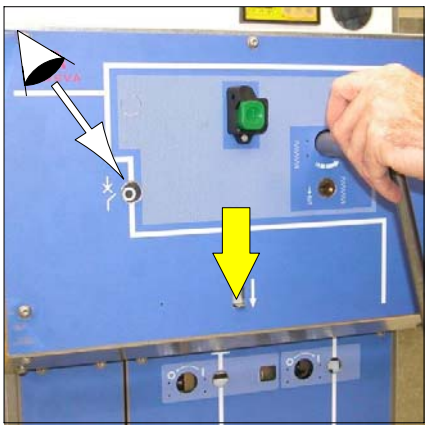


- Pull the lever down:
  The line isolator is now open.
- Remove the lever.

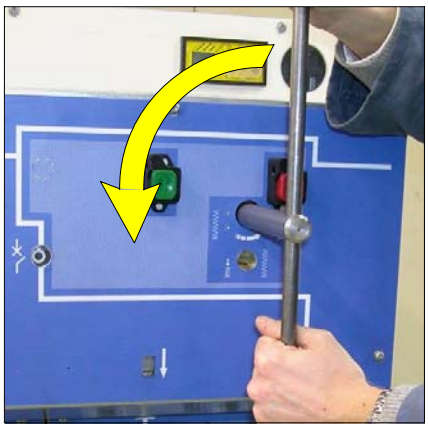
5.5 Closing the circuit breaker [Line Isolator closed]



- Circuit breaker operating lever.

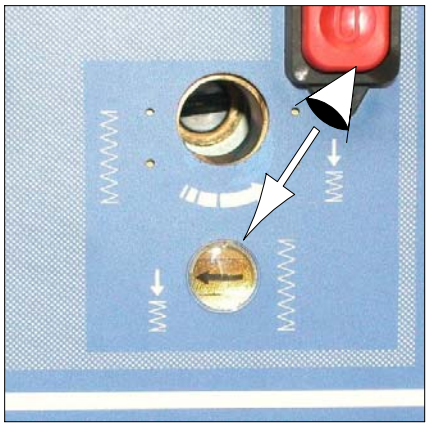


- Circuit breaker open make sure that the tag is fully lowered.
- Introduce the lever into the re-arming spring's switch hub.

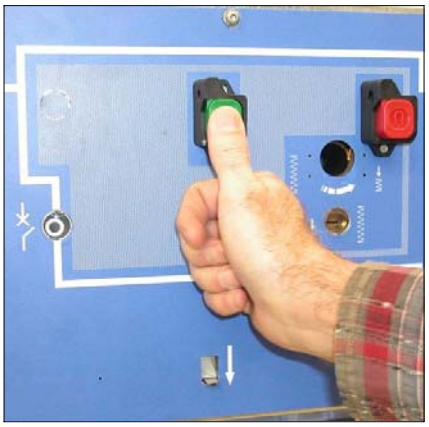


- Turn the lever to the left to re-arm the CB closing spring (rotate through approx. 350°).

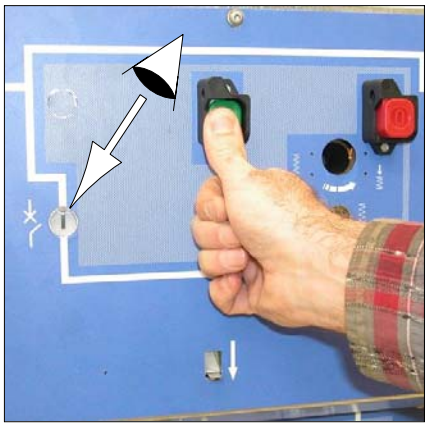
Do not force the lever at the end of the operating!



- The indicator will show that the spring is 'armed'.

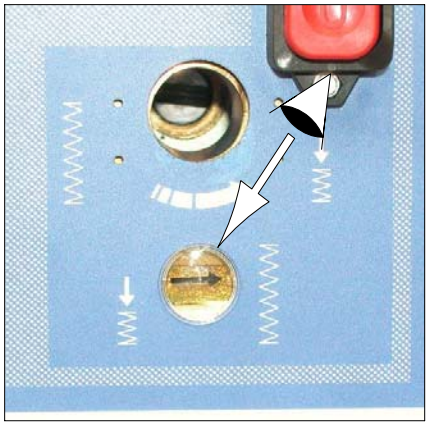


- Press the (green) 'I' button.

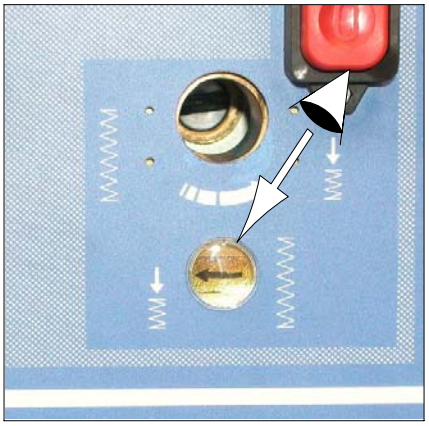


- The circuit breaker is now closed.
- The CB closing spring is 'unarmed'.

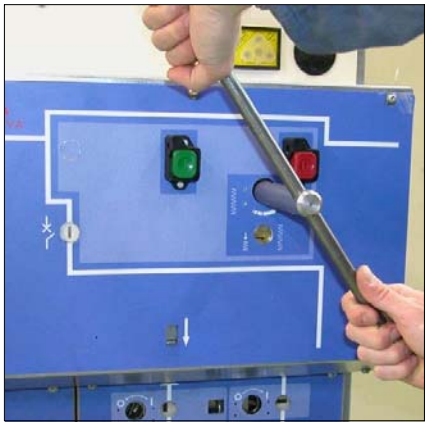
5.6 Re-arming the CB closing spring [CB closed]



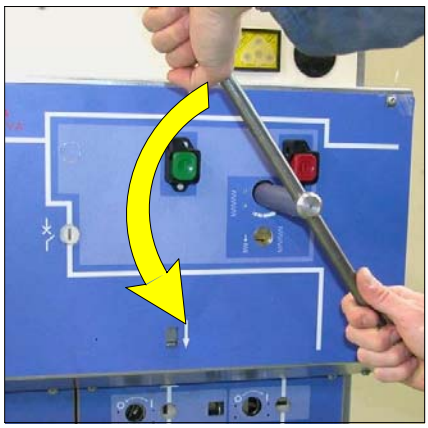
- The closing spring is 'unarmed'.



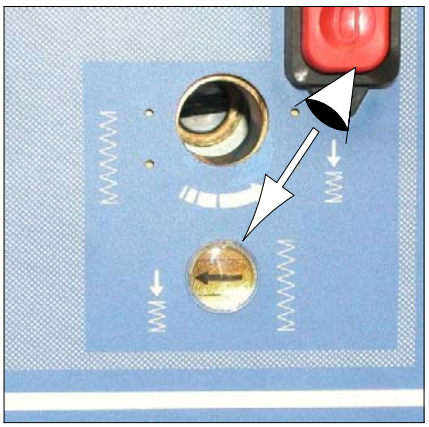
- For motorised controls, the CB closing spring is re-armed as soon as the CB is closed.



- For manual controls, you must manually re-arm the CB closing spring.
- Introduce the lever into the re-arming spring's switch hub.

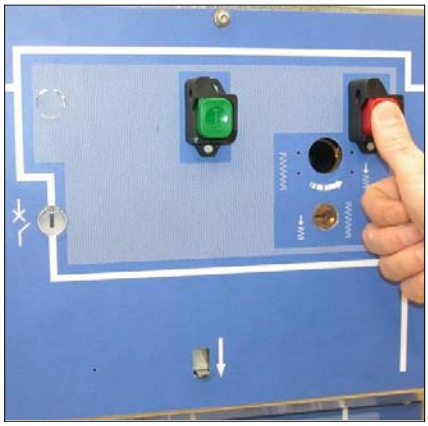


- Turn the lever to the left to re-arm the CB closing spring (rotate through approx. 350°).

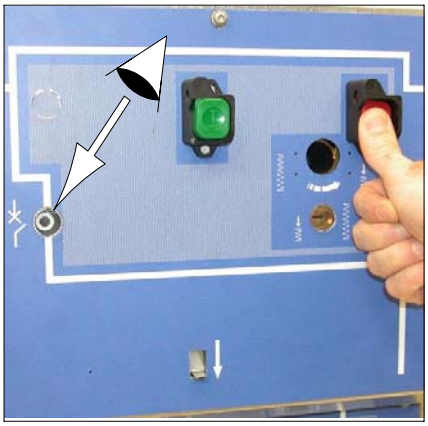


- The indicator will show that the spring is 'armed' even though the CB is closed.

5.7 Opening the circuit breaker [Line Isolator closed]



- Press the (red) 'O' button.

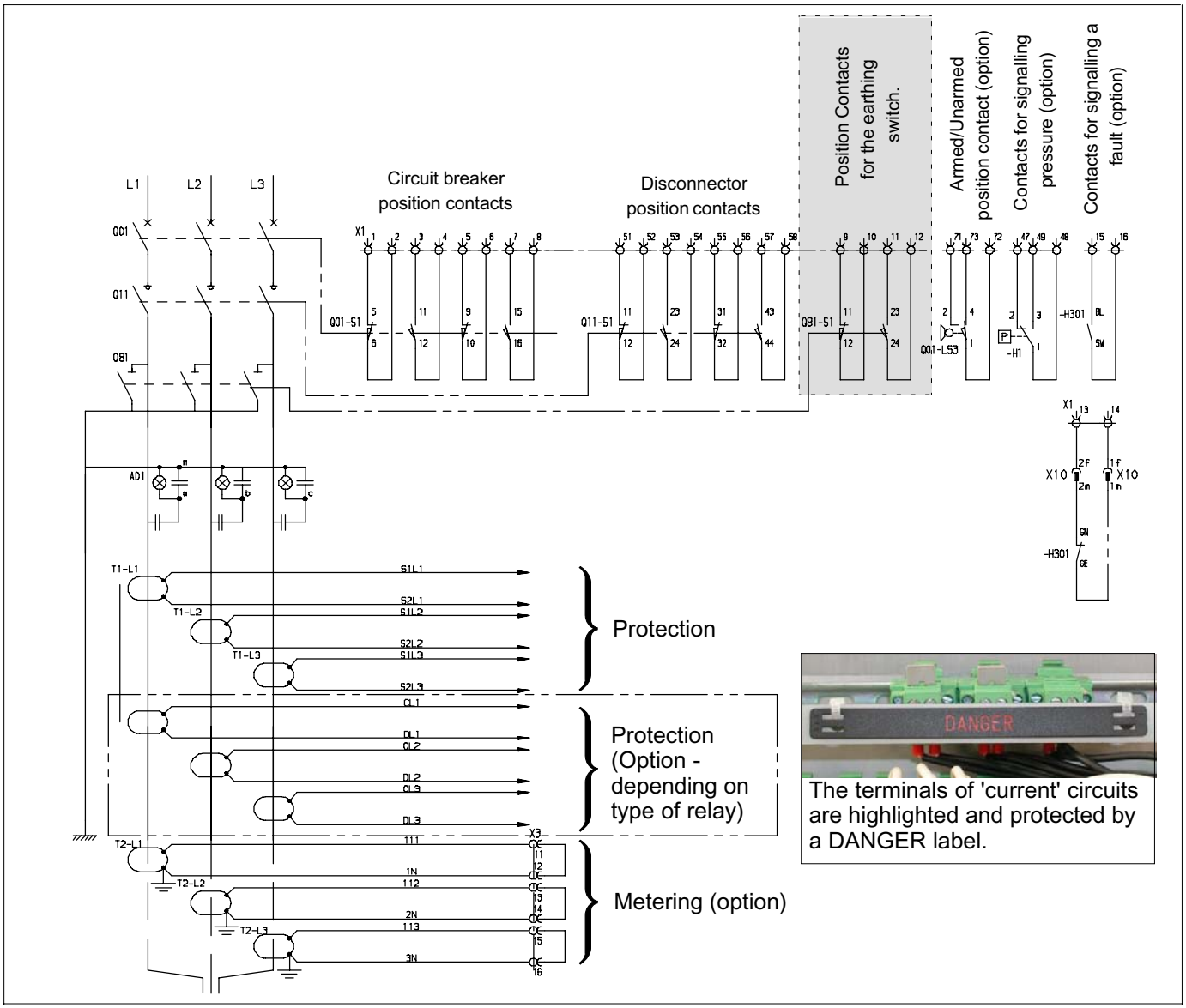


- The circuit breaker is now open.

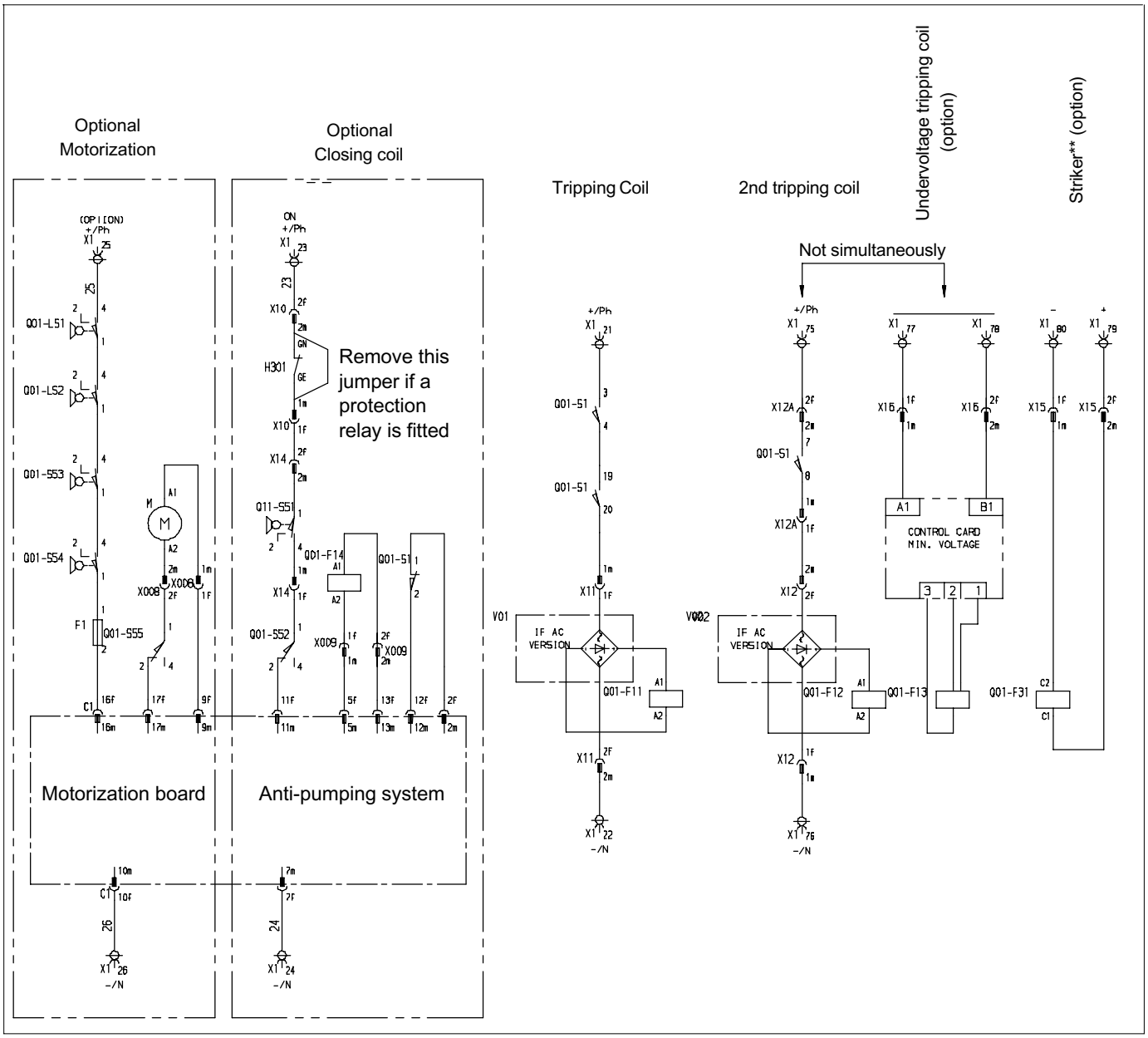
6 CB Function diagram

Key
Q01: circuit breaker
Q01-F11, Q01-F12: Trip Coils
Q01-F13: Undervoltage tripping coil
Q01-F14: Closure Coil
Q01-F31: striker pin
Q01-LS1 to LS3: spring position contacts
Q01-S1: Circuit breaker position contact
Q01-S52: Lever insertion locking contact
Q01-S53, Q01-S54: Motor interlock contacts
Q11: Disconnector
Q11-S1: Disconnector position contact
Q11-S51: Closing interlock contact
-H1: 'Pressure' indictor contact
-H301: 'Fault' indicator contact
C1: Connector
F1: Fuse
M: Motor
V01, V02: Bridge rectifiers
X1, X3: Test terminal box
X10, X12A: Connectors
X14, X15, X16: Connectors

6.1 "Metering - Protection - Signalling" section



'Control' section



7 WIC1 or DPX-1 protection relays (option)

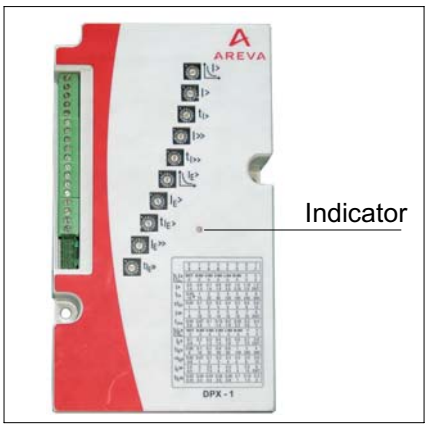
7.1 Configuring the protection relays.

The relays are supplied pre-configured, with a default setting of their maximum levels.

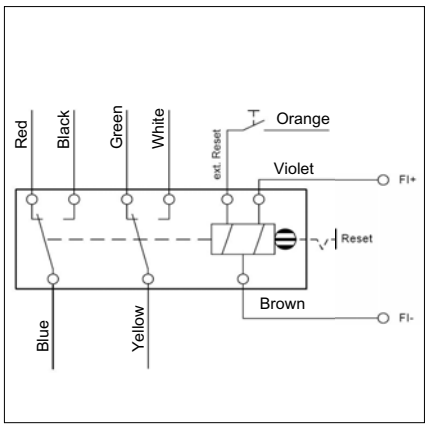
To adjust the protection relays, see the manual supplied with the switchboard.

7.2 WIC1 & DPX-1 protection relays

- WIC1: Standard autonomous protection relay (without earthing fault).
  Optional: with earthing fault.



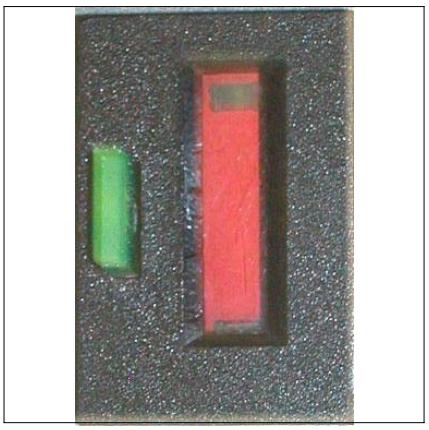
- DPX-1: Autonomous protection relay with earthing fault detection and indicator light:
  - flashing green: OK,
  - fixed green: problem with the relay,
  - fixed red: detection of fault current.



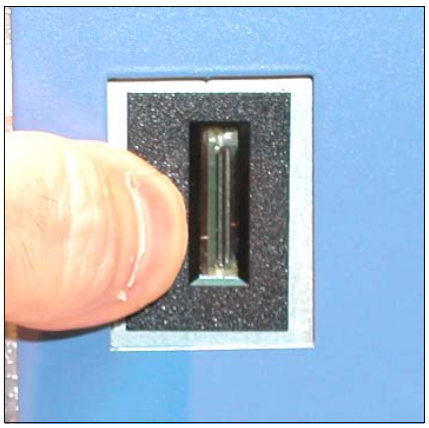
- WI1-SZ5: wiring connnectivity diagram.

7.3 WI1-SZ5 fault indicator

- Indicator normal (no fault)



- Indicator showing a fault (red)



- Press the green button to delete the fault.

8 Maintenance

8.1 Levels of maintenance

Definition	Levels
Operations recommended in the instructions manual "installation - operation - maintenance", carried out by suitably qualified personnel having received training allowing them to intervene whilst respecting the safety rules.	1
Complex operations, requiring specific expertise and the implementation of support equipment in accordance with AREVA's procedures. These are carried out by AREVA or by a specialised technician, trained by AREVA (see § 1.2) in the implementation of procedures, and who is equipped with specific equipment.	2
All preventive and corrective maintenance, all renovation and reconstruction work is carried out by AREVA.	3

8.2 General Safety Instructions

Never separate the C150 control mechanism from the circuit breaker part.

Never remove the command control cover without having cut off the LV auxiliaries.

Ensure that the springs have been released by carrying out a complete O-C-O cycle.

8.3 Maintenance of the mechanical control mechanism

Under normal installation and service conditions, the CB630 circuit breaker requires no maintenance:
- throughout the 25 years of its service life,
- as long as it has not reached the maximum number of operating cycles.

By cycle we mean a closing then an opening operation.

The internal electrical connections as well as the adjustments to the control mechanism are carried out at the factory and cannot be modified.

PREVENTIVE MAINTENANCE	Frequency	Levels		
Recommended operations	3 years	1	2	3
Inspection of the tightening of the threaded fasteners and presence of stop elements	X	-	X	X
Carry out a few opening and closing operations of the circuit breaker with the manual (and electrical) controls to ensure its correct operation.	X	-	X	X
Monitor the general appearance of the mechanical components and connections	X	-	X	X

8.4 Corrective maintenance

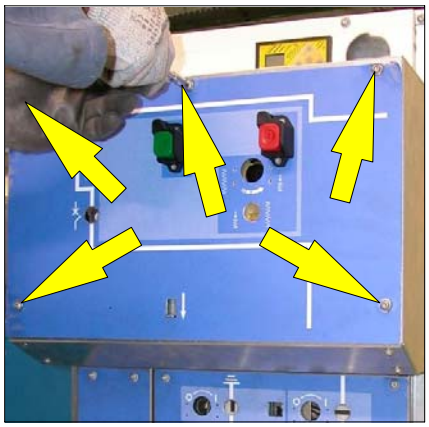
CORRECTIVE MAINTENANCE		Levels		
Replacements or modifications	See chapter	1	2	3
Replacement of the motor (1)	8.7	-	X	X
Replacement of the tripping coil (2)	8.8	-	X	X
Replacement of an under/overvoltage tripping coil (3 and 4)	8.9	-	X	X
Replacement of a fuse striker (5)	8.10	-	X	X
Replacement of the undervoltage tripping coil (6)	8.11	-	X	X
Replacement of a diode bridge (7)	8.12	-	X	X
Replacing the motor electronic control card (8)	8.13	-	X	X
Replacement of a motor reset contact (9)	8.14	-	X	X

8.5 Removal of the protective cover for all maintenance operations

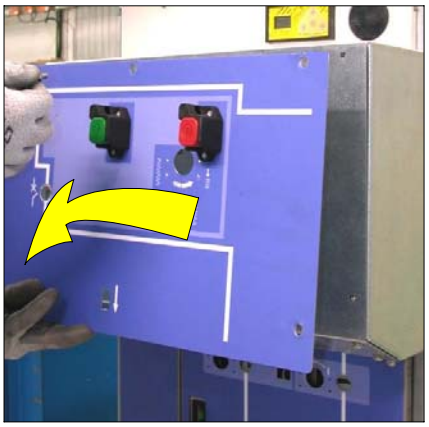
Maintenance operations absolutely must be carried out with the circuit breaker open and the control mechanism deactivated.

Cut off the LV auxiliaries' power circuits,

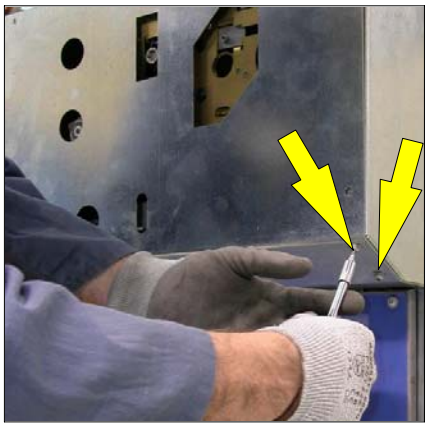
Complete replacement of a C150 control mechanism can only be carried out by AREVA (See § 1.1).



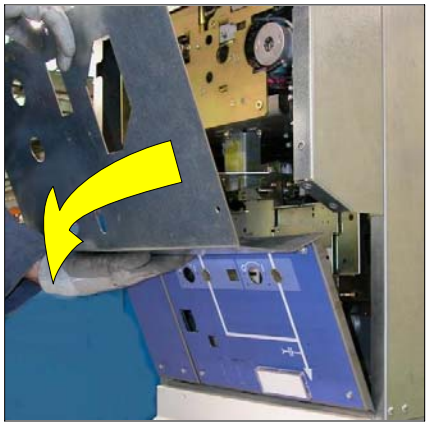
- Unscrew the 5 attachment screws holding the front plates (Allen key - 4mm).



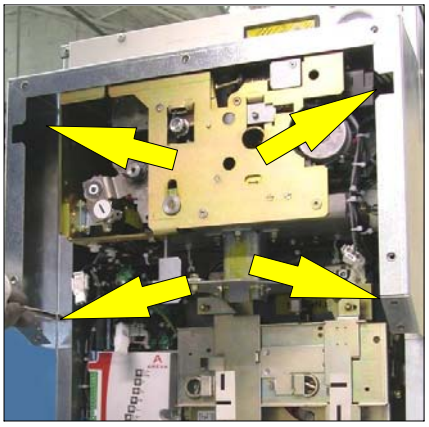
- Remove the plate



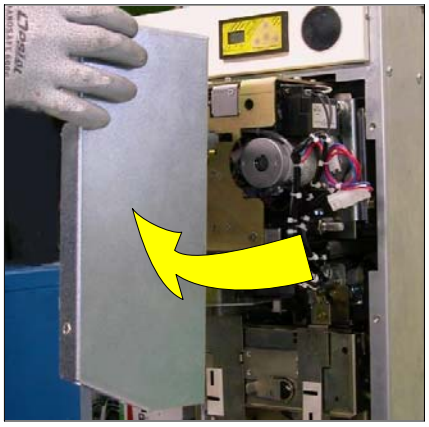
- Unscrew the 4 cover fixing screws (Allen key for hexagonal screws size 4).



- Remove the complete cover and twin front cover assembly.

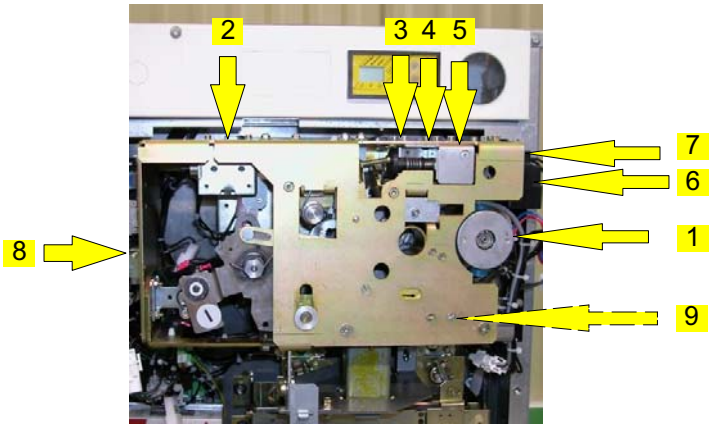


- Unscrew the 4 cover mount fixing screws (Allen key for hexagonal screws size 4).



- Pull off the cover mounts.

8.6 Location of LV components



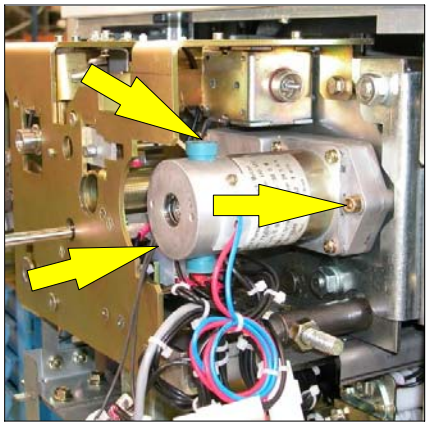
Key

- *1 Motor*
- *2 Closing Coil*
- *3 Tripping Coil on voltage release*
- *4 Tripping Coil on voltage release/application*
- *5 Striker*
- *6 Electronic control board for voltage release coil*
- *7 Diode bridge*
- *8 Electronic motor board*
- *9 Motor rearming contacts*

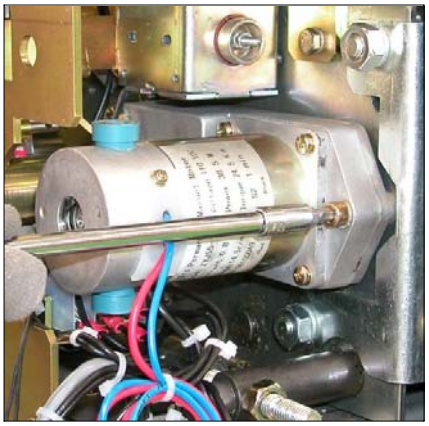
- Location of LV elements

8.7 To replace the motor (1) [See § 8.6)

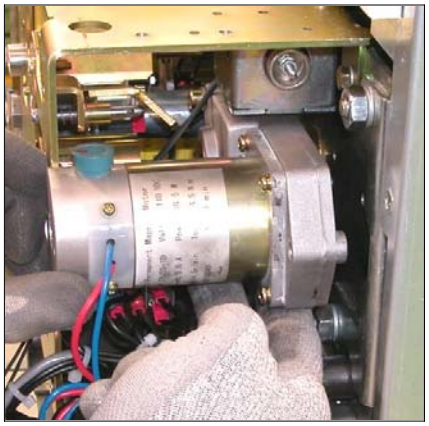
Apply the General Safety Instructions for Electrical Applications and the particular rules for the network concerned for locking out procedures.	Tools required: - Cutting pliers - Allen keys for hexagonal screws size 5 + extension and ratchet wrench	Parts required: - 1 motor of the same reference - 3 washers + 3 mounting bolts - 3 Rilsan cable ties Duration: 1 h 30



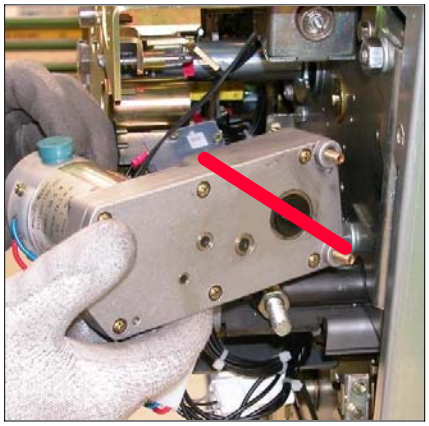
- Disconnect the LV cables from the motor.
- The motor is kept in place by its 3 fixing points.



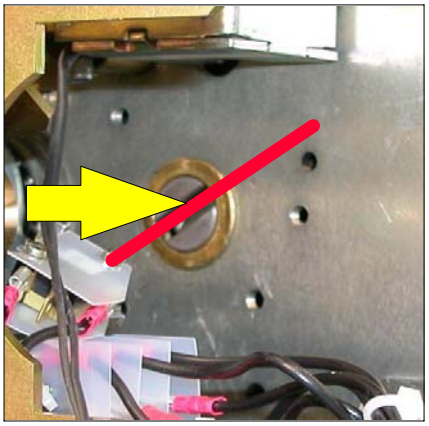
- Unscrew each of the the fixing screws (Allen key for hexagonal screws size 5).



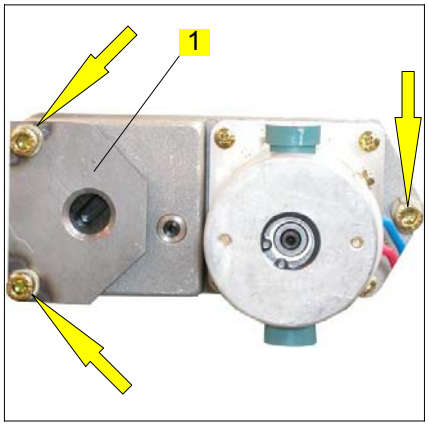
- Remove and extract the motor.



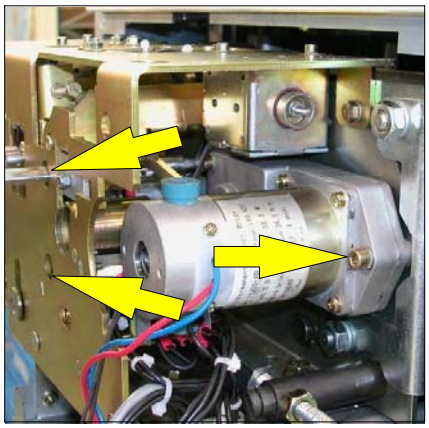
- Present the new motor.
- Identify the drive pin.



- Using the lever, turn the mechanism's shaft clockwise to align the slot with the pin.



- Engage the motor with its centrin device (1) and use the 3 bolts an 3 new washers **supplied.**
- Insert the operating lever to align the centring device and motor drive shaft.

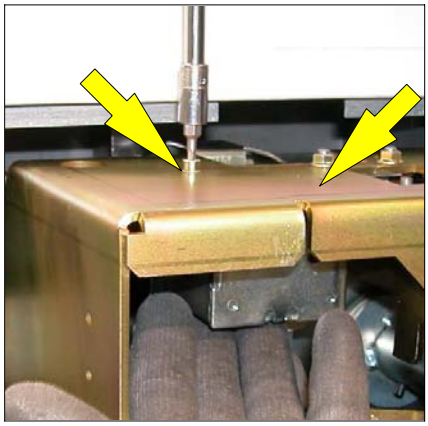


- Make sure that the three mounting points are flat against the partition panel.
- Tighten the fixing bolts.

- Reconnect the motor wires.
- Re-clamp the cables.

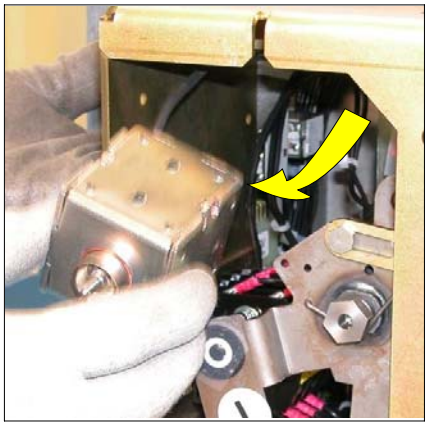
8.8 Replacement of the tripping coil (2) [See Section 8.6]

Apply the General Safety Instructions for Electrical Applications and the particular rules for the network concerned for locking out procedures.	Tools required: - Cutting pliers - Allen key for hexagonal screw size 3 - 2 x open-ended spanners - size 7	Parts required: - 1 coil with the same reference - 2 pre-treated bolts and 2 washers - 3 Rilsan cable ties Duration: 1 h

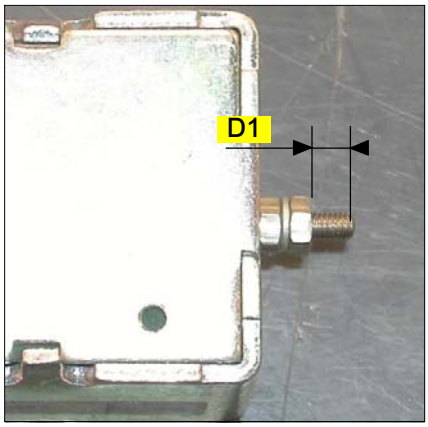


- Hold the coil in place.
- Unscrew and remove the 2 fixing bolts (Allen key of 3 mm).

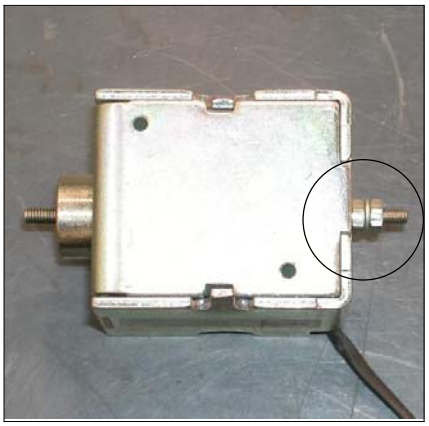
- Cut the fixing collars on the wiring.
- Disconnect the connector from the coil.



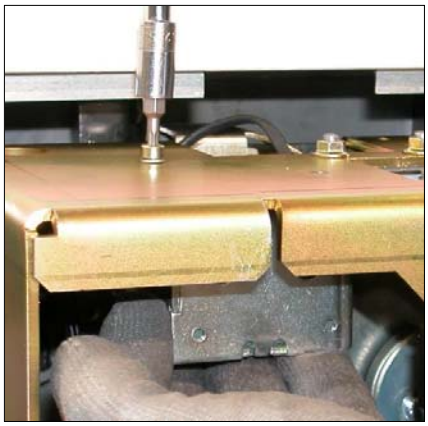
- Extract the coil from the front.



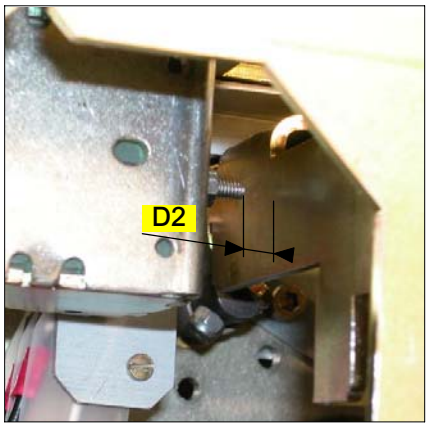
- Measure distance D1 on the removed coil.



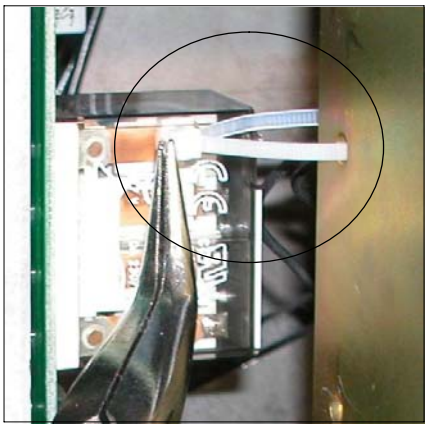
- Measure the same distance D1 on the new coil.
- Tighten the nuts.



- Positioning the new coil.
- Insert and tighten the 2 new mounting bolts **supplied**.



- Make sure that the distance (D2) between the centre of the coil and the drive tab is equal to **4 mm**.



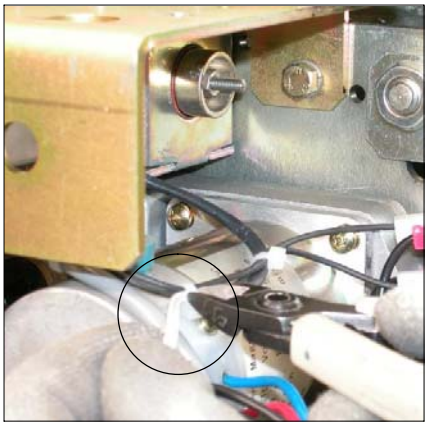
- Reconnect the LV connector.
- Fix the cables in place using Rislan cable ties.

8.9 Replacing an under/overvoltage tripping coil (3 or 4) [See Section 8.6]

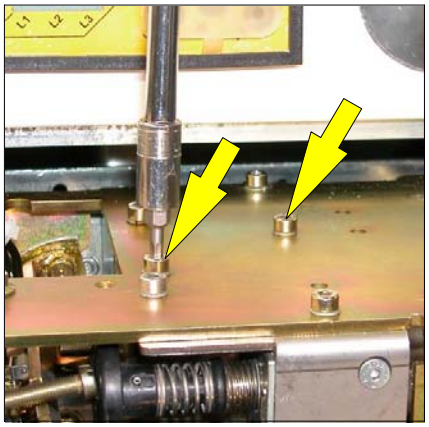
Apply the General Safety Instructions for Electrical Applications and the particular rules for the network concerned for locking out procedures.	Tools required: - Cutting pliers - Allen key for hexagonal screw size 3 - 2 x open-ended spanners - size 7	Parts required: - 1 coil with the same reference - 2 pre-treated bolts and 2 washers - 3 Rilsan cable ties Duration: 1 h

Coil (4) may be either on voltage release/application.

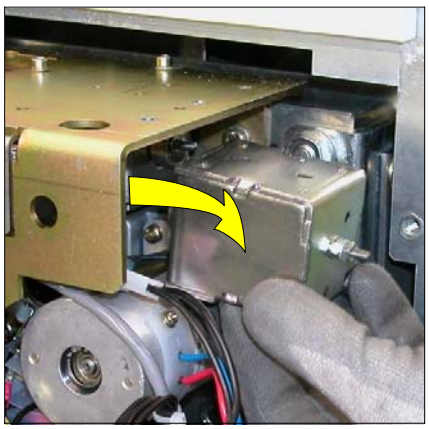
For an undervoltage tripping coil, first remove the coil board (See Section 8.11).



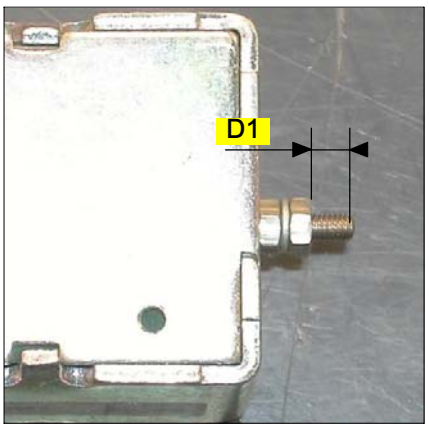
- Cut the fixing collars on the wiring.
- Disconnect the connector from the coil.



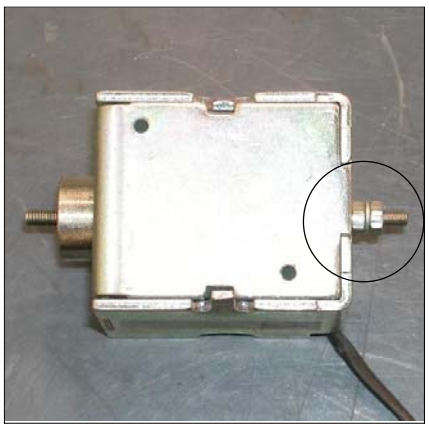
- Hold the coil in place.
- Unscrew and remove the 2 fixing bolts (Allen key of 3 mm).



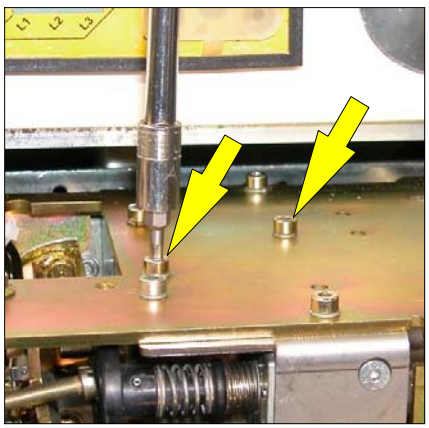
- Note which way round the coil goes.
- Remove this coil from the right hand side.



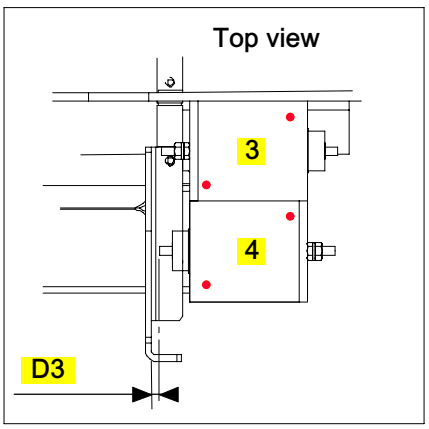
- Measure distance D1 on the removed coil.



- Measure the same distance D1 on the new coil.
- Tighten the nuts.



- Positioning the new coil.
- Insert and tighten the 2 new mounting bolts **supplied**.



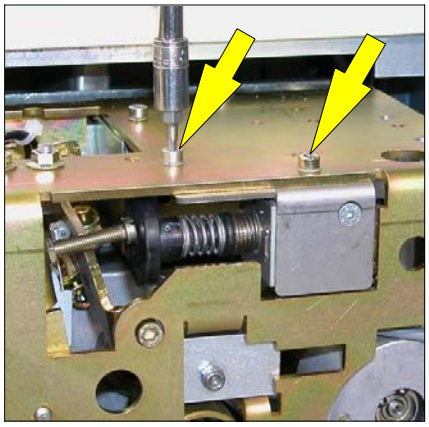
- Make sure that the distance (D3) between the centre of the coil and the trip tab is equal to **3 mm**

- Reconnect the LV connector.
- Fix the cables in place using Rislan cable ties.

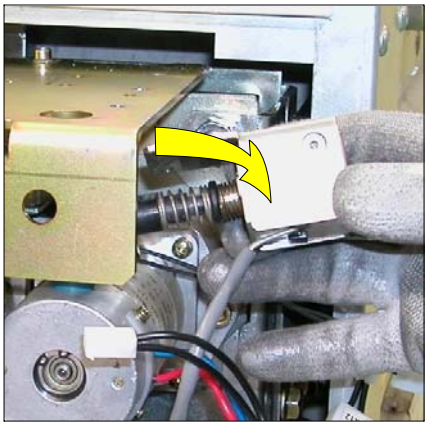
8.10 To replace the striker (5) [See section 8.6]

Apply the General Safety Instructions for Electrical Applications and the particular rules for the network concerned for locking out procedures.	Tools required: - Cutting pliers - Allen key for hexagonals crew size 3 - 2 x open-ended spanners - size 8	Parts required: - 1 striker pin with the same reference - 2 pre-treated bolts and 2 washers - 3 Rilsan cable ties Duration: 1 h

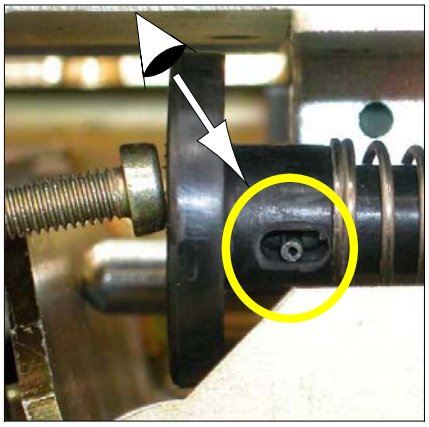
To change the striker (5), first remove the trip coil (4) (See section 8.9).



- Cut the fixing collars on the wiring.
- Disconnect the connector from the striker.
- Hold the striker in place.
- Unscrew and remove the 2 fixing bolts (Allen key of 3 mm).



- Remove the striker from the right hand side.

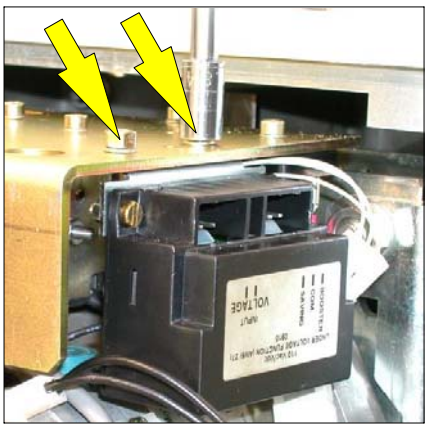


- Position the new striker and press it against the bolt heads.
- Insert and tighten the 2 new mounting bolts **supplied**.
- Reconnect the LV connector.
- Fix the cables in place using Rislan cable ties.

8.11 Replacing the undervoltage tripping coil (6) control board [See section 8.6]

Apply the General Safety Instructions for Electrical Applications and the particular rules for the network concerned for locking out procedures.	Tools required: - Flat headed screwdriver - 8 mm spanner	Parts required: - 1 board of the same reference Duration: 0 h 30

- Using a flat headed screwdriver, loosen the two connectors.

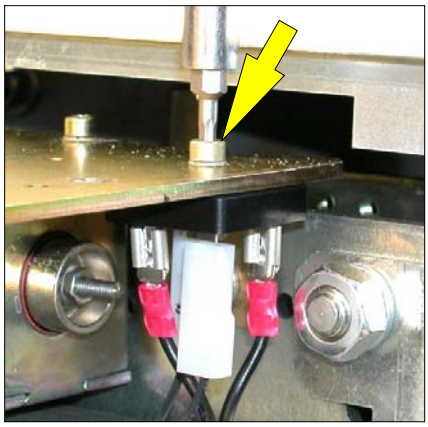


- Unscrew the 2 fixing screws (8 mm spanner).

- Pull out the board.
- Attach and reconnect the new board in its place.

8.12 Replacing the diode bridge (7) [See section 8.6]

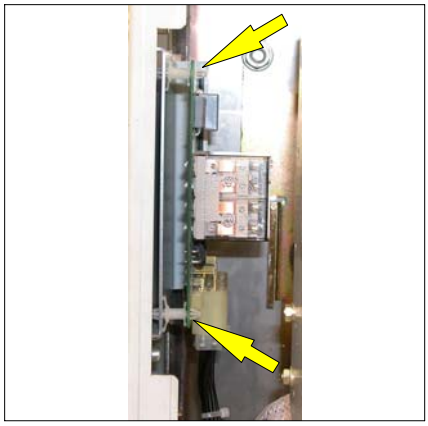
Apply the General Safety Instructions for Electrical Applications and the particular rules for the network concerned for locking out procedures.	Tools required: - Allen key for hexagonal screw size 3 - Flat headed screwdriver	Parts required: - 1 diode bridge of the same reference Duration: 0 h 30



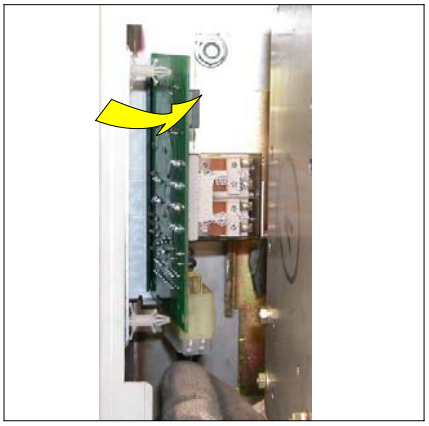
- Unscrew the central bolt holding the bridge in place.
- Replace the diode bridge
- Refit the new bridge in its place.

8.13 Replacing the motor control board (8) [See Section 8.6]

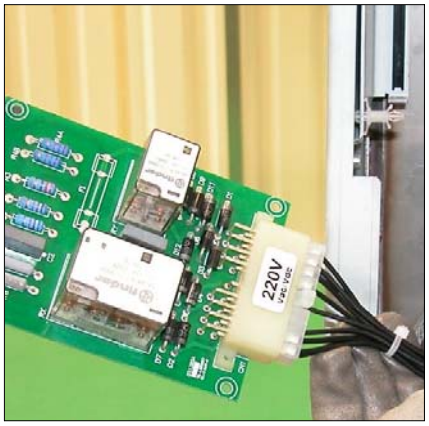
Apply the General Safety Instructions for Electrical Applications and the particular rules for the network concerned for locking out procedures.	Tools required: - Allen key for hexagonal screw size 3 - Flat headed screwdriver	Parts required: - 1 board of the same reference Duration: 1 h 00



- The motor control board is lodged against the left hand upright in the C150 control compartment.
- Press the two pins on the front to free the board.

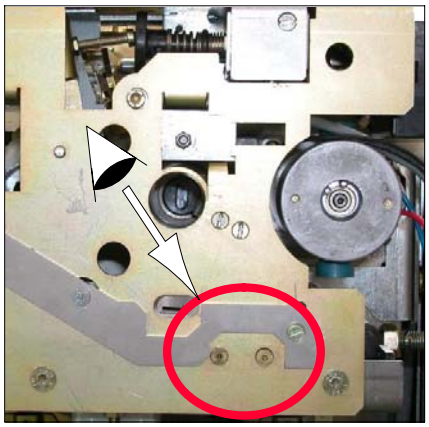


- Lightly push the board aside then pull forwards to free from its rear connector.
- Pull out the board from the bottom.

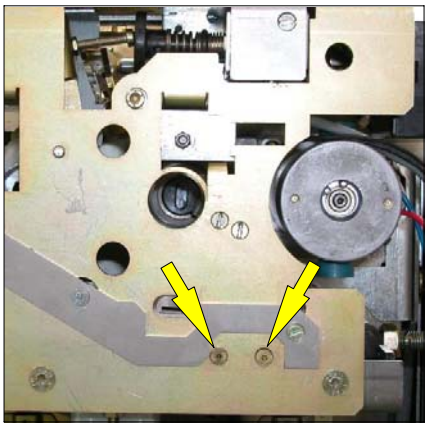


- Disconnect the board.
- Replace the board with one of the same reference.
- Repeat the operations detailed above in reverse to refit the new board.

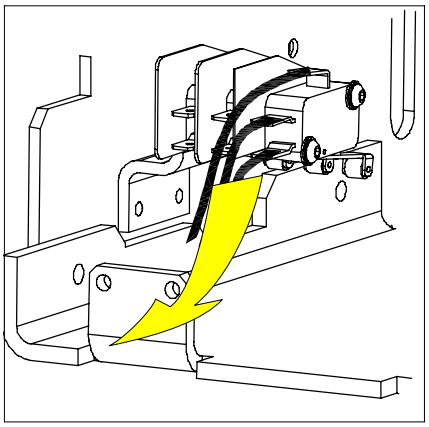
8.14 Replacing a motor re-arming contact (9) [mechanical control tripped and un-armed]



- The motor re-arming contacts are located in the bottom right hand corner of the C150, behind the front panel.

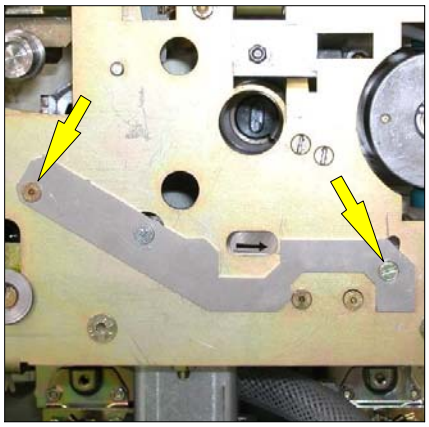


- Loosen then remove the two mounting bolts from the front.

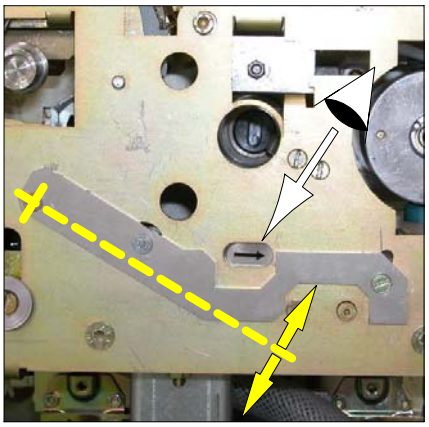


- Remove the contact block.
- Replace the defective contact.
- Refit the block <u>without tightening the bolts</u>.

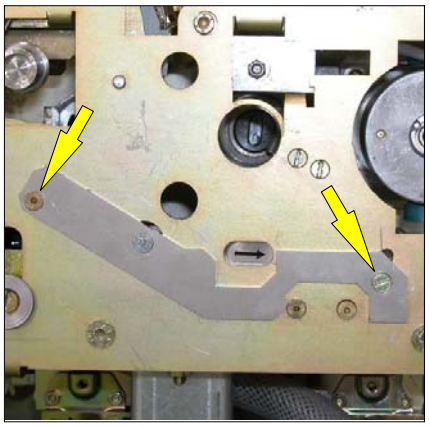
Adjust the motor arming lock before the contacts.



- Loosen the 2 screws on the end of the lock slightly.

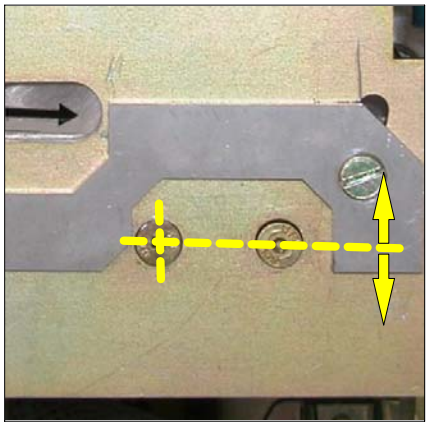


- Turn this lock to align the arrow horizontally in the window.

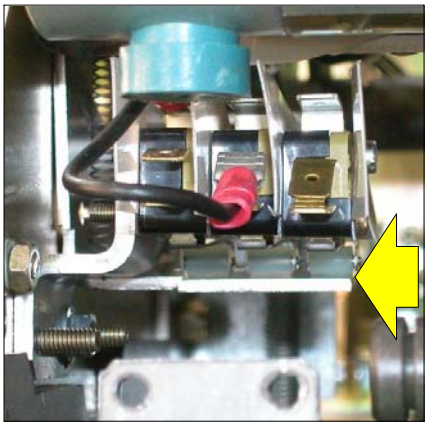


- Once this adjustment has been made, tighten the 2 screws.

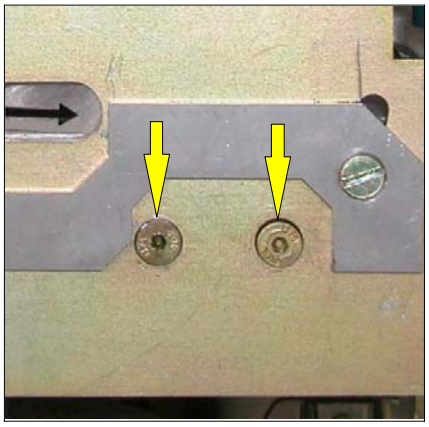
Adjusting the electrical arming contacts.



- Turn the mount to bring the contact tabs into contact with the lock.



- View of the inside of the mechanism: The tabs are pressing against the lock probe.



- Tighten the 2 fixing screws.

9 Spare parts for the circuit breaker

9.1 Intervention levels

For an explanation of the levels of maintenance, please refer to § 8.1.

9.2 The spare part

Describes a part that is designed to replace a corresponding one with a view to re-establishing the original function.

The replacement of these parts can only be carried out by a person who is suitably qualified and trained for this operation.

Exceptional replacement	Denomination	Levels		
		1	2	3
Describes the spare parts or assemblies whose foreseeable service life is at least equal to that of the equipment. Use: Spare parts or sub-assemblies kept in a safety stock.	Tripping coil (closing or tripping operations)	-	X	X
	Undervoltage coil	-	X	X
	Undervoltage coil control card	-	X	X
	Striker	-	X	X
	Diode bridge	-	X	X
	Motor	-	X	X
	Anti-pumping relay	-	X	X
	Operation counter	-	X	X
	Cirrcuit breaker auxiliary contact	-	X	X
	Spring position microswitch	-	X	X
	Microswitch (motor, undervoltage coil, locking)	-	X	X
	Ring	-	X	X
	Fitted C150 control	-	X	X

9.3 Identification and storage of the parts

For all orders for spare parts, it is necessary to enclose the equipment characteristics form.

The components should be stored away from dust, humidity and the sun. In order to facilitate their retrieval, they must be marked by the AREVA reference number.

Certain components are fragile, they should preferably be stored in their original factory packaging.

10 Notes

If you have any comments on the use of this document or on the use of the equipment and services that are described in it, please send us your remarks, suggestions and wishes to:

AREVA Service Technique BP 84019 F-71040 Mâcon Cedex 9 - FRANCE

Fax: 33 (0)3 85 29 36 36

Our policy is one of continuous development. Accordingly the design of our products may change at any time. Whilst every effort is made to produce up to date literature, this brochure should only be regarded as a guide and is intended for information purposes only. Its contents do not constitute an offer for sale or advise on the application of any product referred to in it. We cannot be held responsible for any reliance on any decisions taken on its contents without specific advice.

AREVA T&D
Boulevard de la Résistance BP84019 F-71040 Mâcon Cedex 9 - FRANCE
Tel.: +33 (0)3 85 29 35 00 - Fax: +33 (0)3 85 29 36 36