Outdoor SF_6 Circuit Breaker Type OHB

Instruction for Installation, Service and Maintenance

Ensure compliance of local (site) legal and safety norms

Check that the personnel operating the apparatus have this instruction manual with them.

We recommend that installation and commissioning should be carried out by qualified and authorised personnel.

1.0 Description

Medium Voltage outdoor circuit-breaker type OHB uses Sulphur Hexafluoride gas as insulating and arc quenching medium.

1.1 Design of the circuit-breaker

The circuit-breaker is made up of three separate poles. These consist of three main parts.

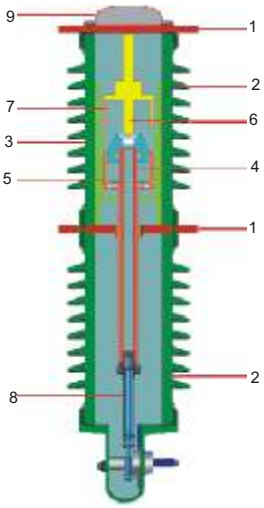
1.1.1. Pole assembly

1.1.2. Cabinet with operating mechanism

1.1.3. Steel structure

1.1.1. Pole assembly

- Pole assembly consists of three poles mounted on a common duct.
- Each pole comprises of a fixed and moving contacts, nozzle assembly, SF6 gas and an insulating pull rod placed in the porcelain housing.
- Each pole is provided with individual pressure switch as per rated pressure for the rated voltage system.
- Robust housing for protection against fire and hazardous conditions.
- Primary terminal connectors can be provided, such as NEMA 4.
- Poles are interconnected with each other as well as to the operating mechanism with a linkage arrangement.



1. Terminal
2. Insulating enclosure
3. Blasting nozzle
4. Moving arc contact
5. Moving contact
6. Fixed arcing contact
7. Fixed contact
8. Insulating tie-rod
9. Cap with vent valve

Sectional view of pole part

Rear view with back cover open

1.1.2. Cabinet with operating mechanism

1.1.2.1 Base Cabinet

The base cabinet is made of painted mild steel. The cabinet houses a spring operated mechanism which is mechanically linked to all three poles. The cabinet also includes the followings:

- Anti-condensation heater
- Circuit breaker status indicator
- Mechanical operation counter
- Breaker control switches
- Anti-pumping relay
- AC / DC fuses, MCBs
- Auxiliary wiring
- Terminal blocks
- Gas pressure monitoring relays

Operating mechanism with electrical accessories

1.1.2.2 Operating mechanism

For high operational reliability and minimal maintenance, a simple and robust spring operated mechanism is used.

Features

- O-C-O operation without recharging
- Closing spring is charged by motor in less than 15 secs.
- Mechanical / electrical anti-pumping
- Provision for manual charging
- Suitable for rapid auto-reclosing
- Manual closing and tripping arrangement
- Mechanical ON - OFF and SPRING CHARGED indication
- Auxiliary switch: 13 NO + 13 NC
- Additional tripping solenoid(optional)

1.1.3. Structure

The breaker is supplied with galvanised steel structure, if ordered, which supports the breaker on the foundation. Additionally, a CT structure can be provided to mount instrument transformers on either side of the circuit breaker.

1.1.4. Standards

The circuit breakers comply with the requirements according to IEC 62271-100.

1.0 Packing Information, Goods marking & Transport

1.1 Goods marking
1.2 Documents
1.3 Transport
1.4 Lifting

2.0 Receipt & storage prior to installation

2.1 General
2.2 Receipt & storage of breaker

3.0 Safety provisions and assembly instructions

3.1 Warning texts
3.2 Safety Precaution

1.0 Packing Information, goods marking & transport

1.1 Goods marking

The circuit-breaker is transported in seaworthy packing in 'OPEN' position in two parts (in most of the cases). The poles with duct is packed in one case and the control cabinet is packed in the other.

The breaker structures (if part of the order) are packed separately.

The CT structures (optional item) are packed separately.

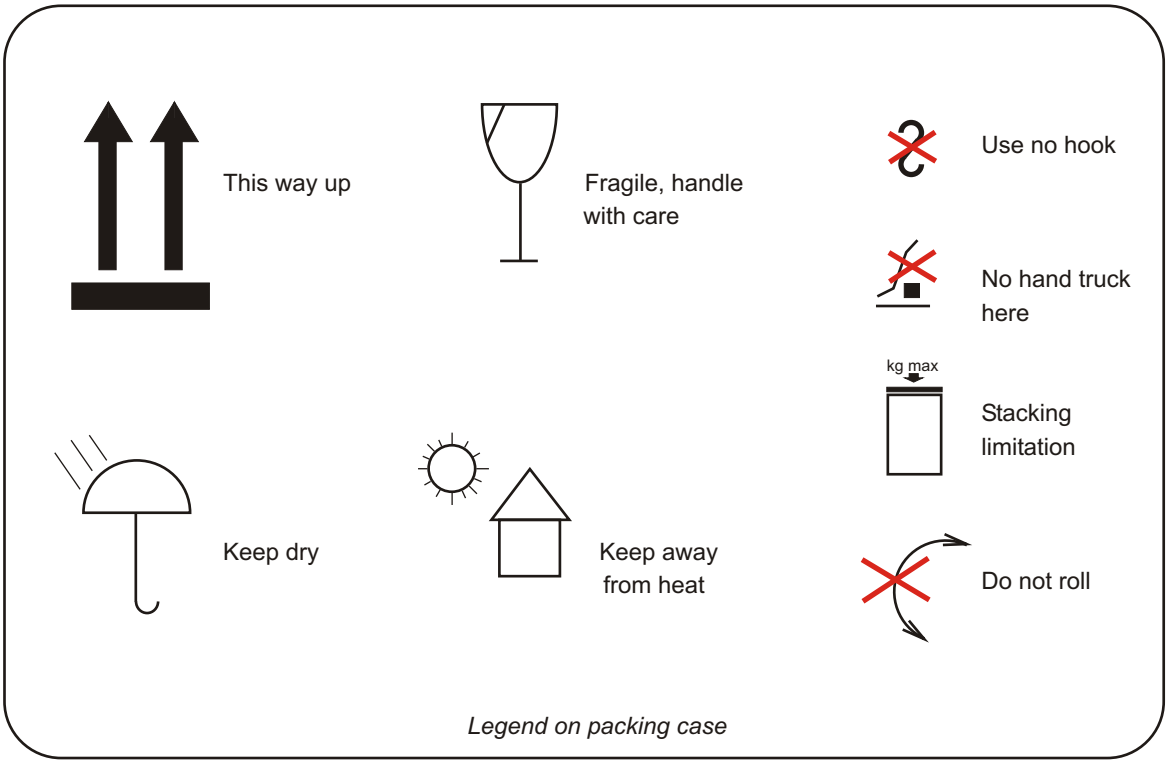
Each case is marked with case markings on two sides with indelible black ink. The case markings include information of case number, gross weight, etc.

In addition to the above, the cases are marked with the following symbols. These should be observed when choosing lifting equipment.

1.2 Documents

Following documents are packed with breaker:

- Instruction manual
- Test certificates
- Drawings
- Packing list



Legend on packing case

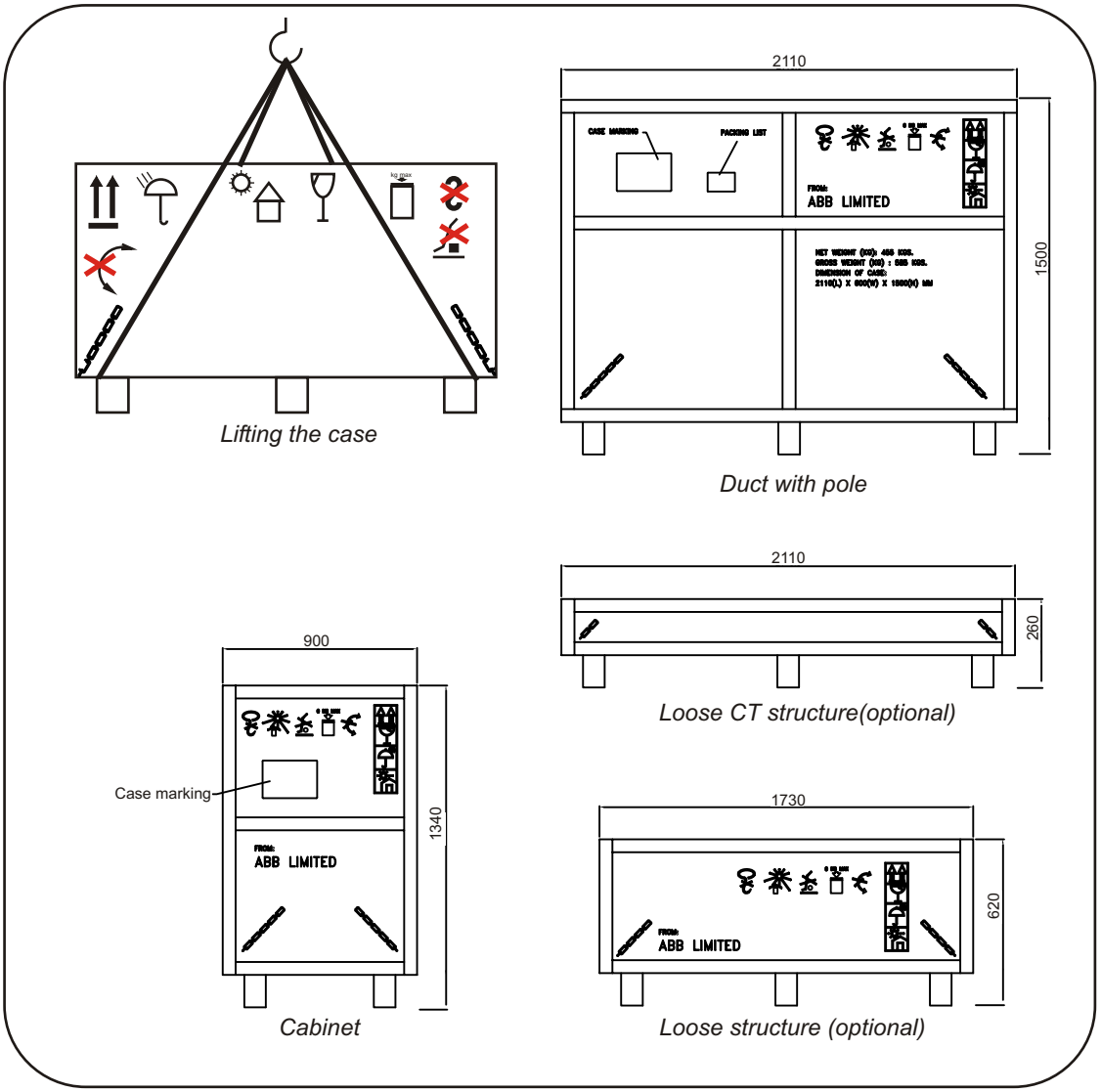
1.3 Transport

The circuit- breakers shall be transported in packed condition only. Following precautions are to be taken while transporting:

- Ensure that packing cases are not placed on wet surfaces / waterlogged areas.
- Breakers should not be stacked one over the other.

1.4 Lifting

Before lifting the case, observe the information on it (such as symbol, weight, etc.). The cases shall be Lifted by a lifting device equipped with forks or slings. If a crane is used, slings shall be used. The units must not be rolled or dropped.



Lifting the case

Duct with pole

Loose CT structure(optional)

Cabinet

Loose structure (optional)

2.0 Receipt & Storage prior to installation

2.1 General

The breaker with complete packing should always be stored indoor to protect from direct sunlight & rain/snow.

Breakers can be stored upto 3 months from date of shipment from the factory. For longer storage, the packing needs to be removed and the breaker be kept under controlled environmental conditions.

We define storage in controlled conditions as a place with :

- Leak proof roof
- Solid, flat ground
- Relative humidity less than 50%
- Temperature 20°C (± 10° C)

2.2 Receipt & Storage of Breaker

Each delivery, on receipt, should be checked for:

- Shortages and discrepancies. (Check against order and delivery documents).
- Any transit damage and material losses.
- Abnormality, if any, must be notified immediately to: ABB, forwarding agents and the insurance company.

The operating cabinet should be unpacked on arrival. If it is not going to be stored in an approved storage the heating elements must be connected permanently to the electric supply to protect the control equipment from corrosion or freezing damage.

The breaker with duct & poles should be stored in their original transport units, where they are well protected from damage. The breakers if stored outdoors, should be well covered with tarpaulin. The tarpaulin should not be placed directly on breaker. An air gap should be left to prevent condensation.

The minimum allowed ambient temperature for the Outdoor SF6 Circuit Breaker is (-)25°/ (-)40°C(optional).

Structures may be stored outdoors. Spare parts should be stored indoors in a recommended storage area in their original packing.

3.0 Safety provisions for circuit-breaker

The entire assembly instruction should be read carefully before starting the assembly work.

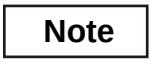
3.1 Warning texts

Warning texts are stated in 5 different degrees of urgency, which should be carefully observed. These are described below:

DANGER indicates an immediate risk situation that can lead to death or serious personal injury if not avoided.

Warning indicates a risk situation that can lead to death or serious personal injury if not avoided.

Caution indicates a risk situation that can lead to small or moderate damage



Note is used when there is danger that can lead to equipment damage only

Important indicates an operation or a suggestion for handling

Before carrying out any operation, always make sure that the operating mechanism springs are discharged and that the apparatus is in the open position. On receipt, check the state of the apparatus, that the packing is undamaged and that the nameplate data corresponds with that specified in the order acknowledgement and in the delivery note.

3.2 Safety Precaution
When working on high-voltage circuit breaker the below-mentioned risk must be taken into consideration and corresponding safety measures taken.

RISK	SAFETY MESAURES
1) Work next to high voltage	Warning plate is placed inside the door of the operating device. Disconnect all electrical supply. Connect earthing devices near the workplace. If work must be carried out near energized parts of the plant, it has to follow local safety regulation of the organization responsible for the circuit breaker.
2) Work on ladders and platforms	The work shall follow the directions of the authority for occupational safety and health. Avoid work in severe weather conditions, which entails a great deal of climbing for short periods.
3) Work with low- voltage. Both D.C. and A.C. Voltage may be drawn to the operating device.	Do not connect control supply and heater voltage until all connection work is completed.
4) Risk in operating mechanism and link system The spring operated device has energy stored in the operating spring, when it is in charged condition. The device can be activated by heavy vibrations or unintentional, slight touch on mechanical latch parts.	Warning plate is placed on the supporting frame. No work must be carried out unless the closing and opening springs are discharged, the circuit-breaker is in position OFF “0” and the supply to the motor is disconnected. The operating mechanism must not be operated unless it is connected to the circuit / poles.
5) Work on pressurized porcelain Insulators. The breaker contains SF_6 gas at high pressure. Damages in the porcelain can cause risk of the porcelain breaking.	Work close to the insulators of the circuit breaker that entails risk of porcelain damage must not be carried out until the gas pressure has been lowered to 1.0 bar absolute pressure.

General

1.0 Technical details
- 1.1 Type designation
- 1.2 Specifications
- 1.3 Rating plate

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- **2.1 Information on SF_6 gas and gas mixture type SF_6 / N_2**

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General

1.0 Technical details

This operating instruction is applicable for Outdoor circuit Breaker type OHB.

1.1 Type designation

Outdoor Vacuum Circuit Breaker

OHB 36 16 25

Type OHB

Rated voltage –
24 for 24kV
36 for 36kV
40 for 40.5kV

Rated normal current -
12 for 1250 Amp
16 for 1600 Amp
25 for 2500 Amp

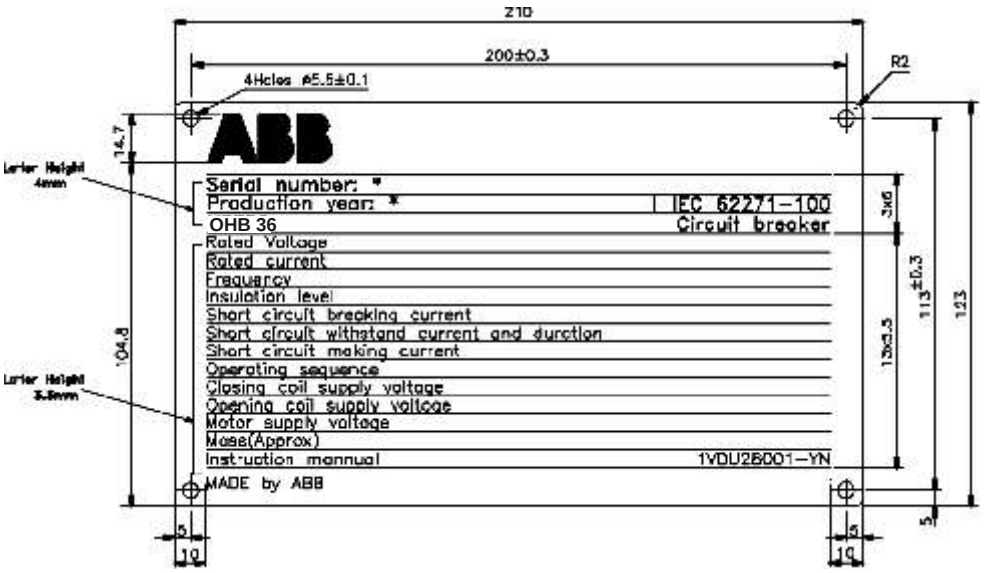
Rated breaking capacity
25 for 25kA
31 for 31.5kA

1.2 Specifications

Type	OHB 24	OHB 36	OHB 40.5
Standard	IEC – 62271-100		
Rated voltage	24kV	36kV	40.5kV
Frequency	50 Hz		
Insulation level	70/150kVp	95/200kVp	95/200kVp
Normal current	1250 / 1600 / 2000 / 2500 Amps		
Short circuit breaking current	25 / 31.5kA		
Operating sequence	0-0.3S-CO-3 Min.-CO		
Weight	800 kg		
Rated gas pressure (abs)	3.8bar	3.8bar	5.5bar*

*2.2bar abs. at the time of despatch

1.3 Rating plate



2.0 Breaker details

The circuit breaker type OHB is a three pole SF_6 circuit breaker and designed in a column type construction with "spring stored energy operating mechanism" as shown in Standard General Arrangement drawing (refer Fig.1a, b & c).

2.1 Information on SF_6 gas and gas mixture type SF_6 / N_2

OHB Breakers are filled up with SF_6 gas at rated pressure.

Sf_6 gas is the media used for quenching the arc developed during the current breaking and also to provide adequate insulation for OHB type circuit breaker and it is one of the predominant gas for the circuit breakers of Puffer and Auto-Puffer ™ type.

At Low ambient temperatures below -30°C, there is a risk of SF_6 gas getting condensed, resulting in drastic density changes. The temporary condensation at low temperature is not dangerous but can cause problems in density monitoring and temporarily, some reduction of breaking capacity.

Suggested way to avoid this is to fill the same with Gas mixtures i.e., the mixture of SF_6 and Nitrogen gas.. i.e, to fill the SF_6 at the lower density. For installation requiring ambient temperatures between - 25°C and -40°C, Nitrogen will be filled up to the rated density requirements of the breaker there by the density monitoring are effectively controlled.

Mixing Proportion

For OHB 40, the recommended density of filling SF_6 up to -25 °C is 0.55 MPa. For operating up to a range between -25 °C, -40 °C, the following proposition is suggested (Filling pressure).

Gas Mixture: SF_6 / N_2
Lowest Ambient - 40 °C.
Filling pressure (absolute at +20 °C) =
0.385 Mpa SF_6 + 0.165 Mpa N_2

Mixture Filling.

Mixed gas is always lilled in such a sequence that SF_6 is filled first and then nitrogen gas is filled up to rated pressure at +20°C according to the rating plate.

By filling SF_6 first, a satisfactory gas mixture, without layers of gas, is always obtained. Otherwise the mixing process takes long time since it is based on diffusion and convection. In the event of gas loss, refill with correct mixing proportions and always with SF_6 gas first..

Measurement of Mixing Proportions

Mixing proportion for mixed filled can be measured by DILO SF_6 percentage measuring Device 3 -027. The instrument is calibrated for SF_6 / N_2 gas mixture and it shows directly on the display, the volume of the SF_6 part.

3.0 Function

The standard schematic circuit diagram of the breaker shown is in Fig.2 (please refer order bound drawings for details).

3.1 Switching operations

As supplied from ABB the circuit breaker will be in open position and closing spring in discharged condition. When the control supply is given to the breaker, closing spring will get charged automatically by means of spring charging motor.

3.2 Closing operation

To close the circuit breaker the “CLOSE" control element is actuated either electrically through the closing coil or mechanically through push button arrangement. This enables the, spring stored energy mechanism to release the spring energy, through the linkage system, which rotate the common shaft. The rotation of the common shaft moves the moving contact of all the poles upward through the operating stud, closing the circuit breaker. This movement also exerts the required contact pressure on the moving contact.

3.3 Opening operation

To open the circuit breaker, the "OPEN" control element is actuated either electrically through the opening coil or mechanically through push button arrangement. This enables the spring stored energy mechanism to release the spring energy through the linkage system, which rotate the common shaft in opposite direction. This rotation forces the moving contact of all the poles to move downward, opening the circuit breaker.

3.4 Operation under low pressure

Whenever, the gas pressure inside the pole gets reduced in abnormal conditions, pressure switch contact enable gas monitoring relay, which can be used for alarm and tripping of breaker (as per approved drawings).

4.0 Installation

General

As supplied from ABB the circuit breaker are complete in all respect with all the necessary settings for smooth and trouble free operations of the circuit breaker All the moving parts of the circuit breaker are positioned correctly coupled together and they are well secured with the fasteners.

It is recommended to use standard tools and standard practices for lifting and transport of the circuit breaker at time of installation so as to avoid mechanical damage of the pole parts. In general the unpacking and lifting of the circuit breaker shall be done as explained and given in clause 4.2.

4.1 Preparations

The following are to be made available --

An erection crane with a load carrying capacity of about 1500 kg, and a crane hook with height of at least 4 m (= 13 feet) above the floor.

- Lifting ropes.
- Dimension drawings, installation drawings, wiring and circuit diagram.
- Torque wrench for a range of 6-100 NM
- Circlip pliers.
- Commercially available set of open and ring spanners size from 7 mm to 43 mm.
- Cleaning and working material like cloth etc.
- Conducting grease.
- Spirit level.

4.2 Installation procedure

4.2.1 Installation of Breaker with cabinet attached to the pole duct

Circuit Breaker can be transported in three parts as explained below.

1 Cabinet with Spring-Mechanism Drive & Electrical wiring & apparatus.
2 Duct-with-Poles and the inter-pole-links.
3 Structure Assembly

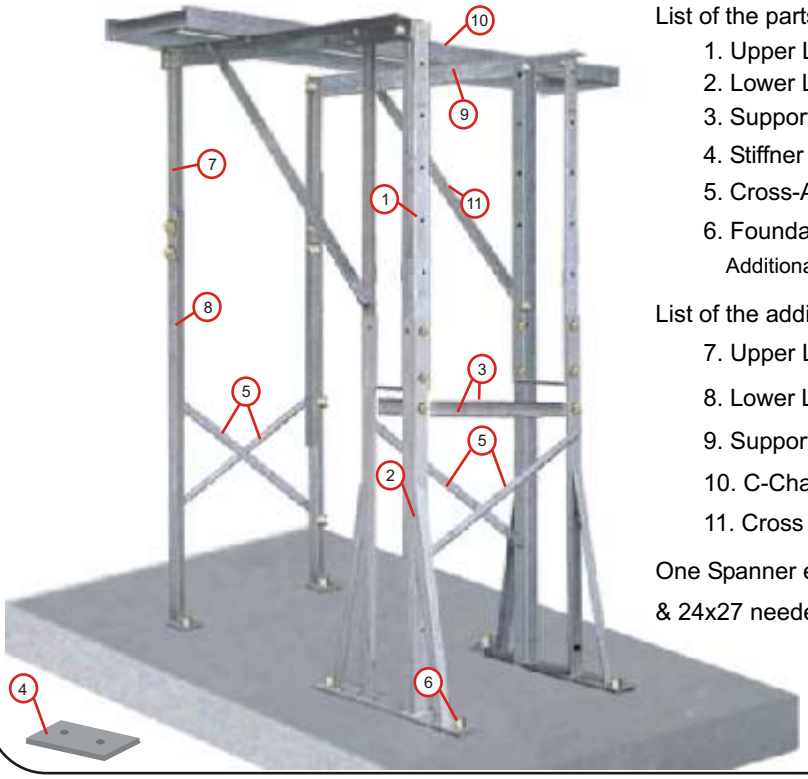
In some cases CB is transported in two cases
1. Complete CB
2. Structure assembly.

Before delivery, both Tripping and Closing Springs are discharged and Circuit Breaker kept in OPEN position. Before starting installation ensure that foundation with Foundation Bolts as per drawing is ready [Refer Fig.1a, 1b & 1c].

4.2.1.1 Unpacking of structure

- Place the case horizontally on a flat surface before opening the cover.
- Check that all parts are included in the delivery. Check the packing list.
- Check that no parts have been damaged during transport; especially the porcelain insulators.
- Report any faults immediately to the ABB representative.

4.2.1.2 Various parts of Structure assembly:



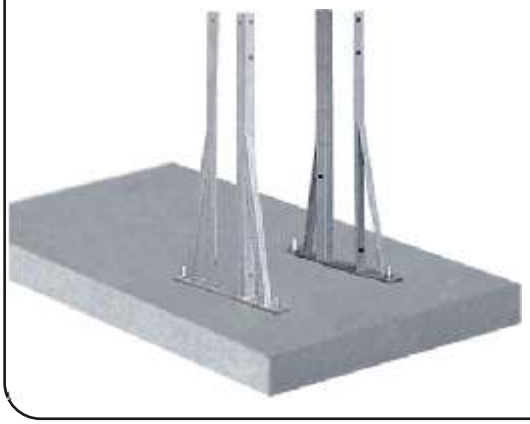
List of the parts of structure
1. Upper Leg Assembly- 2 Nos
2. Lower Legs Assembly - 2Nos
3. Support Angles - 2 Nos
4. Stiffner - 2 Nos
5. Cross-Angles. – 4 Nos
6. Foundation Bolts- 4 Nos [2 Nos Additional for CT structure]

List of the additional parts for CT structure
7. Upper Leg Assembly – 2Nos
8. Lower Leg Assembly – 2 Nos
9. Support Angles – 2 Nos
10. C-Channel for C.T/P.T.- 1 No
11. Cross Angles – 2 Nos.

One Spanner each [open & ring] of size 18x19 & 24x27 needed to assemble the structure

Parts of structure assembly

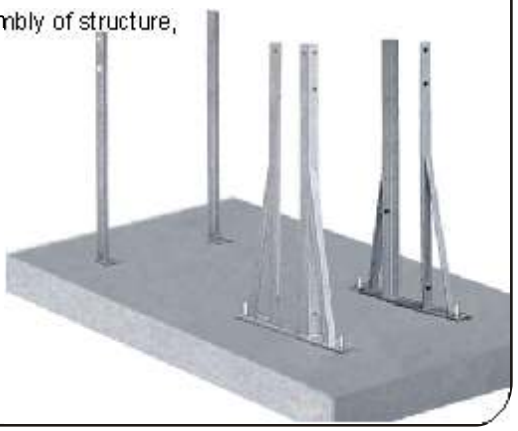
4.2.1.3. Assembly sequences for Structure :



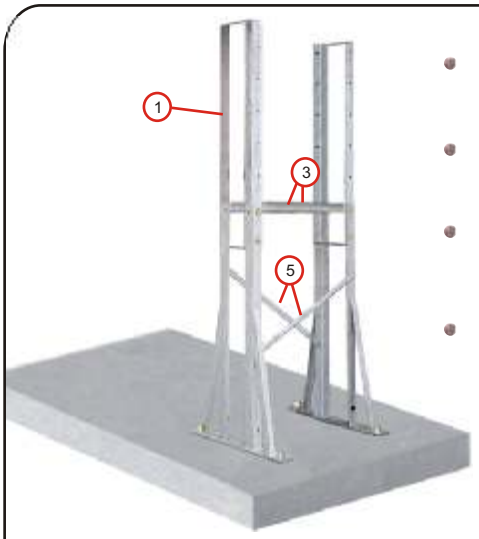
- Fix the Lower Leg Assembly as shown.
- Fix M20 Plain Washer, Spring Washer & Hex nut or Expansion Bolts in case the foundation is with Expansion bolts.
- Keep Nuts slightly loose for flexibility during entire Assembly of structure.

Arrangement without CT structure

- Fix the Lower Leg Assembly as shown
- Fix M20 Plain Washer, Spring Washer & Hex nut or Expansion Bolts in case the foundation is with expansion Bolts.
- Keep Nuts slightly loose for flexibility during entire assembly of structure,
- Fix Lower Legs of CT Structure Assembly [optional]

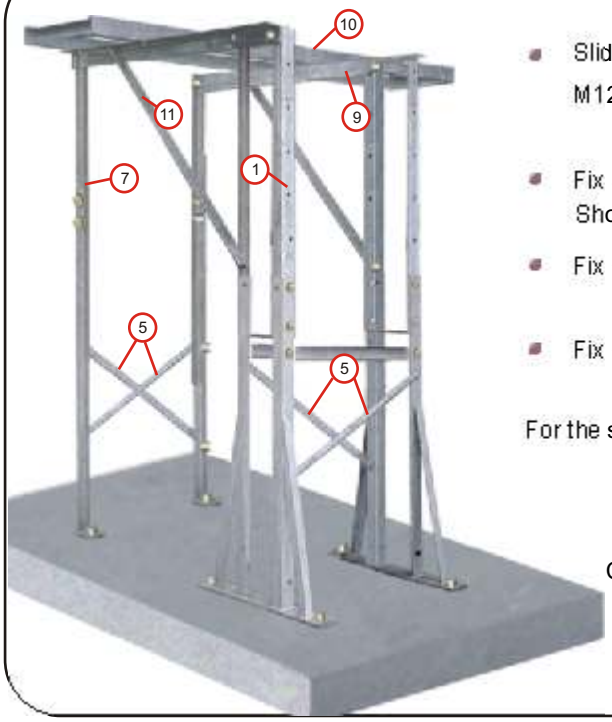


Arrangement with CT Structure [Optional]



- Fix Cross-Support Angles (5) as shown using M12 bolts, spring washers, plain washers & Hex Nuts.
- Slide Upper Leg Assembly (1) into Lower Leg Assembly to required height.
- Fix Support Angles(3) as per the order bound GA drawing and M12 bolts, spring washers, plain washers & Hex Nuts.
- For the sake of flexibility, do not fully tighten the fasteners.

Circuit Breaker Structure Assembly



- Slide Upper Leg (7) in Lower Leg assembly & assemble using M12 bolts, spring, washers, plain washers & Hex Nuts.
- Fix Support-Angles(9) on Upper Leg Assembly(1) & (7) as Shown
- Fix Cross-Angles (11)
- Fix CT Frame(10) on the Support Angles(9)

For the sake of flexibility, do not fully tighten the fasteners.

Circuit-breaker Structure Assembly with CT structure

4.2.1.4 Dismantling of Cases

4.2.1.4.1 Unpacking of Cabinet

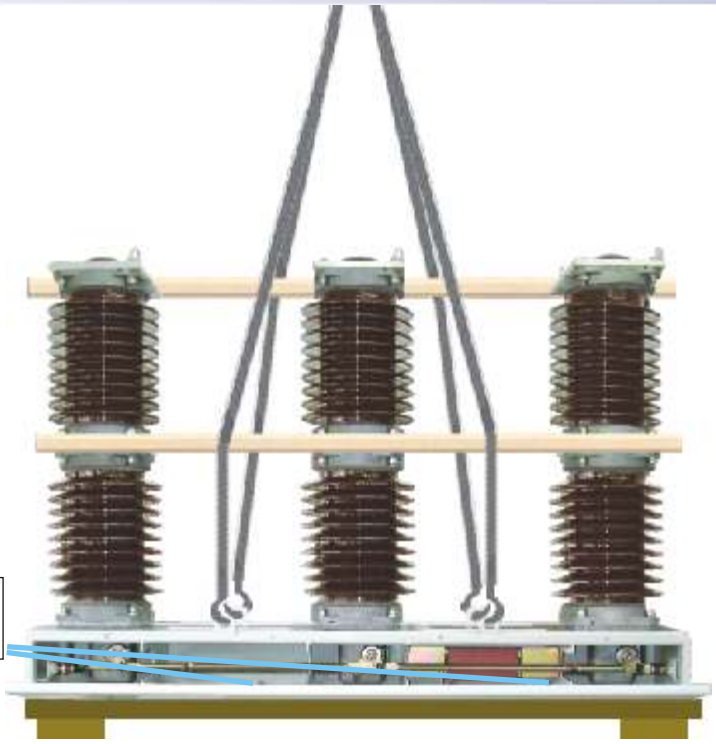
Cabinet in wooden case

For assembly

- Remove top & all side covers of packing case containing Cabinet Assembly.
- Remove Vacuum sealing, if provided.
- Do not remove the bottom pallet.

4.2.1.4.2 Unpacking of Duct & Pole Assembly

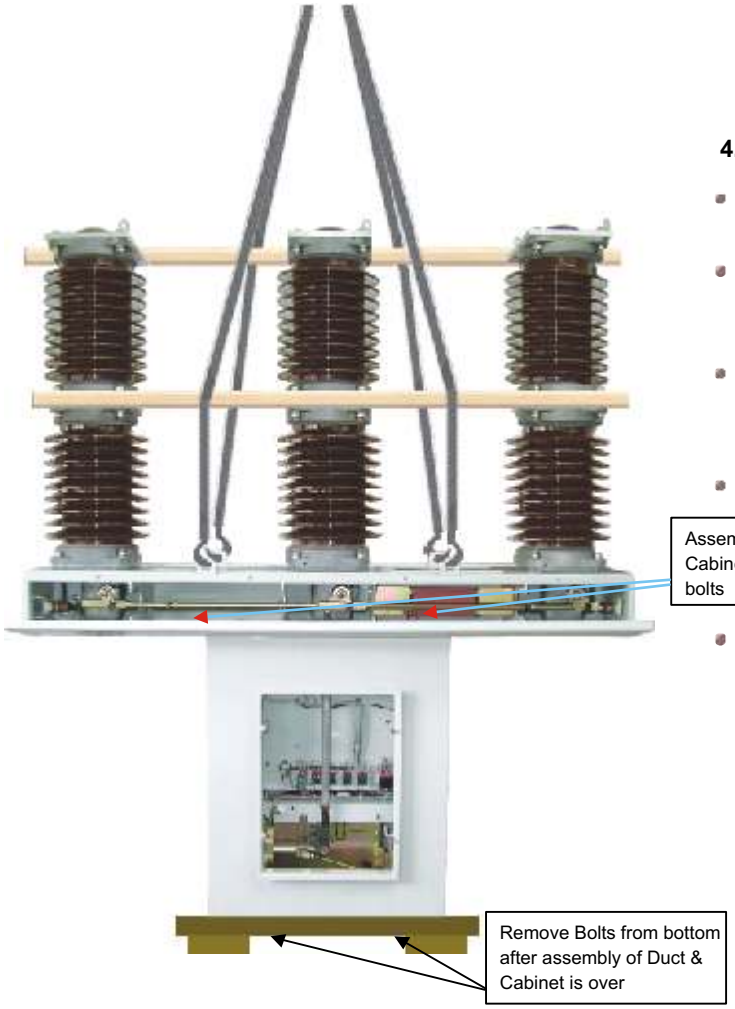
- Remove top & all side covers of casing containing Poles-with-Duct assembly.
- Remove Vacuum sealing, if provided.
- Hold Poles-with-Duct Assembly by lifting crane as as shown.
- Remove the M8 Bolts from the rear covers of the Duct & open the rear cover.
- Remove bolts fixed to the bottom packing pallet.
- Do not remove the wooden batons.



Unpacking of Poles-with-Duct Assembly

4.2.1.5 Assembly of Duct-with-Poles on Cabinet :

- Lift entire assembly, match 4 holes with cabinet and place it slowly on the cabinet.
- Assemble Poles-with-Duct & Cabinet together using M12 bolts, spring washers. M12 nut are welded to the cabinet
- Remove the bolts from the pallet as shown [Bolts can be removed without opening the Cabinet]
- Connect drive link as per 4.2.1.6



- Lift the entire assembly to the ready structure.

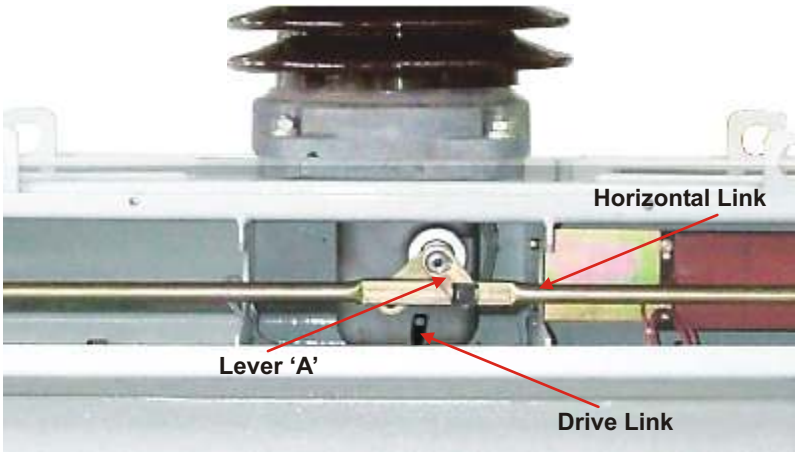
Assembly of Poles-with-Duct & Cabinet

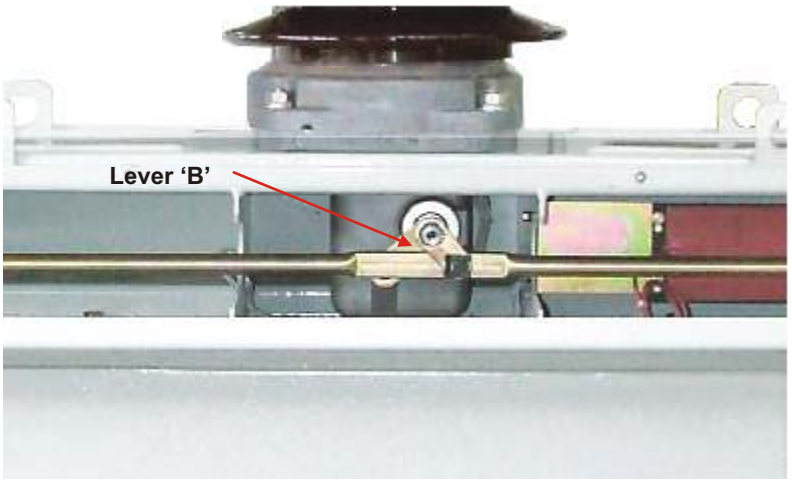
4.2.1.6 Assembly of the drive link to connect operating mechanism to the poles

- Refer figures below before going for assembly.
- The drive link will protrude inside the duct loosely.
- Remove U-clips and pins of all three poles.
  Remove lever 'A'.
  Remove horizontal link.
- Connect drive link with lever 'B' (with U-clips and pins).
- Re-connect horizontal link, lever 'B' and refit the U-clips.

Caution

DO NOT DISTURB THE LENGTH SETTING OF THE DRIVE LINK WHILE FITTING. IT IS FACTORY SET FOR OPTIMUM OPERATION.



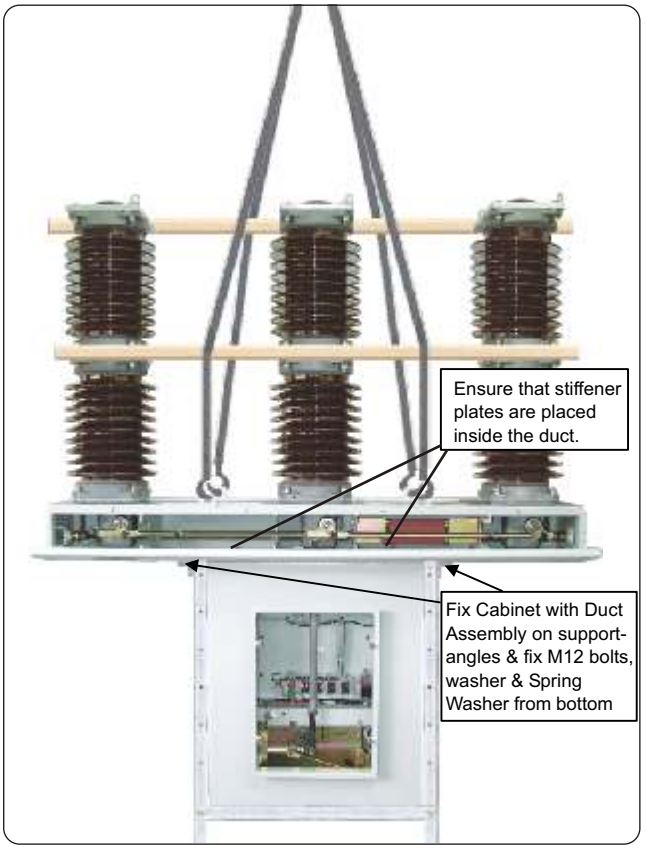


Drive link assembly

4.2.1.7 Assembly of entire Circuit-Breaker on structure

- Refer figure below before assembly.
- Slowly lower the Circuit-Breaker in such a way that the Cabinet enters inside the Upper Leg Assemblies & rests on the support angles & the Duct rests on the Upper Leg Assemblies of structure.
- Ensure that stiffener plates are present inside the duct before tightening the duct.
- Engage Cabinet with the support angles. Fix M12 bolts, spring washers, plain washers from bottom of the support angles. [M12 Nuts are welded inside the cabinet]
- This completes the assembly.

Now fasten all hardware; do not remove slings until all hardware are fastened fully.
Carry out the pre-commissioning test as described.



Fixing of the Breaker on the structure

Breaker mounted on structure at lower height

4.2.2 Installation of Breaker with cabinet at lower height

Circuit Breakers are be transported in three parts as explained below.

1 Cabinet with Spring-Mechanism Drive & Electrical wiring & apparatus.
2 Duct-with-Poles and the inter-pole-links.
3 Structure Assembly and connecting drive link & pipe assemblies.

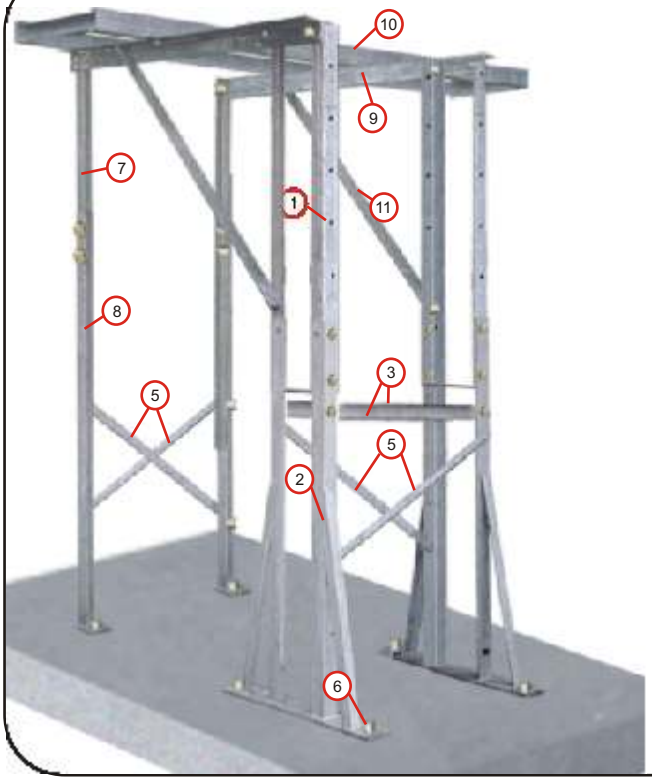
Following additional items are supplied and to be used for installation of control cabinet at lower height:

- Extended Drive-link
- Cover for driver-link
- Top support angle

Before delivery, both Tripping and Closing Springs are discharged and Circuit Breaker kept in OPEN position.

Before starting installation ensure that foundation with Foundation Bolts as per drawing is ready (Refer Fig.1a, 1b & 1c .

4.2.2.1 Various parts of Structure assembly:



List of the parts of structure

1. Upper Leg Assly- 2 Nos.
2. Lower Legs Assly – 2Nos
3. Bottom Support Angles(front and rear) 2 Nos
4. Top Support Angles(front and rear) 2 Nos (Not shown in illustration)
5. Cross-Angles. – 4 Nos
6. Foundation Bolts- 4 Nos [2 Nos Additional for CT structure]

List of the additional parts for CT structure

7. Upper Leg Assly – 2Nos
8. Lower Leg Assly – 2 Nos
9. Support Angles – 2 Nos
10. C-Channel for C.T/P.T.- 1 No
11. Cross Angles – 2 Nos.

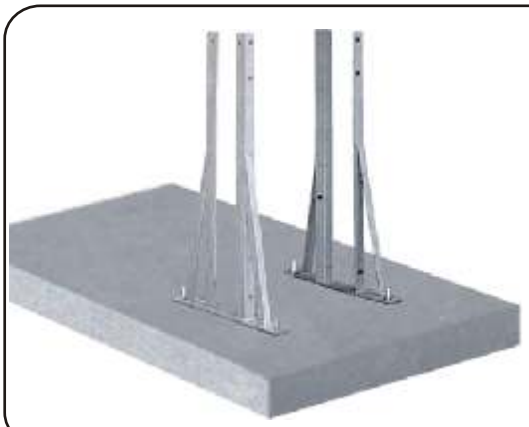
One Spanner each [open & ring] of size 18x19 & 24x27 needed to assemble the structure

Parts of structure assembly

4.2.2.2 Unpacking of structure

- Place the case horizontally on a flat surface before opening the cover.
- Check that all parts are included in the delivery. Check the packing list.
- Check that no parts have been damaged during transport; especially the porcelain insulators.
- Report any faults immediately to the ABB representative.

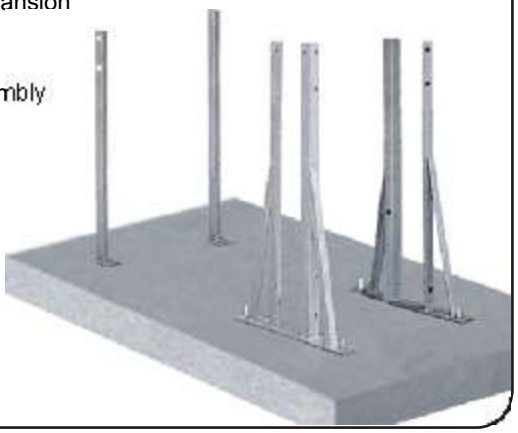
4.2.2.3 Assembly sequences for Structure :



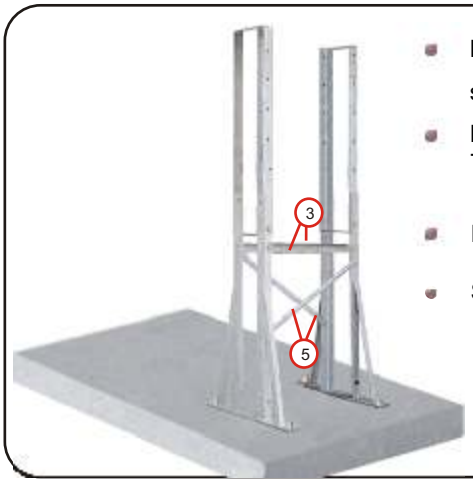
- Fix the Lower Leg Assly as shown.
- Fix M20 Plain Washer, Spring Washer & Hex nut or Expansion Bolts in case the foundation is with Expansion bolts.
- Keep Nuts slightly loose for flexibility during entire Assembly of structure.

Arrangement without CT structure

- Fix the Lower Leg Assly as shown
- Fix M20 Plain Washer, Spring Washer & Hex nut or Expansion Bolts in case the foundation is with expansion Bolts.
- Keep Nuts slightly loose for flexibility during entire assembly of structure,
- Fix Lower Legs of CT Structure Assembly [optional]



Arrangement with CT Structure [Optional]



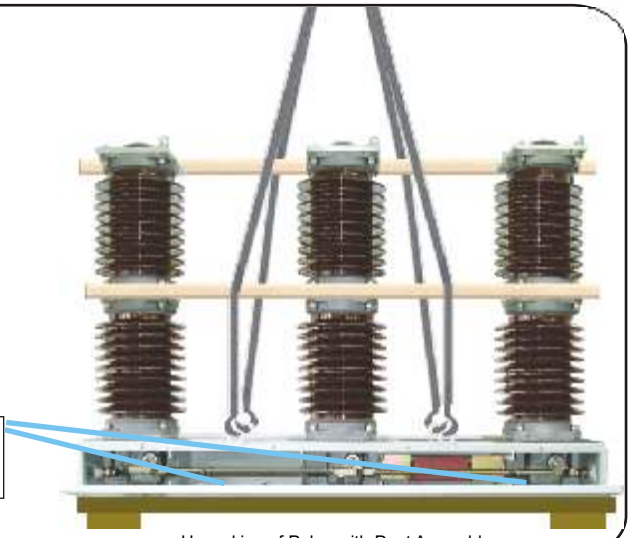
- Now fix Cross-Support Angles (5) as shown M12 bolts, spring washers, plain washers & Hex Nuts .
- Fix Bottom Support Angles(3) as per the order bound GA drawing To achieve lower height and M12 bolts, spring washers, plain washers & hex nuts.
- For the sake of flexibility, do not fully tighten the fasteners.
- Slide upper leg assembly into lower leg and tighten.

Circuit Breaker Structure Assembly

4.2.2.4 Unpacking of Duct & Pole Assembly

- Remove top & all side covers of casing containing Poles-with-Duct assembly.
- Remove Vacuum sealing, if provided.
- Hold Poles-with-Duct Assembly by lifting crane as as shown.
- Remove the M8 Bolts from the rear covers of the Duct & open the rear cover.
- Remove bolts fixed to the bottom packing pallet.
- Do not remove the wooden Batons at this stage.

Remove hardware only after holding the assembly by crane



Unpacking of Poles-with-Duct Assembly

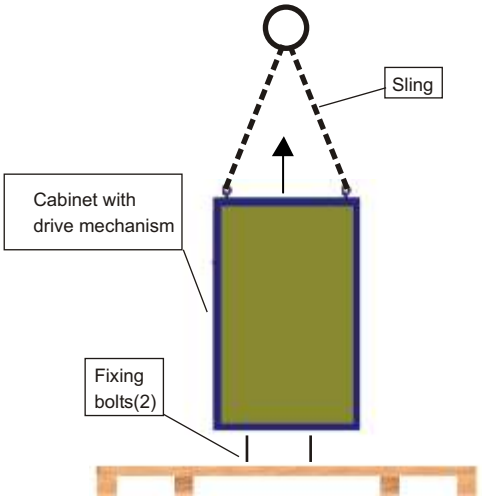
4.2.2.5 Dismantling of Cases

4.2.2.5.1 Unpacking of Cabinet

Fig.8. Cabinet Assembly on palate

- Remove top & all side covers of casing containing Cabinet Assembly.
- Remove Vacuum sealing, if provided.
- Do not remove the bottom pallet.

- Fix 2 nos eye-bolts on the cabinet diagonally, remove fixing bolts(2) and lift the cabinet.



4.2.2.6 Mounting of Breaker

- Fix the cabinet on the lower support angles such that the hinged door is on the front side.
- Fix hardware from the bottom (M12 nuts are welded inside the cabinet).
- Fix the top support angle above the cabinet.

- Fix Support-Angles(9) on Upper Leg Assembly(1) & (7) as Shown
- Fix Cross-Angles (11)
- Fix CT Frame(10) on the Support Angles(9)

For the sake of flexibility, do not fully tighten the fasteners.

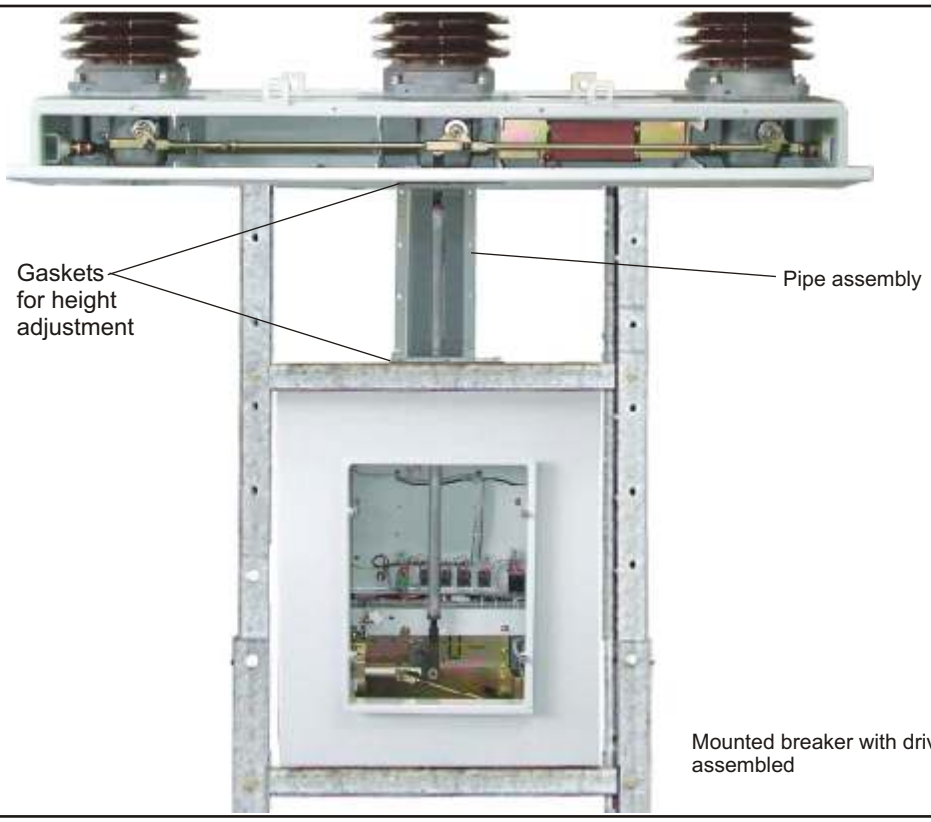
Structure Assembly with CT structure (optional)

- Lift the pole and duct assembly and fit it on the structure as shown in figure.
- Ensure that the stiffener plates are inside the duct before tightening duct with upper legs.

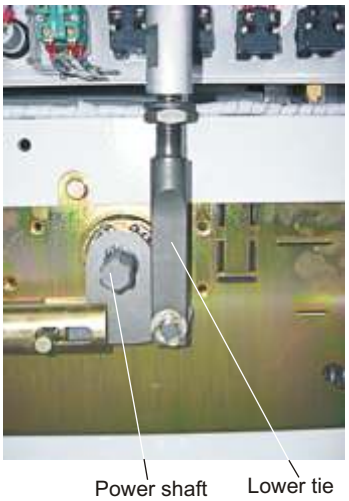
4.2.2.7 Linking of drive link

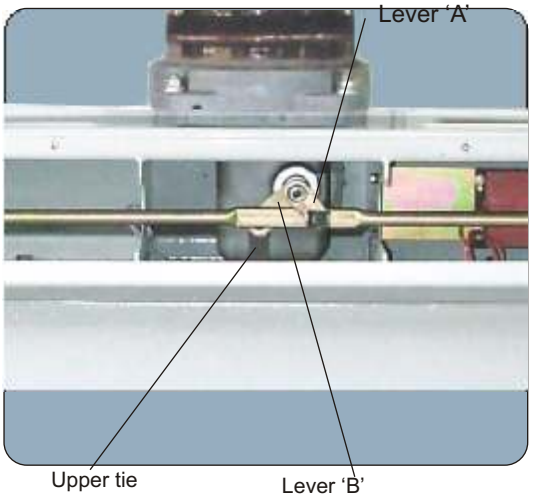
- Insert the pipe assembly between the cabinet and the duct.
- Insert gaskets to adjust the gap between the cabinet and the duct to 800mm precisely.
- Bolt the upper and the lower ends of the pipe assembly to the duct and the cabinet respectively. Use M12 bolts, plain & spring washers and hex nuts.
- Insert the drive link pipe (without the end ties) through the hole on top of the cabinet such that it passes through both the duct and the cabinet. The end of the pipe bearing the green mark must be placed the upper end.
- Thread in the upper and the lower ties taking care of the right hand and the left hand threads respectively . Do not tighten the nuts on the ties at this stage.

The drive link

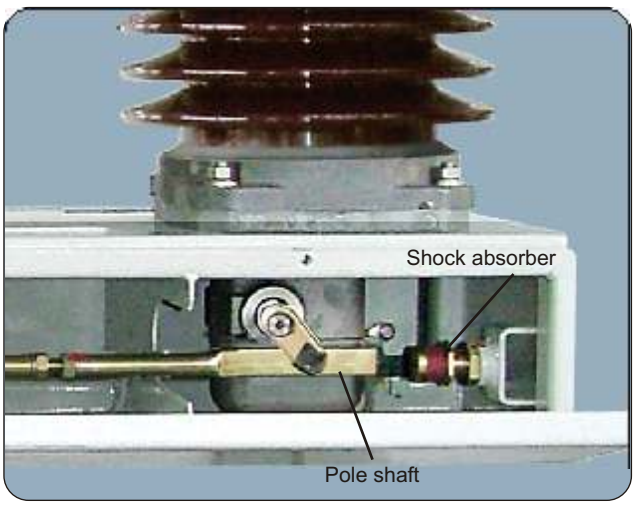


Mounted breaker with drive link assembled



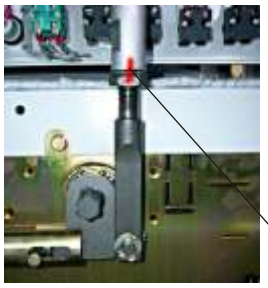


- Insert the hole of the lower tie in the link pin of the lever (beside the power shaft), insert a washer and lock it with a split pin and bend it's legs (refer illustration).
- Fixing of upper tie of drive link:
  - Remove the U-clip and remove the pin from all the three poles.
  - Remove lever 'A'.
  - Remove horizontal link.
  - Negotiate the upper tie of the drive link such that it's hole comes in line with that of the composite lever. If required, rotate the tie to achieve the alignment.
  - Insert the link pin through both the holes and lock it with the U-clip.
- Reconnect the horizontal link, lever 'A', Pins and U-clips.
- Rotate the drive link clockwise such that the pole shaft moves out and rests lightly on the shock absorber.



- Put a few drops of Loctite 270 at both ends, between the nuts and the drive link pipe ends, tighten the nuts.
- Put red paint marks at both ends, covering the nuts and the drive link pipe to mark the setting.

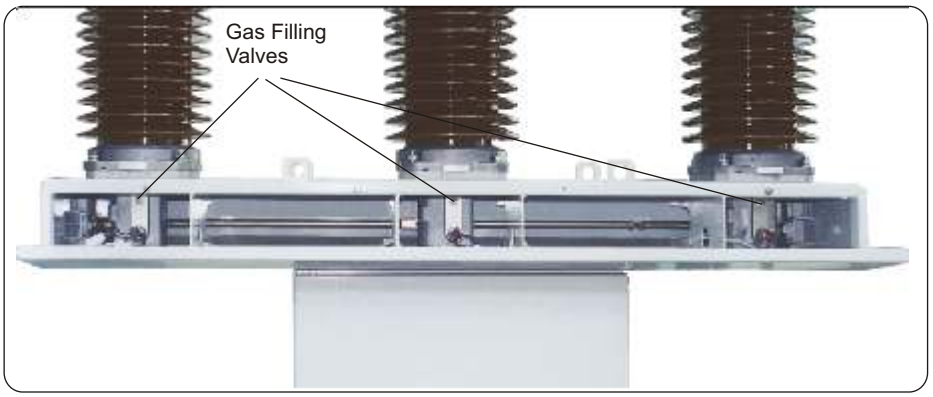
This completes the assembly of the drive link to connect the operating mechanism to the poles.

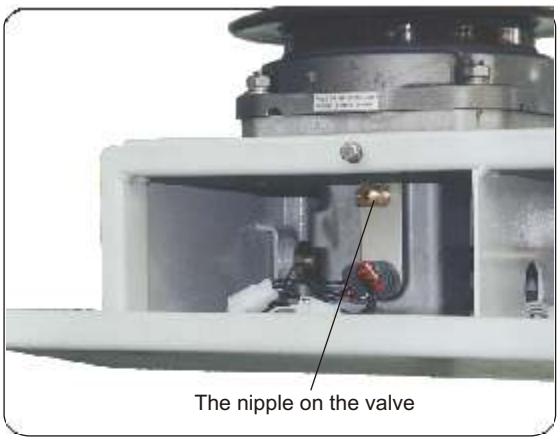


4.3 Topping up of SF_6 Gas *(for 40.5kV breakers only)*

The pressure of SF_6 gas (for 40.5kV breakers) in the poles at the time of despatch is 2.2bar abs. This needs to be increased to 5.5bar abs.

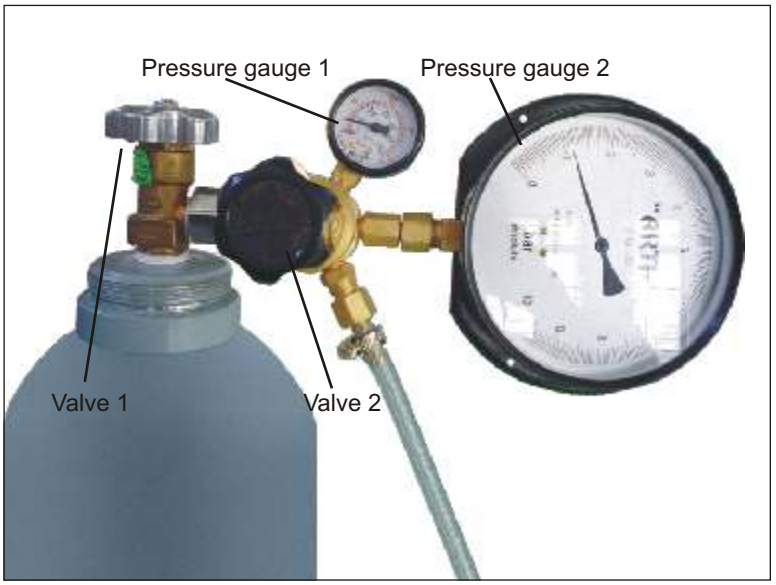
The following procedure shows topping up of Sf_6 gas to 5.5bar abs in case of 40.5kV rating, and also for topping up in other breakers in case of abnormal pressure drop.





- Open the front cover of the duct to get access to the gas filling valves.
- Remove the cap from the Gas filling valve and put on the Nipple for connecting the gas pipe.
- Take out the filling pipe with the pressure regulator and the gauges and attach the free end of the regulator to the SF_6 gas cylinder.
- Connect the free end of the pipe to the nozzle fitted to the gas filling valve in the duct.
- Open both valves 1 & 2 slightly and notice the increase of pressure on the pressure gauges. Pressure gauge 1 indicates the pressure in the cylinder and the Pressure Gauge 2 indicates the pressure inside the pole.
- Open Valve 2 very gradually till the pressure gauge 2 shows the desired value and then close valve 2 and subsequently valve 1.


The gas set




Adopter to gas cylinder

Diagram for SF_6 gas filling pressure (in kPa absolute),accroding to the ambient temperature

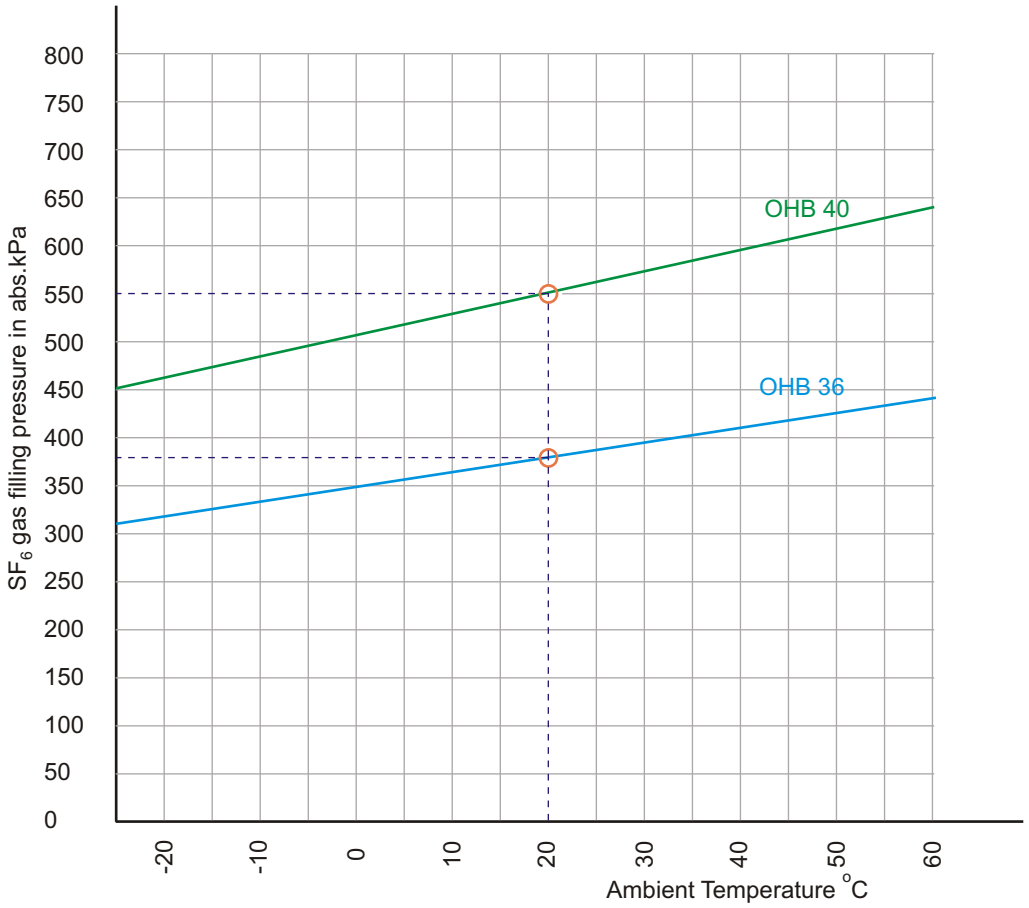


Table indicating the variation in the pole filling pressure value according to the ambient temperature

Ambient Temperature (°C)	Filling pressure of SF_6 Gas (abs.kPa) for 24 - 36kV	Filling pressure of SF_6 Gas (abs.bar) for 24 - 36kV	Filling pressure of SF_6 Gas (abs.kPa) for 40.5kV	Filling pressure of SF_6 Gas (abs.bar) for 40.5kV
-25	311	3.11	450	4.50
-20	319	3.19	461	4.61
-15	326	3.26	471	4.71
-10	334	3.34	483	4.83
-5	342	3.42	595	5.95
0	349	3.49	505	5.05
5	357	3.57	516	5.16
10	364	3.64	527	5.27
15	372	3.72	548	5.48
20	**380**	**3.80**	**550**	5.50
25	388	3.88	562	5.62
30	395	3.95	572	5.72
35	403	4.03	583	5.83
40	410	4.10	593	5.93

Note

For breakers supplied with SF_6 + N_2 for low temperature the poles are supplied with pressure of 2.2 bar abs (pure SF_6). This needs to be topped upto 3.85 bar (abs) by pure SF_6 and later on by N_2 upto 5.5bar (abs) at 20 deg C.

For temperature other than 20 deg C, refer to ABB.

5. Commissioning:

5.1 General Procedures

All the activities concerning commissioning of the breakers must be carried out by ABB personnel or customer personnel who are suitably qualified and have an in-depth knowledge of the apparatus & installation. If the operations are disbled, do not force the mechanical interlocks, but check that the operation sequence is correct

- Before putting the circuit-breaker into service carry out the following operations.
- Check the tightness of the power connection on the circuit breaker terminals.
- Check that the value of the supply voltage for the auxiliary circuits is within 85% and 110% of the rated voltage of the electrical devices.
- Check that no foreign body, such as packing material, has got into the moving parts.
- Check correct setting of the thermostat.
- Check that the erected circuit breaker is isolated from high voltage system and earthed according to regulation. The control current circuit is connected to the low-voltage system.
- Check the connections as per approved drawings have been made correctly. Then the trial switching can be carried out from a protected position.
- Also carry out the checks indicated in the following table.

Subject of inspection	Procedure	Positive check
Insulation Resistance	**Medium voltage circuits** With a 2500 V Megger, measure the insulation resistance between phases and exposed conductive part of the circuit.	The insulation resistance should be at least 200 Meg. ohm and, in any case, constant in time.
	Auxiliary circuits With a 500 V Megger measure the insulation resistance between the auxiliary circuits and the exposed conductive part	The insulation resistance should be a few Mohm and, in any case, constant in time.
Auxiliary Circuits	Check that the connections to the control circuit are correct; and the supply voltage is correct .	The connections are according to the electric diagram enclosed with the circuit-breaker.
Manually charged operating mechanism	Carry out a few closing and opening operations N.B. Give rated auxiliary supply to the u/v release on the operating mechanism (if provided).	The operations and relative signals occur correctly.

Subject of inspection	Procedure	Positive check
Motor charged operating mechanism	Give rated auxiliary supply to the geared motor for spring charging	The springs are charged correctly The signals are correct. The geared motor cuts off when the springs are charged.
	Carry out a few closing and opening operations. N.B. Give rated auxiliary supply to the under-voltage release on the operating mechanism (if provided).	The geared motor recharges the springs after each closing operation.
Under-Voltage release (optional)	Give the rated auxiliary supply to the under-voltage release and carry out the circuit-breaker closing operation	The circuit-breaker closes correctly The signals are correct
	Disconnect the power supply to the release	The circuit-breaker opens
Shunt opening release / trip coil	Close the circuit breaker manually Put the changeover switch on LOCAL Locally control the electric opening of the circuit-breaker using the special pushbutton (alternatively opening can be set and controlled remotely).	The signal changes over The circuit breaker opens normally
Local-remote selector switch	Open the circuit breaker manually Put the changeover switch on LOCAL Locally control the electric closing of the circuit-breaker using the special pushbutton (alternatively closing can be set and controlled remotely).	The circuit breaker closes normally
Key lock (optional)	Open the circuit breaker Turn the key and remove it. Attempt the circuit breaker closing operation	Neither manual nor electric closing should take place
	Insert the key again and turn it 90 deg. Carry out the closing operation	Both electric and manual closing take place correctly; in this position the key cannot be removed
Changeover switch for Local/Remote electrical control	Put the changeover switch on REMOTE Close the cabinet door. Carry out a few opening and closing operations using the remote controls.	The operations and signals are normal
Auxiliary contacts in the operating mechanism	Insert the auxiliary contacts into suitable signalling circuits. Carry out a few closing and opening operations	Signals occur correctly

Subject of inspection	Procedure	Positive check
Cable glands	Check lightness of the fairleads used and of the free ones.	The fairleads used must be correctly locked; the free fairleads must be covered with the relative plate and blocked

5.2 Space heaters

A space heater is provided in the control cabinet. The heater switch must always be ON when the breaker is in service to prevent condensation.

5.3 Anti-pumping device

- Issue a "close" command by applying a control voltage to terminal 101 & 102 leave the voltage applied. The breaker will close.
- Issue open command by applying a voltage to terminal 103 & 104. The breaker will open.
- After the interruption by OPEN command the circuit breaker should not re-close in spite of the CLOSE command still being present.

Note

The ESH operating mechanism on OHB circuit breaker is fitted with a mechanical anti-pumping device, which prevents re-closing due to either electrical or mechanical commands.

5.4 Check of heaters:

Measure the resistance or apply voltage and measure the current, when the thermostat controlled additional heater is installed, check the adjustment of thermostat.

5.5 Concluding Work:

- Remove all test and measuring equipment.
- Connect circuit breaker to high voltage power lines.
- Make sure that safety regulations are followed.
- Take the breaker in to service.

6.Periodical checks:

Before carrying out any operation, make sure that the operating mechanism springs are discharged and that the apparatus is in the open position.

6.1. General

The frequency and type of inspections depend on the service conditions. Various factors must be taken into account: frequency of operations, interrupted current values, relative power factor and the ambient temperature.
As a precaution, the following table gives the checking program , showing the relevant time intervals.

As far as the time interval between these operations is concerned, it is advisable to comply with specifications given in the table, at least during the first check. On the basis of the results obtained during the periodic inspections, contact an ABB service center for any clarifications.

6.2 Checking Program

Checking operation	Time interval	Criteria
Carry out five mechanical opening closing operations.	1 Year	The circuit-breaker must operate normally without stopping in intermediate positions.
Visual inspection of the poles (insulating parts).	1 Yr./ 5000 operations	The insulating parts must be free of any accumulation of dust, dirt, cracks, discharges or traces of surface discharges.
Visual inspection of the operating mechanism and transmission.	1 Yr./ 5000 operations	The elements must be free of any deformation.
Measuring the insulation resistance.	1 Yr/5000 operations	Screws, nuts, bolts, etc. must be tight.

After 10,000 operations or after 5 years, it is advisable to contact an ABB service center to have the circuit-breaker checked.

6.3 General Inspection of the circuit breaker

Part subjected to	Abnormalities noticed	Remedies
Spring operated mechanism	Presence of dust on the mechanism	Clean with a dry brush or cloth
	Distorted or oxidised spring	Replace the damaged spring
	Locking rings out of place, loose nuts or screws.	Re-fix the locking rings in Their position and tighten the nuts & screws after proper resetting
High voltage breaker pole parts	Presence of dust or dirt on the the insulating parts	Clean with a dry brush or cloth
	Locking rings out of place, loose nuts or screws.	Re-fix the locking rings in their position and tighten the nuts & screws after proper resetting
	Distortion or cracking of the insulating parts	Ask ABB Nasik for replacement of the damaged parts
	Trace of overheating or loose screws on the connection to the circuit breaker terminals	Clean the connections and the breaker terminals with a rough rag soaked in a suitable solvent, cover them with conducting grease and tighten the screw
Earthing connection	Trace of the oxidation and / or loose nuts	Clean with a rough cloth soaked in a suitable solvent. Tighten the earthing connection fully and cover it with conducting grease
Auxiliary circuit supply voltage	Check the supply voltage of the operating mechanism electrical accessories	The close/ opening coils must operate correctly for values between 85% and 110% of the relative rated voltage
Operating and control elements	Carry out the functional tests	Replace the damaged or faulty elements (if necessary ask ABB)

PART C: OPERATING MECHANISM WORKING PRINCIPLE AND MAINTENANCE

OPERATING MECHANISM

1.0 Spring charged mechanism

1.1 General

The operating mechanism has a spring charging device, which can be operated by motor or manually. The operating device has helical tension spring for closing and opening. The opening spring is charged automatically when the breaker is closed.
A closed breaker with charged closing spring can thus be operated OPEN - CLOSE - OPEN without intermediate motorized or manual charging, and the breaker can, therefore, be used for auto re-closing duty cycle.

An indication shows whether the closed spring is charged or not, and the number of opening operations are recorded by the counter.

The motor can be supplied via station battery, a network or via transformer with a limit load of at least 500 VA.The motor starts after each closing operation and charges the closing springs within 15 seconds.

1.2 Construction

The construction of the operating mechanism is shown in Fig A.

Major components of ESH mechanism are:

1. Closing Spring
2. Tripping Spring (next page)
3. Geared-Motor (next page)
4. Push Button Assembly
5. Closing Coil
6. Tripping Coil.
7. Motor cut-off switch.
8. Auxiliary switch.
9. Spring Charged indication
10. Breaker ON/OFF indications
11. Bottom Shaft (Charging Shaft)
12. Top Shaft (Power Shaft)

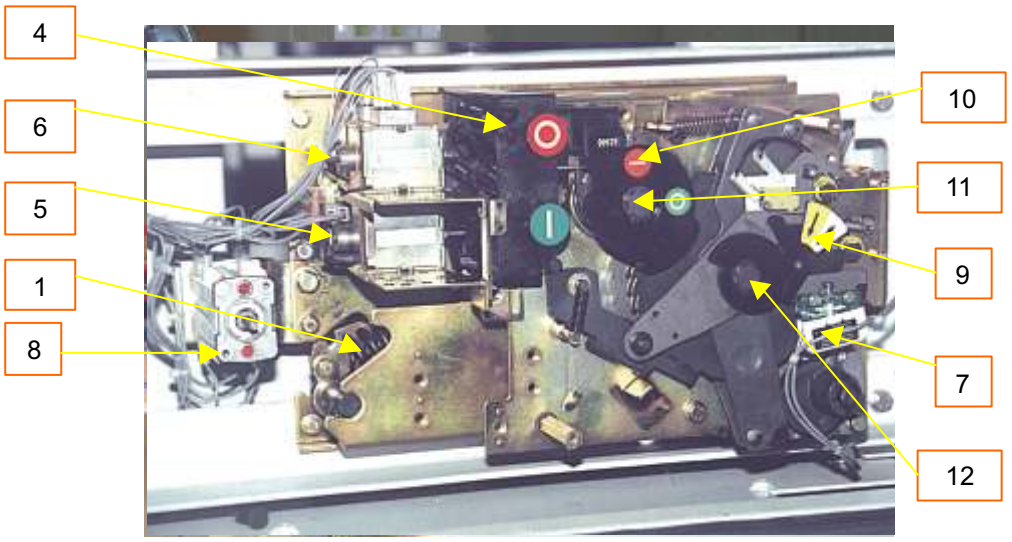
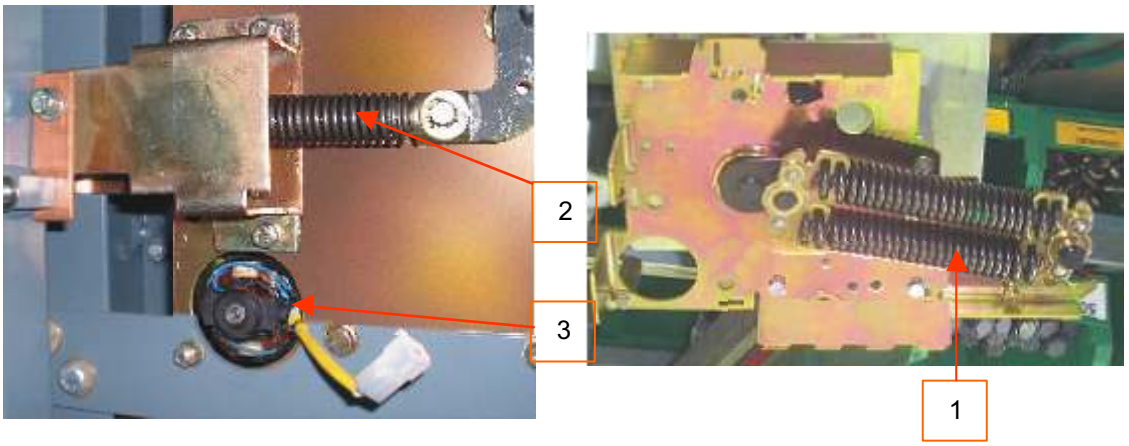


Fig. A



1.3 Operating mechanism - Working principle

There are two options for charging the springs

1. By electric motor.
2. Manual operation

1.3.1 Electrical Spring Charging (Ref Fig B)

Spring charging unit consists of Arm (1), Charging gear (2), Closing Spring (3), latches (4), reduction gear with Spring charging Motor and Cam (5). Closing - Spring assembly & charging gear are mounted on power shaft. When the Motor rotates, the reduction gear connected to that gives 1/144 reduction. Reduction gear assembly is connected axially with the Cam that rotates the spring-charging arm.

The arm rotates the charging gear, at the same time; the latches hold the charging gear and arm returns to its position. Closing spring gets stretched and this continues till the spring gets fully charged. The backward rotation of the charging gear (2) is prevented by latches (4). A plastic cam activates Motor-cut-off switch & Spring Charged indication will appear after full charging. Closing lever (6) stops the shaft from further rotation. Motor cutoff switch disconnect the supply of the motor. Fig. F (page 45) shows initial stage of closing spring and associated lever (L1).

Fig. G (page 45) shows the condition after closing spring gets fully charged. During this process latch L1 rotates of about 180°.

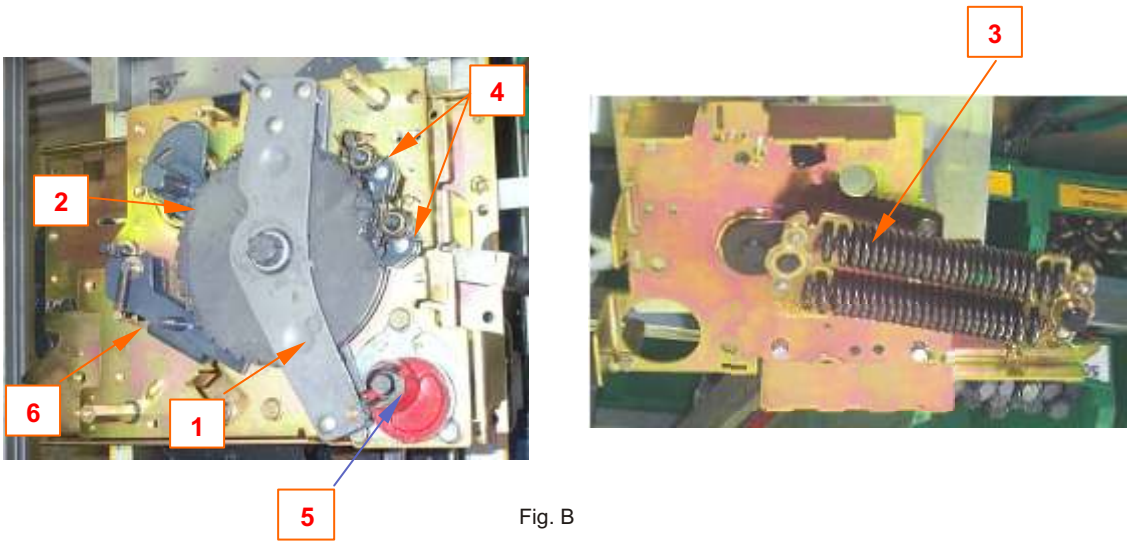


Fig. B

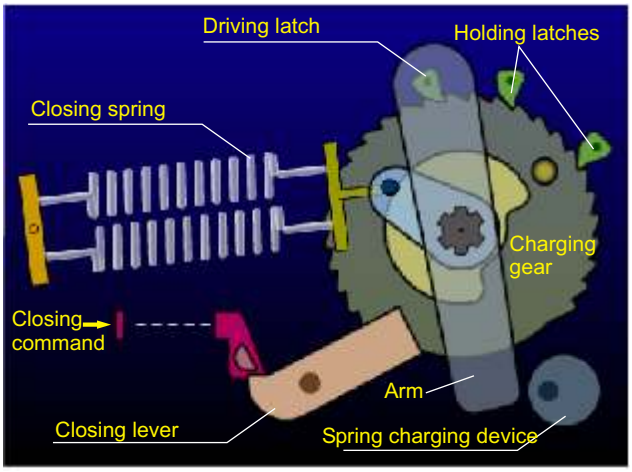


Fig C Mechanism in open condition & both the springs in discharged condition

The spring charging motor charges the springs after each closing operation until the spring-charged indication appears. Should there be no voltage during charging, the geared motor stops, and starts recharging the springs automatically when the voltage is on again. It is, however, always possible to complete the charging operation manually. Motor supply gets cut-off automatically as the spring gets completely charged.

1.3.2 Manual Spring Charging

For charging the Closing-springs manually, fully insert the charging handle into the seat and rotate it clockwise until you see the spring-charged indication.

Ensure the handle is engaged with the seat.

The force, which can normally be applied to the charging handle, is 130 N. In any case, the maximum force applied must not exceed 170 N. As the springs get charged, a sound [internal latches getting engaged] can be heard.

The arm won't rotate the charging-gear further, since the charging-gear has no teeth on remaining periphery.

1.4.1 Closing Operation:

Consider both the springs are in discharged condition and breaker is open (Ref Fig. E, Page 45) In this condition neither close nor open operation is possible to perform on the breaker. Latch assembly (La) and (Lb) are in released condition. The closing spring can be charged either electrically or manually as explained in section1.3. During the process of charging pin (P1) comes in contact with closing lever (Ref Fig F, Page 45). Pin (P1) will creates pressure on closing lever as closing spring is fully charged. Position of the closing lever in this condition is retained by half shaft.

If close command is initiated now, it will rotate half shaft (Ref Fig. G). Rotation of half shaft will release closing lever and hence charging gear. Due to this spring

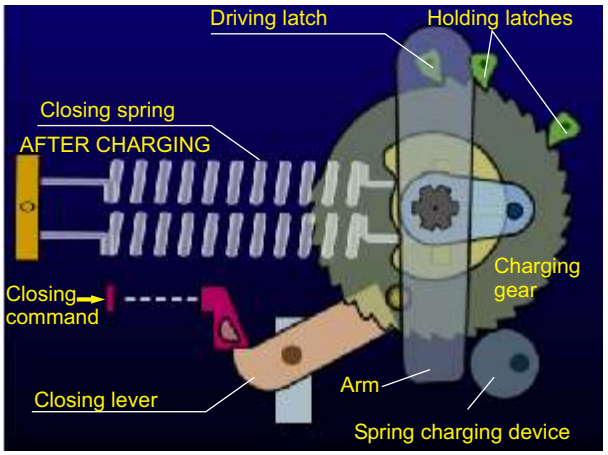


Fig D. Closing spring is charges, ready for closing operation

energy stored in closing spring acts on power shaft, which will cause the rotation of the cam mounted on the power shaft. Mechanism lever (Ref. Fig.G) is resting on the outer periphery of this cam, which is directly connected to charging shaft. Rotation of cam will push this mechanism lever upwards, this will results in rotation of the charging shaft. Tripping lever is mounted on same charging shaft. One end of this tripping lever is connected to common shaft of the breaker via link, and another end is connected to tripping spring. Rotation of around 90° will close the circuit breaker as well as charging of the tripping spring.

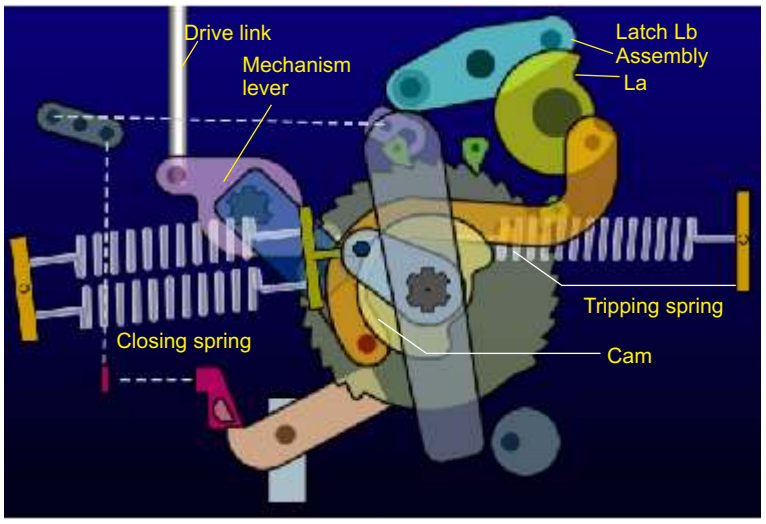


Fig. E Mechanism in open condition and both springs in discharged condition

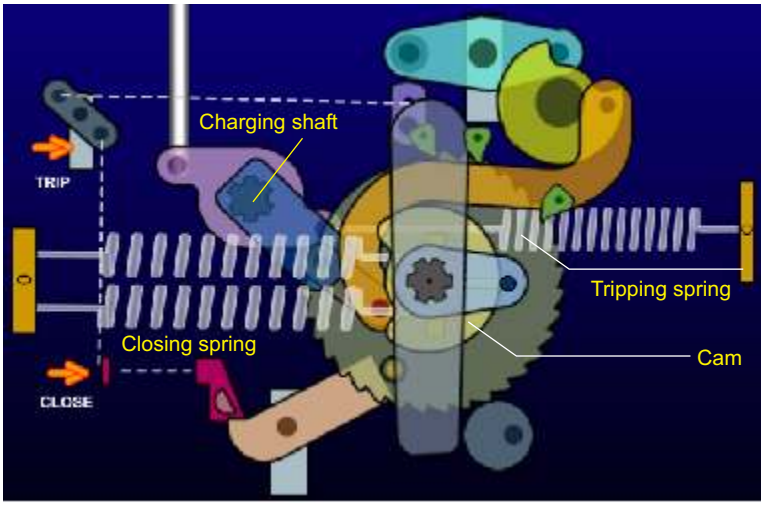


Fig. F Mechanism in open condition and closing springs in charged condition

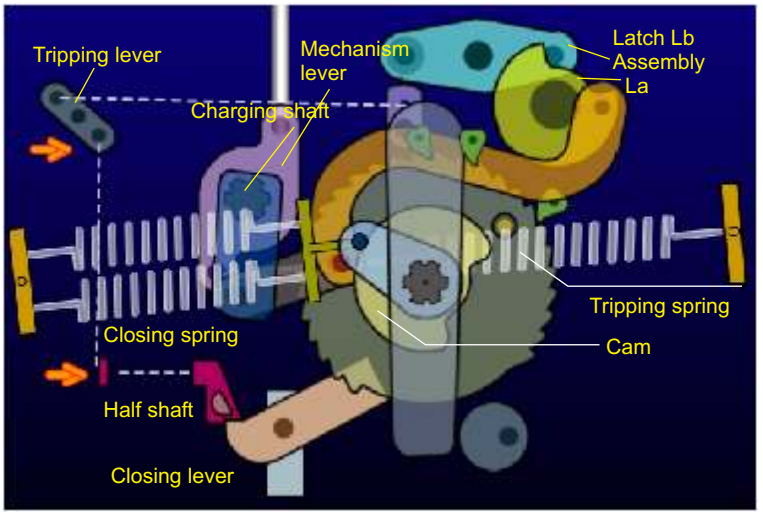


Fig. G Circuit breaker closed, tripping spring charged

1.4.2 Tripping Operation:

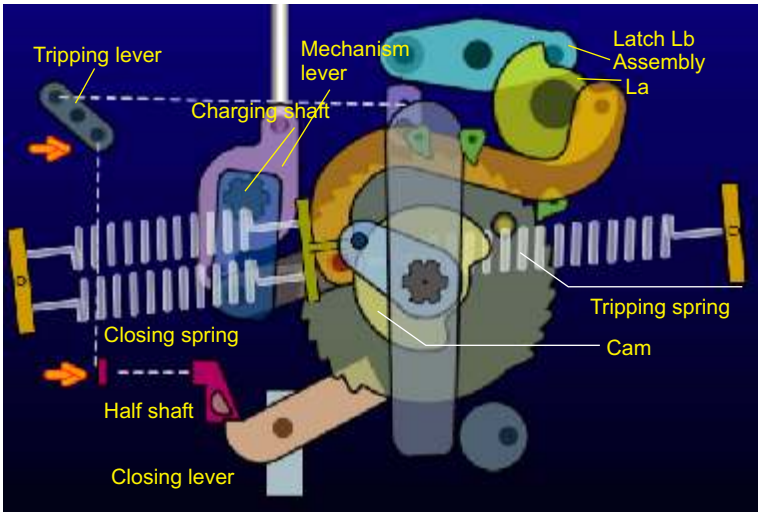


Fig. H Circuit breaker in closed condition, ready for tripping

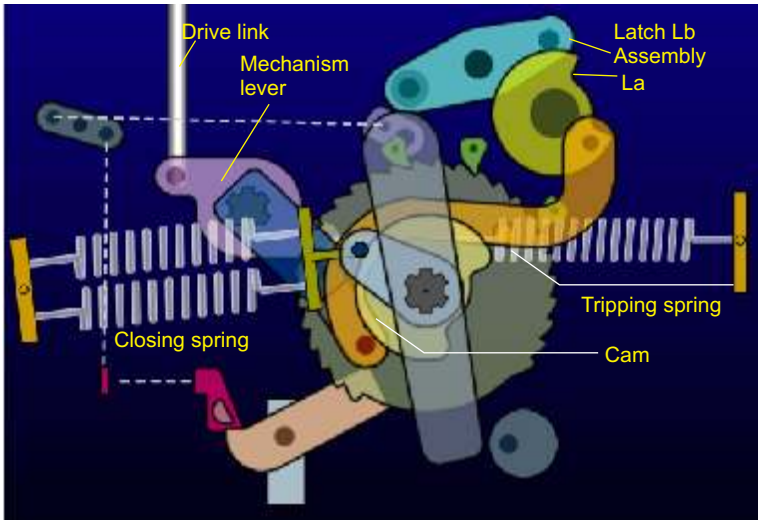


Fig J Circuit breaker in open condition

Now with previous reference consider tripping spring is in charged condition. Fig. H shows the charged condition of the tripping spring and internal detail for position of different components. Latch Assembly (La) and (Lb) engaged with each other. Engagement of (La) and (Lb) will confirm that breaker will not open in this condition unless and until the opening command is initiated.

If trip command is initiated now, it will pull the latch (Ref. Fig. J). Hence its engagement with the latch assembly will break. This will move the latch assembly (La) in downward direction. Downward movement of latch assembly will release the latch(Lb).

Hence there is no more pressure or any engagement that will retain the current poison of arm and leverage. Armand leverages are free to move now. As previously discussed these components are directly connected to charging shaft. Tripping spring directly exerts pressure on the shaft via tripping lever. As leverage becomes free to move tripping spring will pull back the tripping lever and open the circuit breaker.

1.5 Maintenance of Operating Mechanism

Before carrying out the maintenance of operating mechanism ensure that the breaker is open, the sequential isolators are open and the closing and opening springs are discharged.

1.5.1 Maintenance schedule

Sr No.	Description	Before start Up	Every 1000 operations
1.	Checking of operating mechanism.	✓	✓
2.	Checking of fastener tightness.	✓	✓
3.	Checking of shock absorbers for leakage or struck up.	✓	✓
4.	Checking of various tension springs and bending springs for their proper place.	✓	✓
5.	Closing and tripping spring assembly and split pin/ Circlip on them.	-	✓
6.	Bearing items.	-	✓
7.	Checking of Operation box Assembly for proper open/close operation.	✓	✓
8.	Checking of setting. Proper engagement of lever on shaft.	✓	✓
9.	Spring cut off micro switches.	✓	✓
10.	Lubrication of charging device and operating gear		✓

NOTE

1. Complete overhaul of circuit breaker operating mechanism to be done after 10000 operation or 10 years, whichever is earlier.

2. ABB trained personnel will perform overhaul of breaker.

1.5.2 Trouble shooting guide

FAULT	CAUSE	REMEDY
Spring does not get charged	Motor has wrong or no operating voltage.	Measure voltage on the motor leads.
	Motor shaft broken.	Change motor.
	Motor gear damaged.	Change motor.
	The latch for the tripping device does not function.	Change mechanism.
	Disconnection in the wires.	Check by measuring voltage of motor.
	Micro-switch arm wrongly adjusted.	Adjust the micro-switch operating arm.

FAULT	CAUSE	REMEDY
Closing of breaker does not take place although there is an indication that the springs are charged.	Operating coils does not operate.	Measure the voltage adjust the coils adjustment screw. Check the springs.
	The toggle joints of the mechanism are incorrectly adjusted.	Adjust the toggle joints.
	Wrong wiring of the auxiliary circuit.	Check the wiring as per schematic drawing.
	Wrongly adjusted clearances of coil magnets armature.	Adjust the coil magnet.
Breaker continuously opens and closes.	Anti pumping relay wrong or faulty.	Change relay.

1.5.3 Replacement of operating coil

Refer Figs.6 to 8, (page no 62 to 63) indicate the mounting arrangement for closing coils and the tripping coils.

1.5.4. Replacement of micro-switch Refer Figs. 12 & 13, (page no. 65) indicate the mounting arrangement for micro-switch.

1.5.5 Replacement of motor Refer Figs.9 to 11,(page no. 63 & 64) indicate the mounting arrangement for motor.

1.5.6 Replacement of operating mechanism

The operating mechanism shall be replaced in the following manner.

a. Disconnect the linkage of the operating mechanism to the main shall be replaced in the following manner.
b. Disconnect the electrical connection.
c. Loosen screws that fix the operating mechanism cabinet.
d. Take out the operating mechanism and fix new one.
e. Reconnect the electrical connections and the linkage of the main shaft. After fixing the operating mechanism the following check shall be carried out.
f. Charge the closing spring.
g. Close the breaker.
h. If required then adjust the micro-switch for proper operation.
i. Check the breakers with the auxiliary supply connect while charging at minimum operating voltage of the motor.
j. Take few operations for the new mechanism.
k. Seal various lock nuts of various settings with red paint.

1.5.7 Recommended spares parts

The following spares shall be kept to take care of any contingency

Sr. No	Name of parts
1	Spring charging motor
2	Tripping/closing coils
3	Micro-switches
4	Auxiliary switches
5	Shock absorber
6	Operating box assembly
7	Opening transmission lever
8	Closing transmission lever
9	Operating Mechanism

FAILURE REPORT

Number (by ABB)

In case of failure please take a copy of this form is and complete it as fully as possible, to make feasible failure analysis and rectify it. For selecting options tick suitable box. If no alternative is applicable, proper description can be filled out in the space provided. Item description should be given for both circuit- breaker and operating mechanism.

1. Identification

Date ----------

Customer ----------

Item designation Serial number

---------- ----------

---------- ----------

---------- ----------

---------- ----------

Order number ----------

2. Historical data

Condition of the breaker when the failure was detected (only one alternative to be selected)

- ☐ In service
- ☐ During maintenance
- ☐ During installation

Use of the circuit- breaker (Only one alternative to be selected)

- ☐ Line breaker
- ☐ Reactor breaker
- ☐ Capacitor breaker
- ☐ Transformer breaker
- ☐ By-pass breaker

Date taken into service---------- Date of failure----------

Date of last overhaul----------

Total number of operating cycles since taken into service----------

Total number of operating cycles since last overhaul----------

3. Characteristics of the failure (multiple alternatives may be selected)

- ☐ Does not close on command.
- ☐ Does not open on command.
- ☐ Closes without command
- ☐ Open without command
- ☐ Does not make the current
- ☐ Does not break the current
- ☐ Fails to carry current
- ☐ Breakdown to earth
- ☐ Breakdown between poles
- ☐ Internal breakdown across open pole
- ☐ External breakdown across open pole
- ☐ Locking on open or closed position
- ☐ Corona
- ☐ Loose parts
- ☐ Missing parts
- ☐ Faulty parts
- ☐ Corrosion
- ☐ Surface defect other then corrosion
- ☐ Incorrect function

Change in functional characteristics

- ☐ Incorrect closing time
- ☐ Incorrect opening time, coil I
- ☐ Incorrect opening time, coil II
- ☐ Incorrect damping
- ☐ Incorrect CLOSE/OPEN time
- ☐ Too high resistance
- ☐ Incorrect pre-insertion time for the resistors
- ☐ Incorrect time span between contacts

4. External circumstances
(Many alternatives may be selected)

- ☐ Strong wind
- ☐ Rain
- ☐ Sudden variation in temperature
- ☐ Snow, ice or hoar-frost
- ☐ Corrosive atmosphere
- ☐ Fog or high humidity
- ☐ Lightning

Ambient temperature(^{o} C)

5. Component responsible (Many alternatives may be selected)

COMPONENT AT SERVICE VOLTAGE

Making and breaking unit
- ☐ Current collector hub
- ☐ Plug
- ☐ Laminar contact
- ☐ Top cap
- ☐ Interrupting Chamber insulator
- ☐ Vacuum interrupter
- ☐ Top terminal plate
- ☐ Bottom terminal plate

Main insulation to earth
- ☐ Post insulator
- ☐ Interrupting Chamber insulator

ELECTRICAL CONTROL AND AUXILIARY CIRCUITS
- ☐ Operating magnet
- ☐ Closing magnet
- ☐ Auxiliary contact
- ☐ Counter
- ☐ Control panel
- ☐ Limit switch
- ☐ Micro switch
- ☐ Thermal relay or heater
- ☐ Terminal blocks, cables
- ☐ Driving motor for mechanism

OPERATING MECHANISM UNIT
- ☐ ESH mechanism

Different Assemblies in ESH Mechanism
- ☐ Opening coil set up
- ☐ Closing coil set up
- ☐ Tripping spring assembly
- ☐ Electric motor
- ☐ Auxiliary switch
- ☐ Indicators
- ☐ Counter
- ☐ Opening breaker indicator
- ☐ Closing breaker indicator
- ☐ Latch assembly for charging gear
- ☐ Charging gear assembly
- ☐ Charging lever group assembly
- ☐ Shock absorber
- ☐ Closing lever
- ☐ Opening box assembly
- ☐ Opening transmission lever
- ☐ Closing transmission lever

Different assemblies in magnetic actuator
Mechanical transmission
☐ Mechanism housing
☐ Operating Shaft
☐ Lever
☐ Common Shaft

Plates
☐ Instruction plate
☐ Rating plate
☐ Cabinet
☐ Packing

6. Consequences (Multiple alternatives may be selected)
☐ Unplanned removal from service
☐ Planned removal from service
☐ Major disturbance
☐ Minor disturbance
☐ Fire or explosion
☐ Removal from service of other breakers to prevent repetition of failure
☐ Circuit- breaker downtime,
☐ Beyond planned time (hours)

7. Action taken (Select only one alternative)
☐ Repair of defective component
☐ Exchange of defective component
☐ Exchange of circuit- breaker pole
☐ Exchange of operating device
☐ Exchange of circuit- breaker

Action to be taken (Select only one alternative)
☐ By personnel from ABB
☐ By personnel from ABB in current company
☐ By customer's personnel

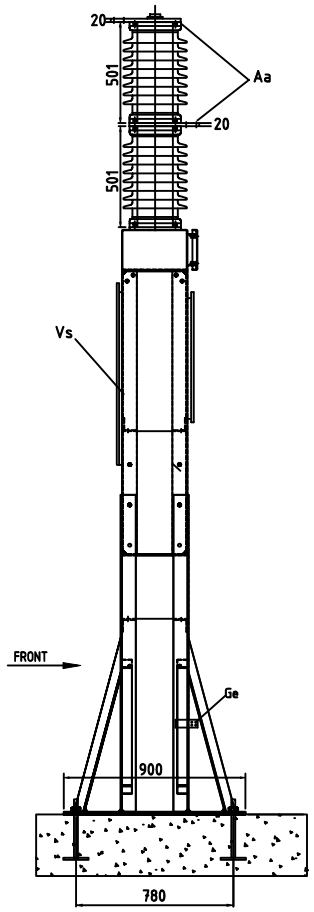
Time required to obtain spare parts (hours) ----------
Time required for repair (hours)----------

Place: ---------- Signature

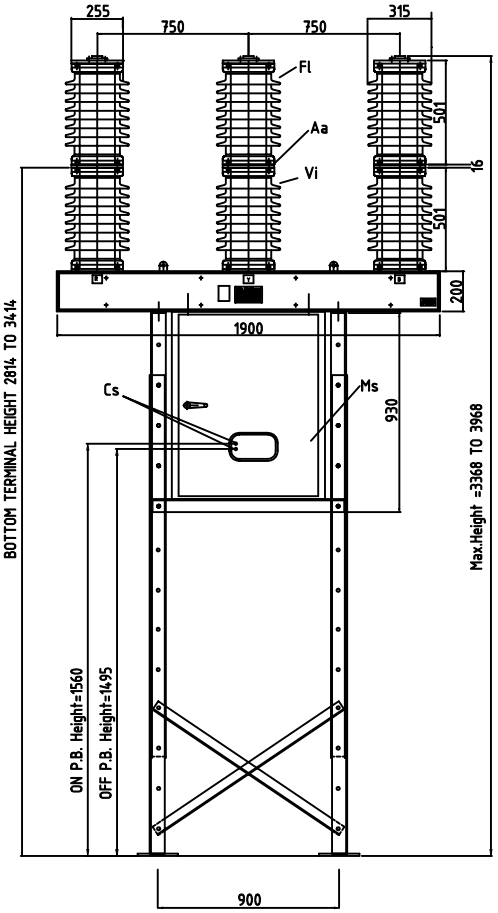
Date: ---------- (Name & Designation)

LIST OF DRAWINGS

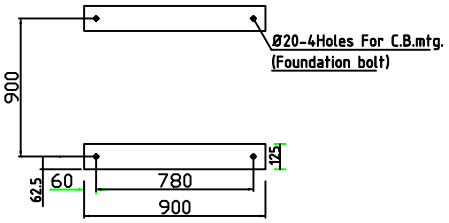
FIG. NO.	NAME OF THE FIG.
1a.	Standard General Arrangement Drawing of OHB Breaker with breaker & CT structure
1b.	Standard General Arrangement Drawing of OHB Breaker (with breaker structure)
1c.	Standard General Arrangement Drawing of OHB breaker control cabinet at lower height (with breaker structure)
4a, b & c.	ESH mechanism with cabinet
5.	Dismantling of operating coils setup.
6.	Steps for replacement of shunt opening release (Y02).
7.	Steps for replacement of shunt opening release (Y01).
8.	Steps for replacement of shunt closing release (YC).
9.	Operating Coils setup for temperature -10°C
10 - 11	Steps for replacement of motor.
12.	Motor.
13 - 14.	Steps for replacement of micro-switches.

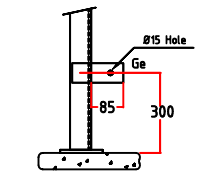


SIDE VIEW

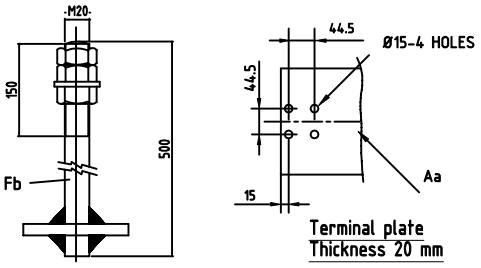


FRONT VIEW

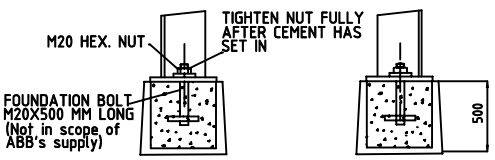




Detail for Earthing



Terminal plate
Thickness 20 mm



Foundation Plinth details

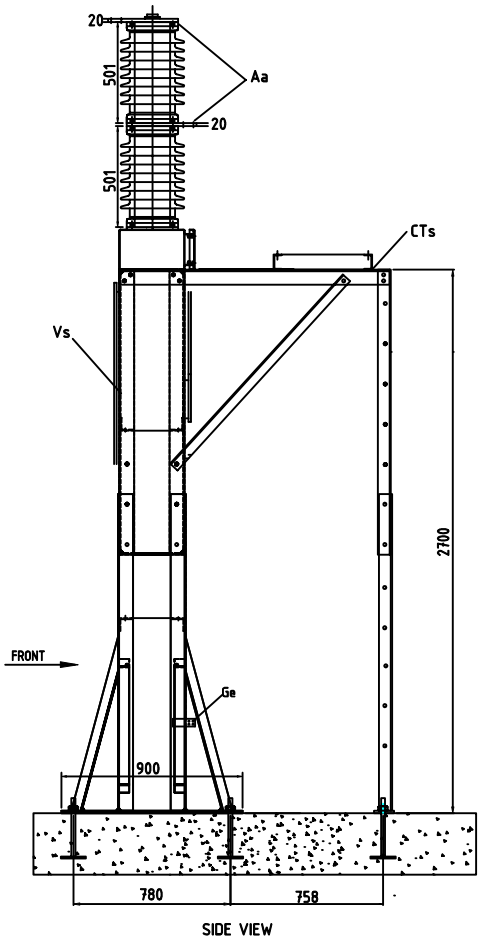
Aa Terminals (Al. Alloy)
Cs Position indicator ON-OFF, Mech Counter
Fl Interrupting chamber
Fb Foundation bolt (M20)
Ge Earthing point (galvanising bus)
Ms Control cubicle with spring drive
Vi Supporting insulator column
Vs Supporting structure (galvanised)

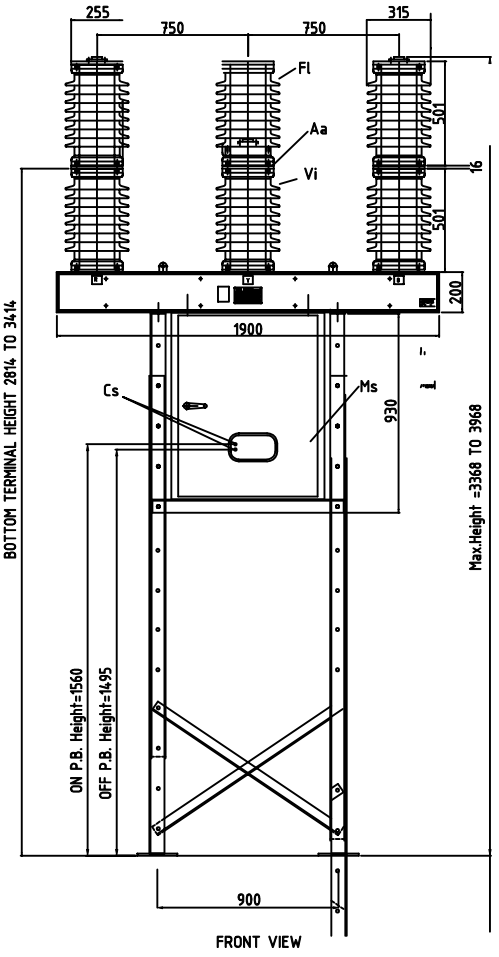
Total weight 900kgs approx.
Creepage distance of bushing insulator for 36kV - 900mm

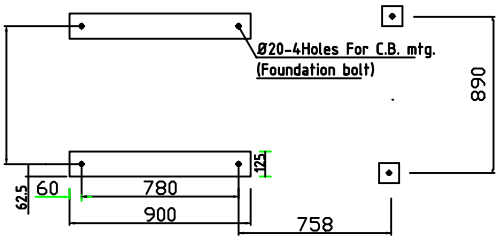
Creepage distance of bushing insulator for 40.5kV - 1116mm
Paint shade for control cabinet : RAL 7035
Insulator colour : Brown

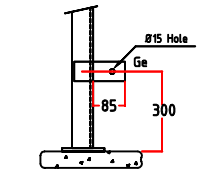
NOTE:
1. Structure is telescopic and has adjustment holes of 200mm
2. All dimensions are in mm.

Fig. 1a. Standard General Arrangement Drawing of OHB Breaker (with breaker structure)

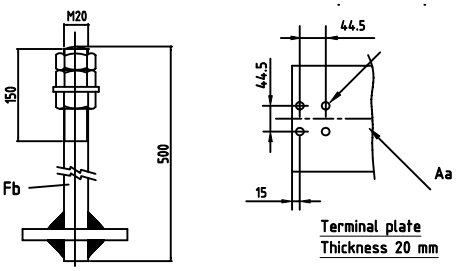


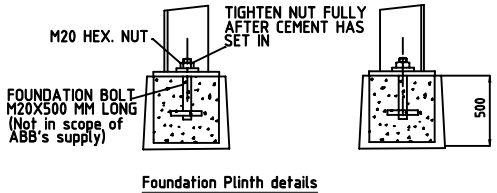






Detail for Earthing

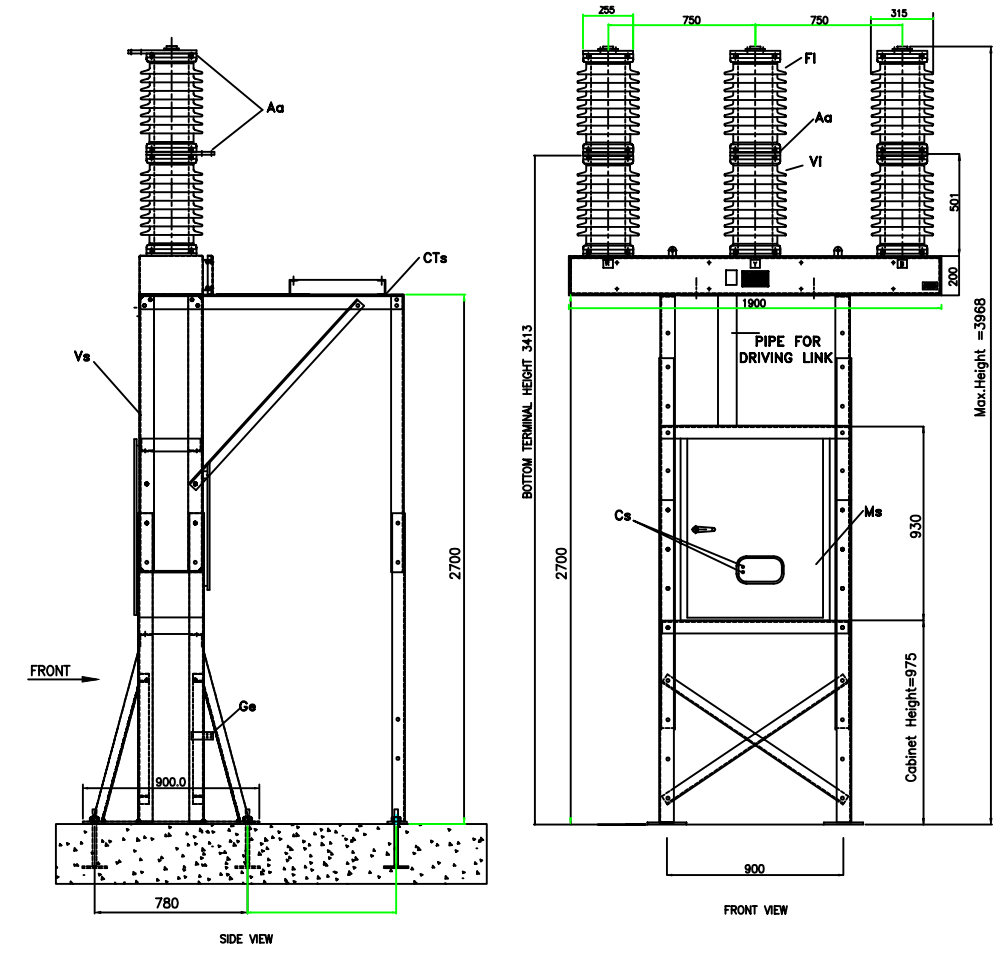


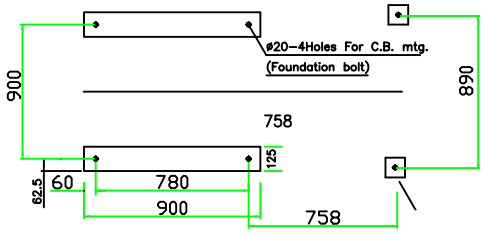


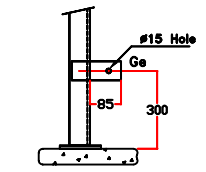
Aa Terminals (Al. Alloy)
Cs Position indicator ON-OFF, Mech Counter
Fl Interrupting chamber
Fb Foundation bolt (M20)
Ge Earthing point (galvanising bus)
Ms Control cubicle with spring drive
Vi Supporting insulator column
Vs Supporting structure (galvanised)
VCTs CT Supporting structure (galvanised)
Total weight 950kgs approx.
Creepage distance of bushing insulator - 900mm
Paint shade for control cabinet : RAL 7035
Insulator colour : Brown

NOTE:
1. For 40.5kV rating creepage distance is 1116mm
2. Mounting holes for mounting of CT on CT structure are 450X450
3. Structure is telescopic and has adjustment holes of 200mm
4. All dimensions are in mm.

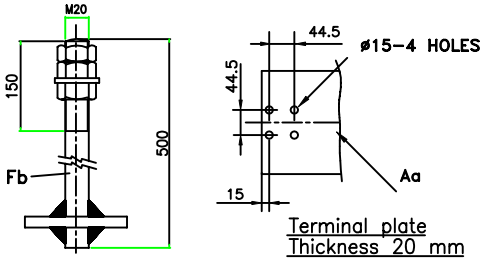
Fig. 1b. Standard General Arrangement Drawing of OHB Breaker with breaker & CT structure

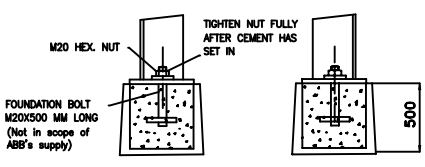






Detail for Earthing





Foundation Plinth details

Aa Terminals (Al. Alloy)
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Fl Interrupting chamber
Fb Foundation bolt (M20)
Ge Earthing point (galvanising bus)
Ms Control cubicle with spring drive
Vi Supporting insulator column
Vs Supporting structure (galvanised)
VCTs CT Supporting structure (galvanised)
Total weight 950kgs approx.
Creepage distance of bushing insulator - 900mm
Paint shade for control cabinet : RAL 7035
Insulator colour : Brown

NOTE:
1. For 40.5kV rating creepage distance is 1116mm
2. Mounting holes for mounting of CT on CT structure are 450X450
3. Structure is telescopic and has adjustment holes of 200mm
4. All dimensions are in mm.

Fig. 1c. Standard General Arrangement Drawing of OHB breaker control cabinet at lower height (with breaker structure)

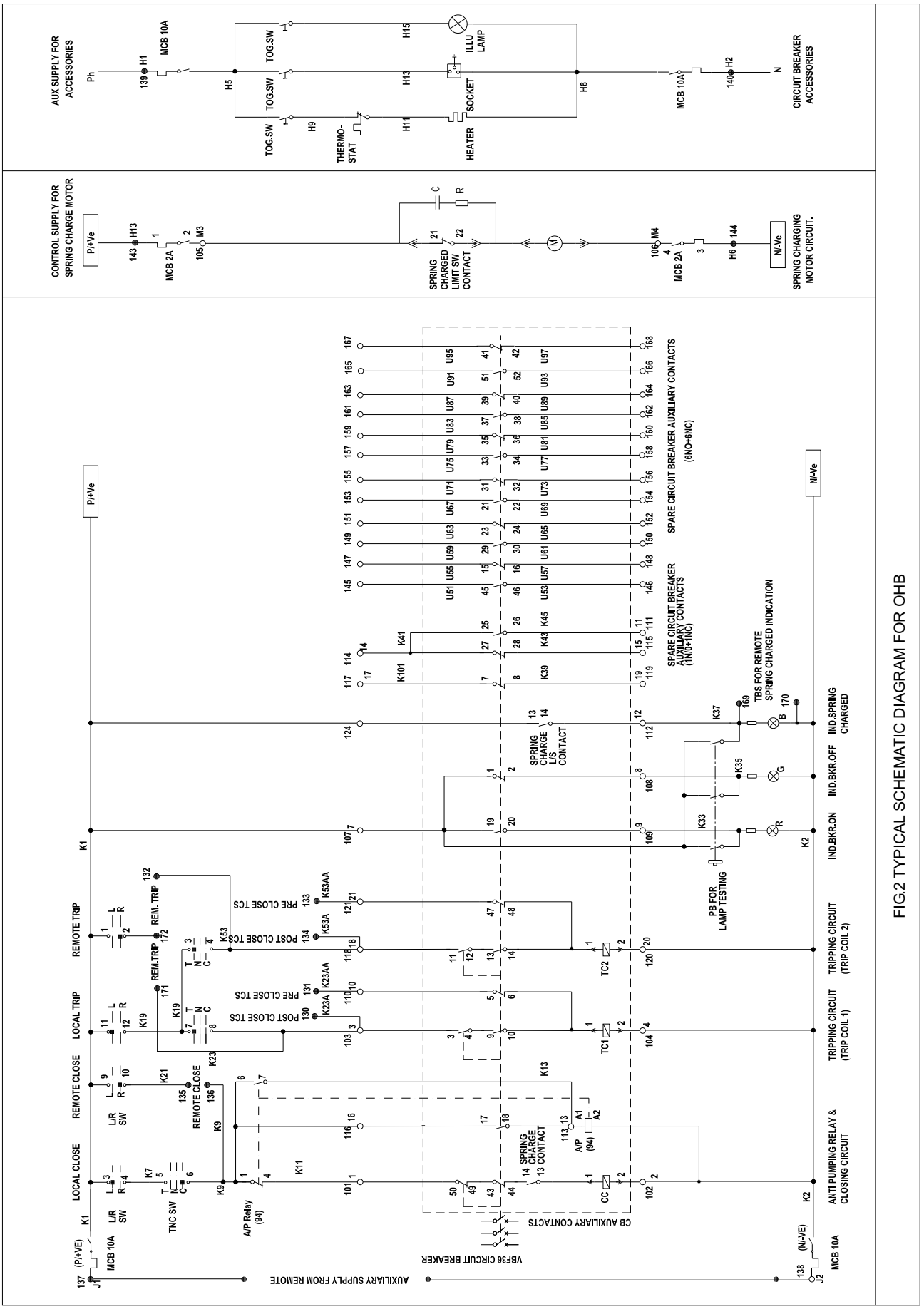


FIG.2 TYPICAL SCHEMATIC DIAGRAM FOR OHB

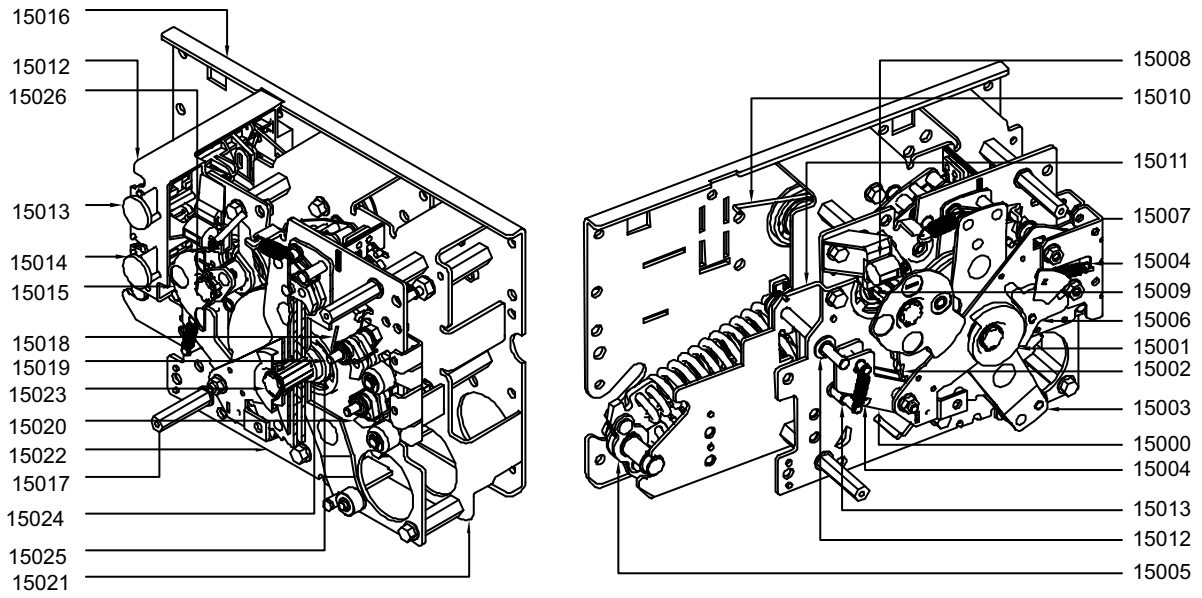


Fig. 3a ESH Mechanism with Cabinet [* Refer Legend on pg. 60]

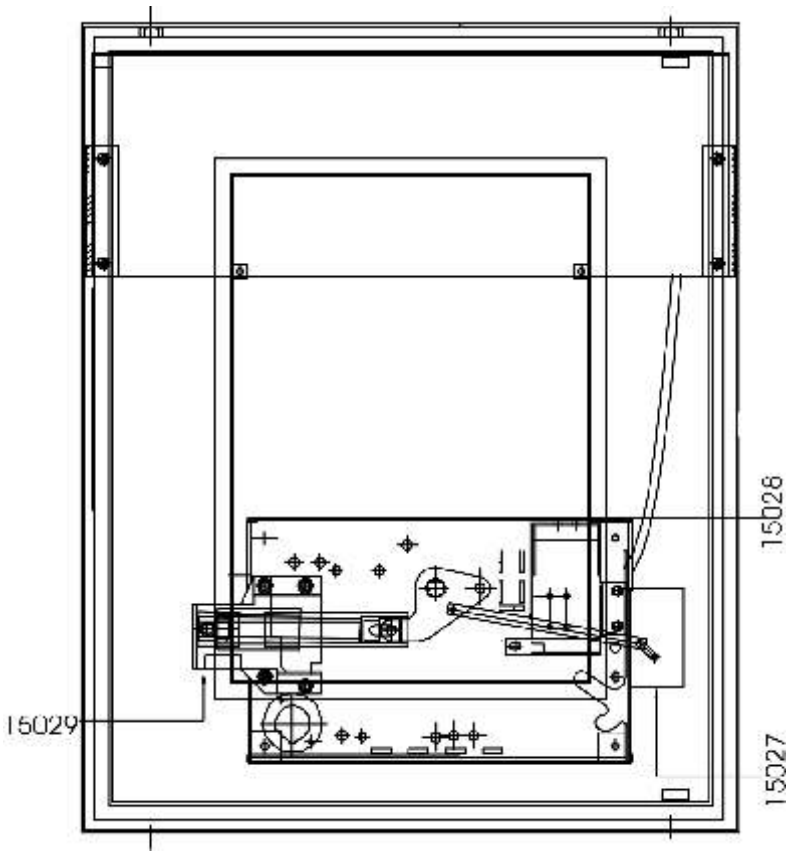


Fig. 3b ESH Mechanism with Cabinet [* Refer Legend on pg. 60]

LEGEND FOR FIG.3a, 3b, (Page 59)

15000A	Operating Mechanism
15000	Closing Lever
15001	Cam
15002	Charging Gear Assembly
15003	Charging lever group Assembly
15004	Tension Spring
15005	Closing Spring Assembly
15006	Indicator
15007	Shock Absorber
15008	Counter
15009	Circlip
15010	Opening Transmission Lever
15011	Closing Transmission Lever
15012	Shaft for closing lever
15013	Shaft for Spring
15012	Operation Box Assembly
15013	Push button For Closing
15014	Push button For Opening
15015	Opening Breaker Indicator
15016	Posterior Plate Assembly

15017	Column For fixing Shield
15018	Bending Spring
15019	Hook Assembly
15020	Hook Support Shaft
15021	Intermediate Plate
15022	Front Plate
15023	Power Shaft
15024	Bearing Spacer
15025	Bearing
15026	Charging Shaft
15027	Auxiliary Switch
15028	Connection link
15029	Tripping Spring Assembly
15030	Shunt operating release(Y01,Y02)
15031	Shunt Closing release
15032	Electric Motor
15033	Micro-Switch
15034	Common Shaft
15035	Lever
15036	Operating Rod

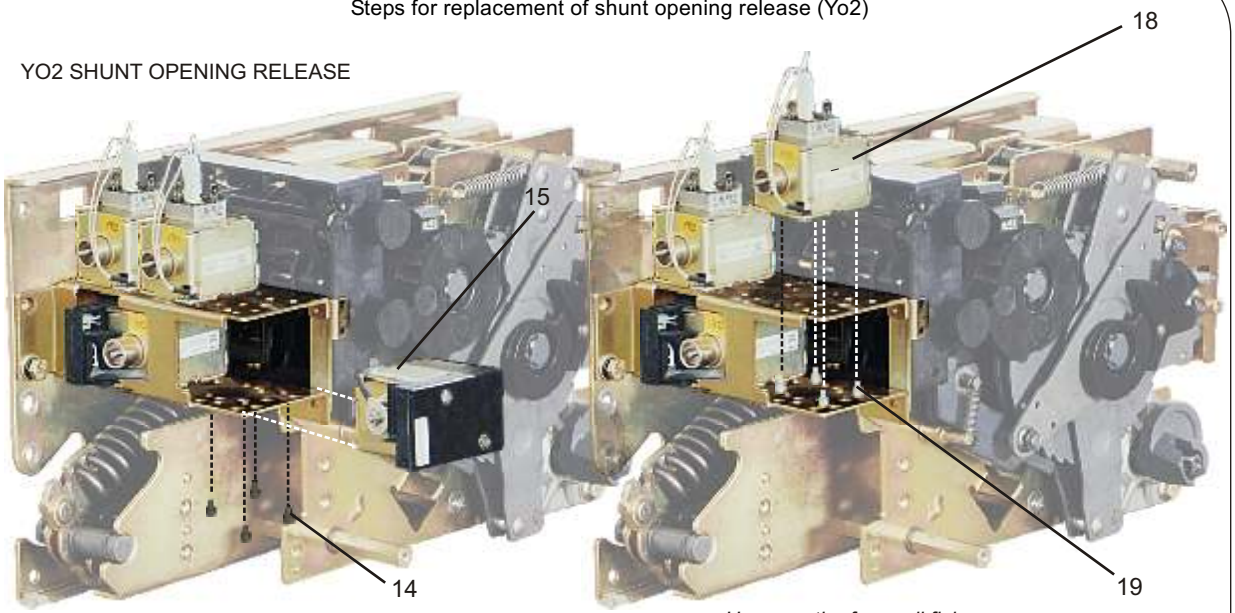
Unscrew the fixing screw of the release group mount

Withdraw the release group mount from the front of the operating mechanism. For assembly, proceed in the reverse order.

Fig. 4

Steps for replacement of shunt opening release (Yo2)

YO2 SHUNT OPENING RELEASE



Unscrew the four coil fixing screws (14) and withdraw the relative YC coil (15).

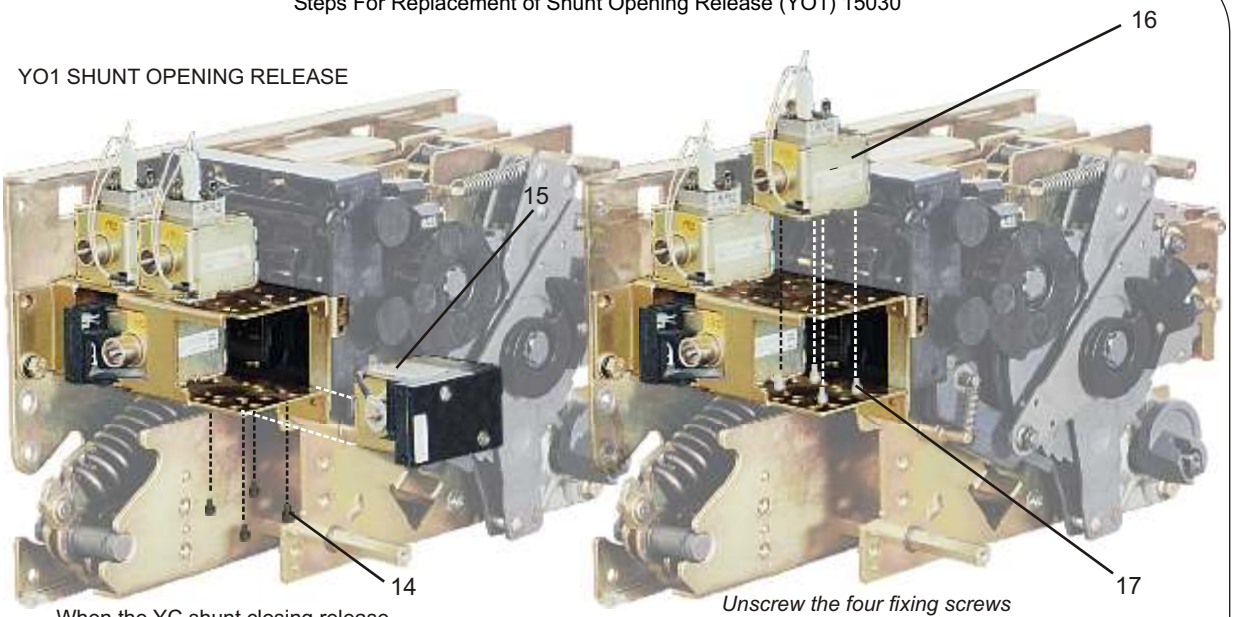
Unscrew the four coil fixing screws (19) and withdraw the relative YO1 coil (18).

FOR ASSEMBLY, PROCEED IN REVERSE ORDER

Fig. 5

Steps For Replacement of Shunt Opening Release (YO1) 15030

YO1 SHUNT OPENING RELEASE



When the YC shunt closing release is present, unscrew the four fixing screws (14) and withdraw it (15)

Unscrew the four fixing screws (17) and withdraw the relative YO1 release(16).

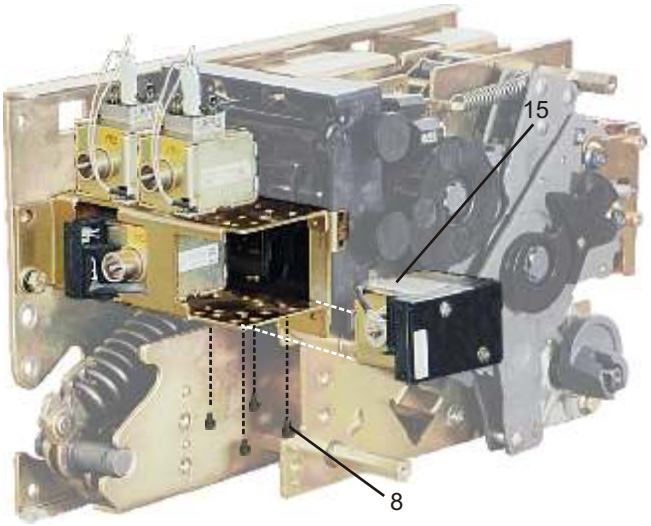
FOR ASSEMBLY, PROCEED IN REVERSE ORDER

Fig. 6

Steps For Replacement of Shunt Closing Release (YC) 15031

Disconnect the power supply connectors of the additional shunt opening release

YC SHUNT CLOSING RELEASES



Unscrew the four fixing screws and withdraw release (8)

FOR ASSEMBLY, PROCEED IN REVERSE ORDER

Fig. 7

Operating Coil Set-Up for Temperature –10 deg. C

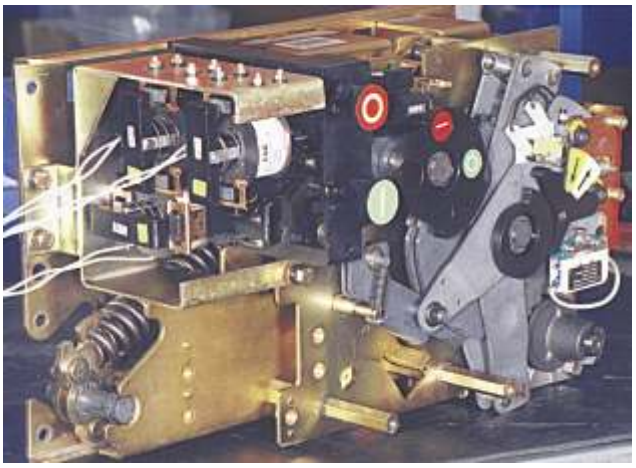
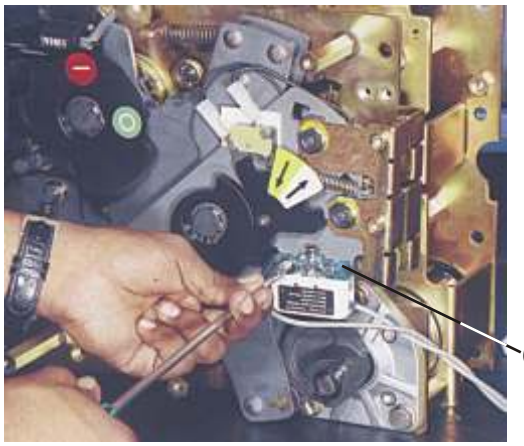
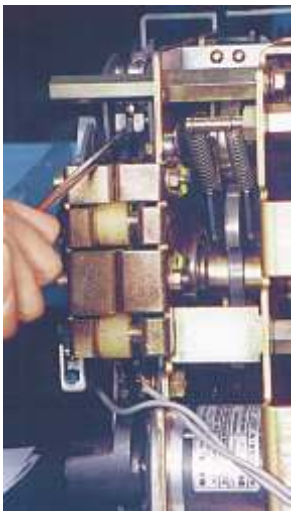


Fig. 8
Steps For Replacement of Shunt Opening Release (YO2) 15030

Steps For Replacement of Motor 15032

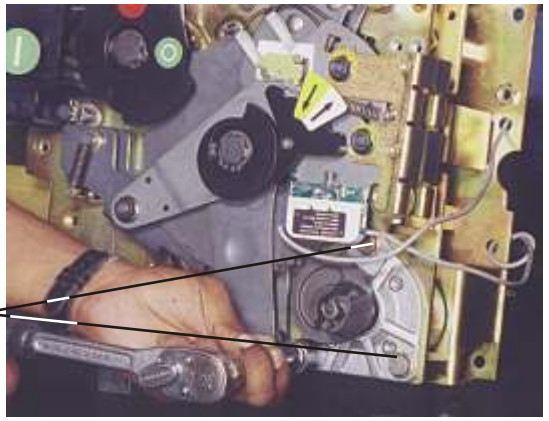


Remove the two motor limit microswitch fixing screws (2)



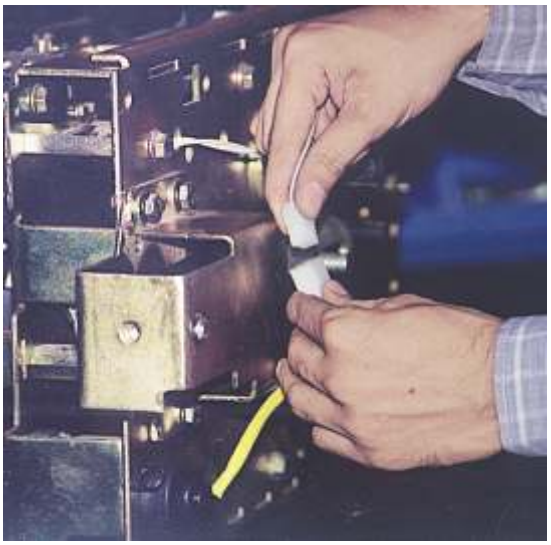
Raise the pair of driving latches using screwdriver and push the lever (3) forward.

Release the return spring, raise the pair of charging pawls and push the lever towards (4).



Unscrew the motor flange fixing screws (6)

Fig. 9



Disconnect the motor power supply (7)

Fig. 10

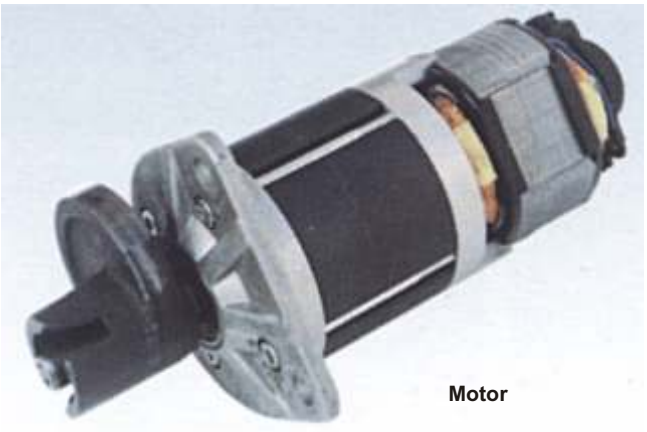
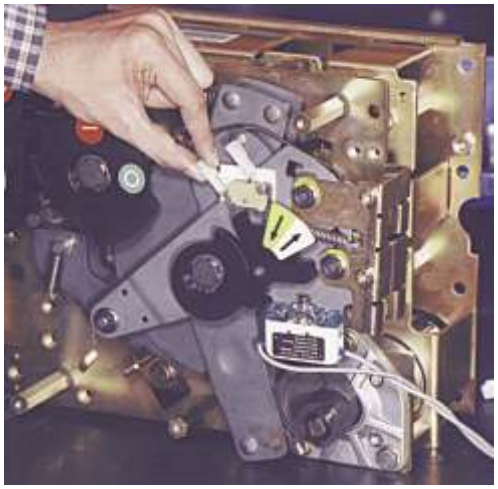
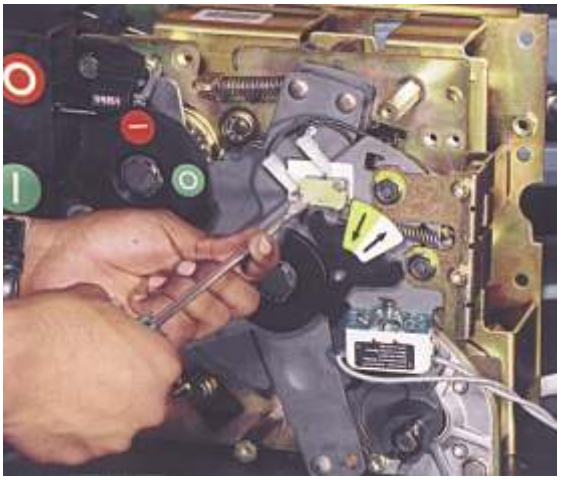


Fig. 11

Steps for replacement of micro-switch 15033



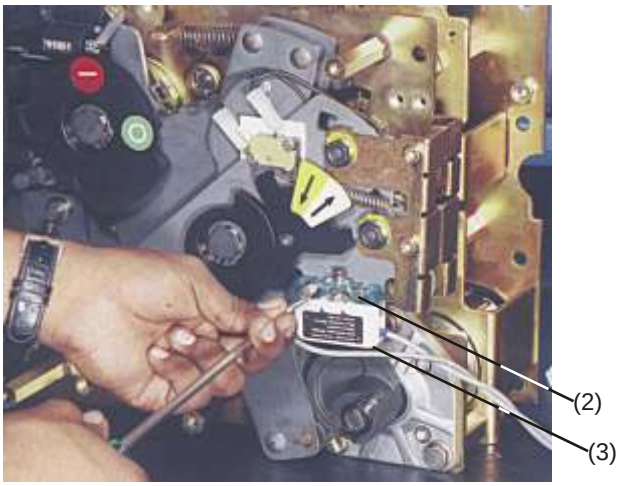
Disconnect the microswitch connection



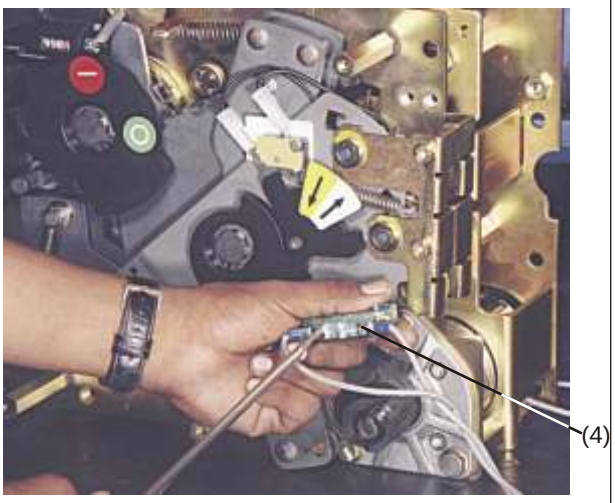
Unscrew the microswitch fixing screws

For assembly connect the Faston as it was in its original position

Fig.12



Unscrew the microswitch fixing screws (2)



Disconnect the microswitch connection (4)

Pull down cover of microswitch (3)

To assemble, proceed in reverse order

Fig.13

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