

# Outdoor SF6 Circuit Breaker - Type OHB

## Instruction for Storage, Installation, Service and Maintenance



## ***For your safety!***

Make sure that the installation site is suitable for the electrical apparatus.

Check that the complete installation, commissioning & maintenance operations are carried out by qualified personnel with in-depth knowledge of the apparatus.

Strictly follow the information given in this instruction manual.

Ensure compliance with legal guidelines of the site location as well as safe work practices.

Check that the rated performance of the apparatus is not exceeded during service.

Pay special attention to the danger notes indicated in the manual by the following symbol:



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

**Strictly follow the instruction to safeguard your own and others' safety!  
For further information, please contact ABB**

## **Introduction**

This publication contains the information necessary for installation and commissioning of OHB outdoor medium voltage circuit-breakers. For correct usage of the product, please read this manual carefully.

For correct mounting of accessories and/or spare parts please refer to the relevant instructions. The OHB circuit-breakers are designed for various standard installation configurations. They do, however, allow further technical-constructional variations (at the customer's request) to suit special installation requirements. For this reason, the information given below does not cover all special configurations.

Apart from this booklet, it is also necessary to refer to the latest technical documentation available (circuit diagrams, wiring diagrams, assembly and installation drawings, etc.), especially with regard to any variations from standardized configurations requested.

## **Environmental protection program:**

The OHB circuit-breakers are manufactured in accordance with the ISO 14001 Standards (Guidelines for environmental management). The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as raw materials .

Assessment of the environmental impact during the life cycle of the product (LCA - Life Cycle Assessment), is carried out during the design stage itself and materials, processes and packing methods were selected to minimize the same.

Production techniques, which prepare the products for simple dismantling and separation of the components, are used during manufacture of the circuit-breakers. This is to allow maximum recycling at the end of the useful life cycle of the apparatus.



**All the activities concerning installation, commissioning, operation and maintenance must be carried out by suitably qualified personnel with in depth knowledge of the apparatus. Only use original spare parts for maintenance operations.**

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## **1. Packing and transport:**

The circuit breaker is shipped in special packing cases in the open position with the springs discharged and with SF6 gas pressure corresponding to rated pressure in case of 36kV rated voltage and reduced to 1.5 bar absolute for 40.5kV rated voltage.

The apparatus is protected by a plastic bag, to prevent any infiltration of water during the loading and unloading stages and to keep the dust off during storage. If provided, the current transformers, support structure and hardware, supplied on request, are packed and shipped separately.

## **2. Checking on receipt:**

Circuit-Breaker is dispatched from factory in three separate cases containing Duct-&-Poles, Cabinet with Operating Mechanism Drive & third case contains Loose Structure with necessary hardware.

possible and in any case within five days of receipt. The apparatus is only supplied with the accessories specified at the time of order and confirmed in the order acknowledgement sent by ABB.

The following accompanying documents are inserted in the shipping packing:

- Instruction manual (this document)
- Test certificate
- Identification tag
- Copy of shipping note
- Electrical schematic diagram

The following documents are sent prior to shipment:

- Order acknowledgement
- Original copy of shipping note
- Drawings/documents regarding special configurations/conditions.



**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 (see fig. 1) with that specified in the order acknowledgement and in the delivery note.**

Also make sure that all the materials described in the shipping note are included in the supply.

If any damage or irregularity is discovered on unpacking, notify ABB (directly or through the agent or supplier) as soon as

### Rating Plate:

<b>ABB</b>			Circuit Breaker Type OHB -- . -- . --		
			Sr. No.	Ref Standard: IEC62271-100	
			Month & Year of Mfg.		
Voltage -- kV	Normal Current : A	Frequency: 50/60 Hz			
Power Frequency/LIV withstand voltage		95kV/200kV peak			
Short circuit breaking current: kA / Making current: kA peak					
Short time withstand current & duration		: kA 3 Sec			
Operating sequence 0-0.3s-CO-3min-CO		Mass(Approx.)		900 kg	
First-pole-to-clear factor 1.5		Gas Pressure SF6/20°C(abs)		3.8 bar	
Closing & opening device supply voltage :		Vdc			
Motor supply voltage :		Vdc			
Heater supply voltage :		Vdc			
		Instruction Manual		1VDU28005-YN	

Fig.1 Rating Plate of OHB36 Breaker

### 3. Storage:

When a long period of storage is foreseen, (on request) ABB can provide suitable packing for the specified storage conditions. On receipt the apparatus must be carefully unpacked and checked as described in Checking on receipt (chap. 2). If immediate installation is not possible, the apparatus must be packed again, using the original packing material. Insert hygroscopic substances inside the packing, with at least one standard bag per piece of apparatus. Should the original packing not be available and immediate installation is not possible, store in covered,

well-ventilated, dry, dust-free, non-corrosive atmosphere, away from any flammable materials and at a temperature between 5°C and +45 °C. In any case, avoid any accidental impacts or positioning which stresses the structure of the apparatus.

**Lifting:**

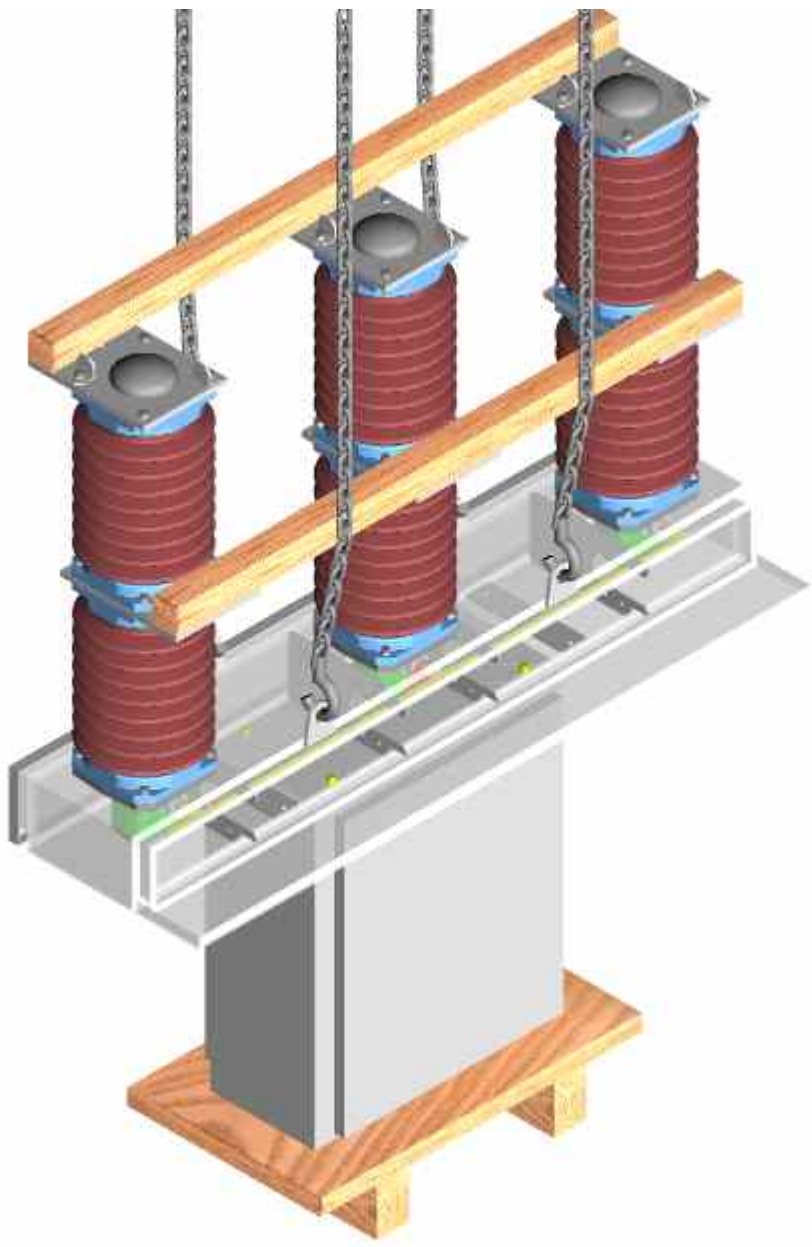


Fig.2 Lifting arrangement.



- The lifting operations must be carried out using a hoist or bridge crane.
- Check that the lifting equipment is suitable for lifting a load of more than 900 Kg;
- The circuit-breaker poles contain SF6 at a pressure of 380 kPa for 36kV application and 550kPa for 40.5 kV application.
- By means of the special spring catches, hook the ropes to the circuit-breaker
- Hook to the special anchoring points provided in the structure and lift.

## **5. Description:**

The OHB medium voltage circuit-breakers for outdoor installation use sulphur hexafluoride gas as insulating and arc quenching medium. The mechanical operating mechanism used is ESH type with stored energy and free release which allows opening and closing operations from local and remote positions. The operating mechanism, the activating kinematics of the moving contact, all the control and operating circuits and the anti-condensation heater are located inside the tight metal cabinet which also acts as the support for the poles and Duct.

The above-mentioned structure is supported by a frame made of telescopic metal sections, which provides the flexibility to adjust the height of the circuit breaker from 3090 to 3990 mm.

The Cabinet has IP 54 degree of protection (if provided with filters over the ventilation holes on the bottom of the box - optional) and is fitted with a tight door with inspection window.

The door has a pad-locking arrangement

Legend [Refer Fig.3]

1. Upper Terminals
2. Porcelain Insulators
3. Lower Terminals
4. Lifting Hooks
5. Supporting Structure
6. Cabinet
7. Inspection window
8. Cross-Angles

### **5.1. Reference Standards**

OHB circuit-breakers comply with the IEC 62271-100, as well as the requirements of the standards of other major industrialised countries.



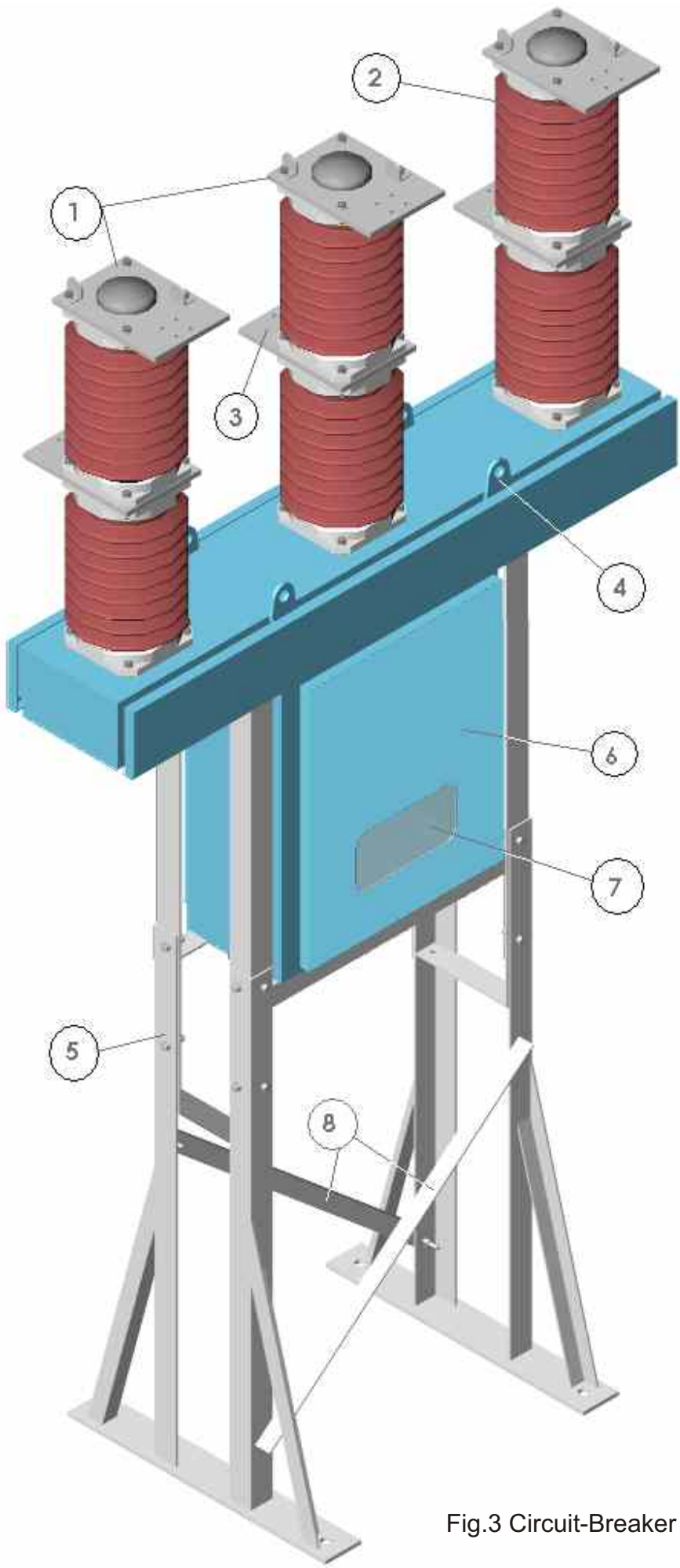


Fig.3 Circuit-Breaker with structure

## 6. Instructions for circuit-breaker operation:

### 6.1. Operating and signaling parts

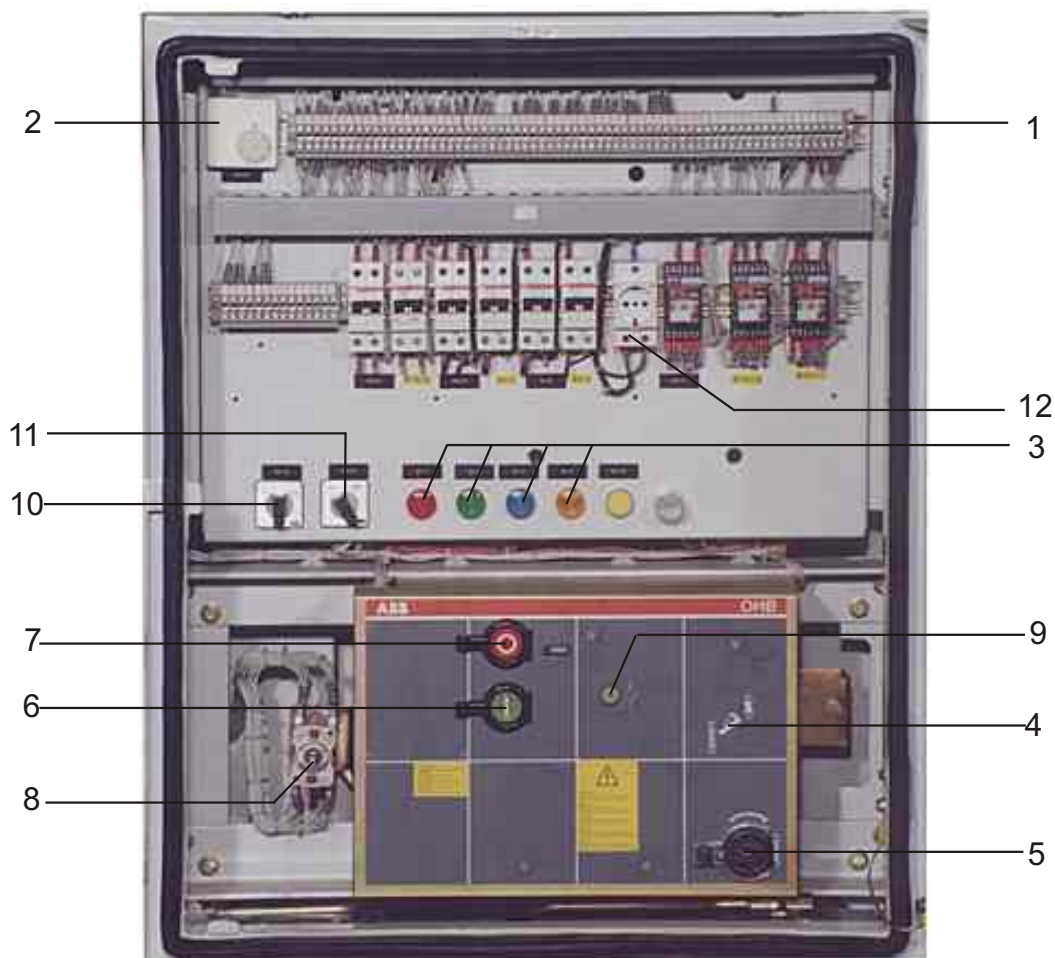


Fig. 4 Operating Mechanism & Wiring Plate

#### Legend

1 Terminal block of the operating and signaling circuits  
 2 Thermostat  
 3 Signaling lamps (on request)  
 4 Spring- charged/discharged signaling device  
 5 Coupling for closing spring charging handle

6 Opening pushbutton  
 7 Closing pushbutton  
 8 Circuit-breaker auxiliary contacts  
 9 Signaling device for circuit-breaker open/close  
 10 Local closing and opening control switch  
 11 Local/remote change-over switch  
 12 Service power supply socket (on request)

## 6.2 Safety indications:



**If mechanical operations are to be carried out on the circuit-breaker inside the installation area or with the protection nets removed, pay great attention to the moving parts and to the medium voltage line. If the operations are disabled, do not force the mechanical interlocks, instead check that the operation sequence is correct.**

### 6.3. Circuit-breaker closing and opening operations

**Circuit-breaker operation can be manual or electrical.**

#### a) Manual operation for spring charging :

To manually charge the closing springs, it is necessary to fully insert the charging lever into the seat (9) and turn it clockwise until the yellow indicator (6) appears. The force which can normally be applied to the charging lever fitted is 130 N. In any case, the maximum force applied must not exceed 170 N.

#### b) Electrical operation for spring charging

On request the circuit-breaker can be fitted with the following accessories for electrical operation:

- geared motor for automatic charging of the closing springs
- shunt closing release
- Shunt opening release.

The geared motor automatically recharges the springs after each closing operation until the yellow indicator (6) appears. If there is

no auxiliary supply during charging, the geared motor stops and then starts recharging the springs automatically when the voltage is on again. It is, however, always possible to complete the charging operation manually.

#### c) Circuit-breaker closing

This operation can only be carried out with the closing springs completely charged. For manual closing, press the pushbutton (12). When there is a shunt closing release, the operation can also be carried out with remote control by means of a control circuit. The indicator (11) shows that closing has been accomplished.

#### d) Circuit-breaker opening

For manual opening, press the pushbutton (13).

When there is a shunt opening release, the operation can also be carried out with remote control by means of a control circuit. The indicator (10) shows that opening has been accomplished.

## 7. Installation:

### 7.1. General



**Correct installation is of prime importance for smooth operation of the product. The instructions given by the manufacturer must be carefully studied and followed. It is good practice to use gloves to handle the parts during installation.**

### 7.2. Normal installation conditions

Maximum ambient air temperature + 40 °C

Minimum ambient air temperature (-) 25 °C

Relative humidity % < 95

Altitude < 1000 m

For other installation conditions, please follow what is indicated in the product Standards. For special installation requirements please contact us. The areas where the power conductors or auxiliary circuit conductors are placed must be protected against the possible access of animals, which could cause damage to equipment as well as the installation.

### 7.3. Preliminary operations

Clean the insulating parts with clean dry cloth.

Check that the upper and lower terminals are clean and free of any deformation caused by shocks received during transport or storage.

Check that there are no foreign bodies inside the operating mechanism box and the pole base.

### 7.4. Foundation for circuit-breaker fixing

The foundation for circuit-breaker fixing must be made of reinforced concrete and must be smoothly leveled. The maximum planarity tolerance allowed is 2 x 1000.

The circuit-breaker can be fixed directly to the floor by means of four expansion anchoring bolts (not supplied) or with log bolts (not supplied).

In the case of fixing with expansion bolts, the HILTY HSA M 20x170 type can be used. In any case, the expansion anchoring bolts must be of a suitable type to resist a vertical extraction force of 15 kN and a horizontal traction force of 20 kN. Refer Fig.6 for Structure without CTs & Fig.7 for Structure with CTs.

In the case of fixing with foundation bolts, these must be made as per Fig.8 for Structure without CTs and as per Fig.9 for Structure with CTs.

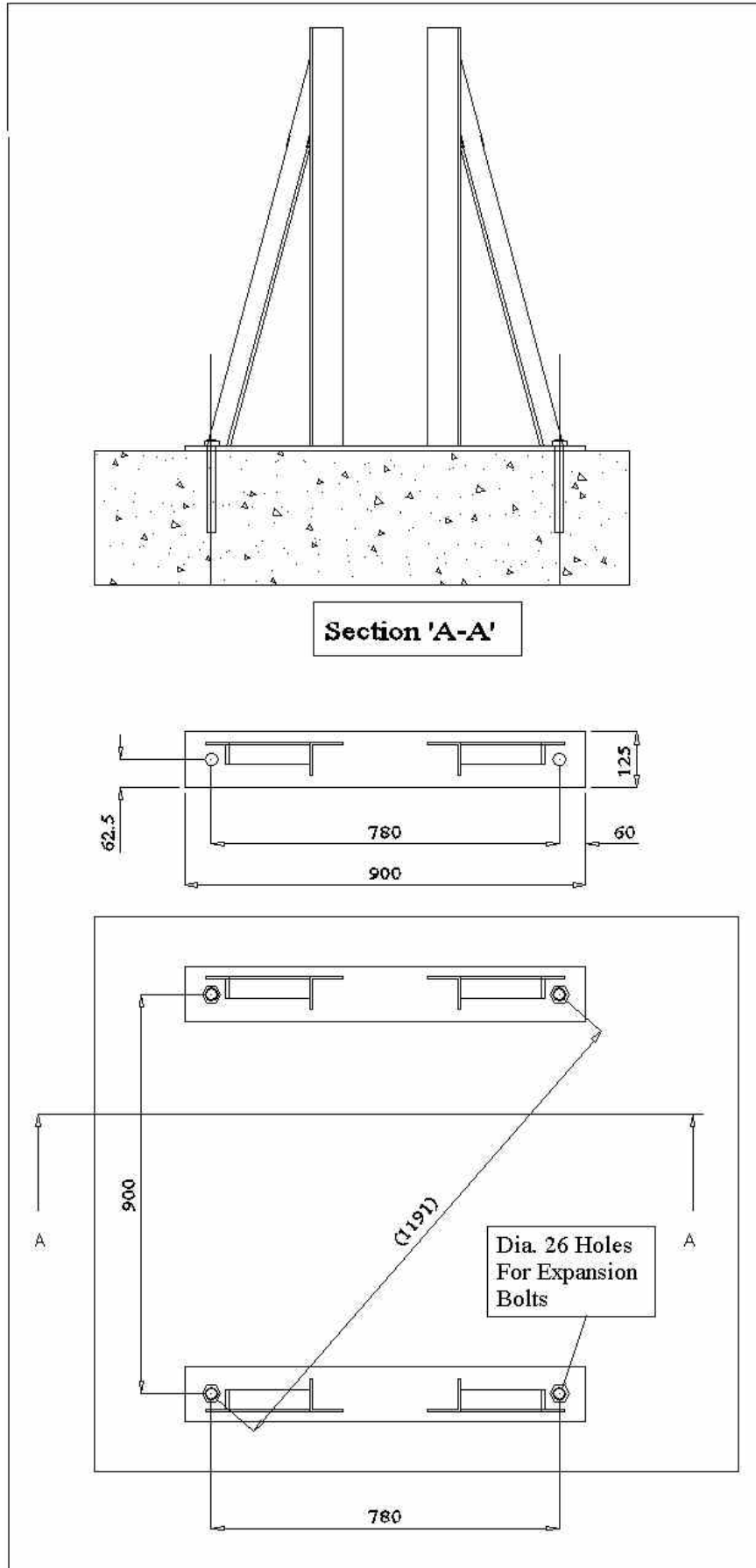


Fig. 6 Foundation details with expansion anchoring bolts (without CT structure)



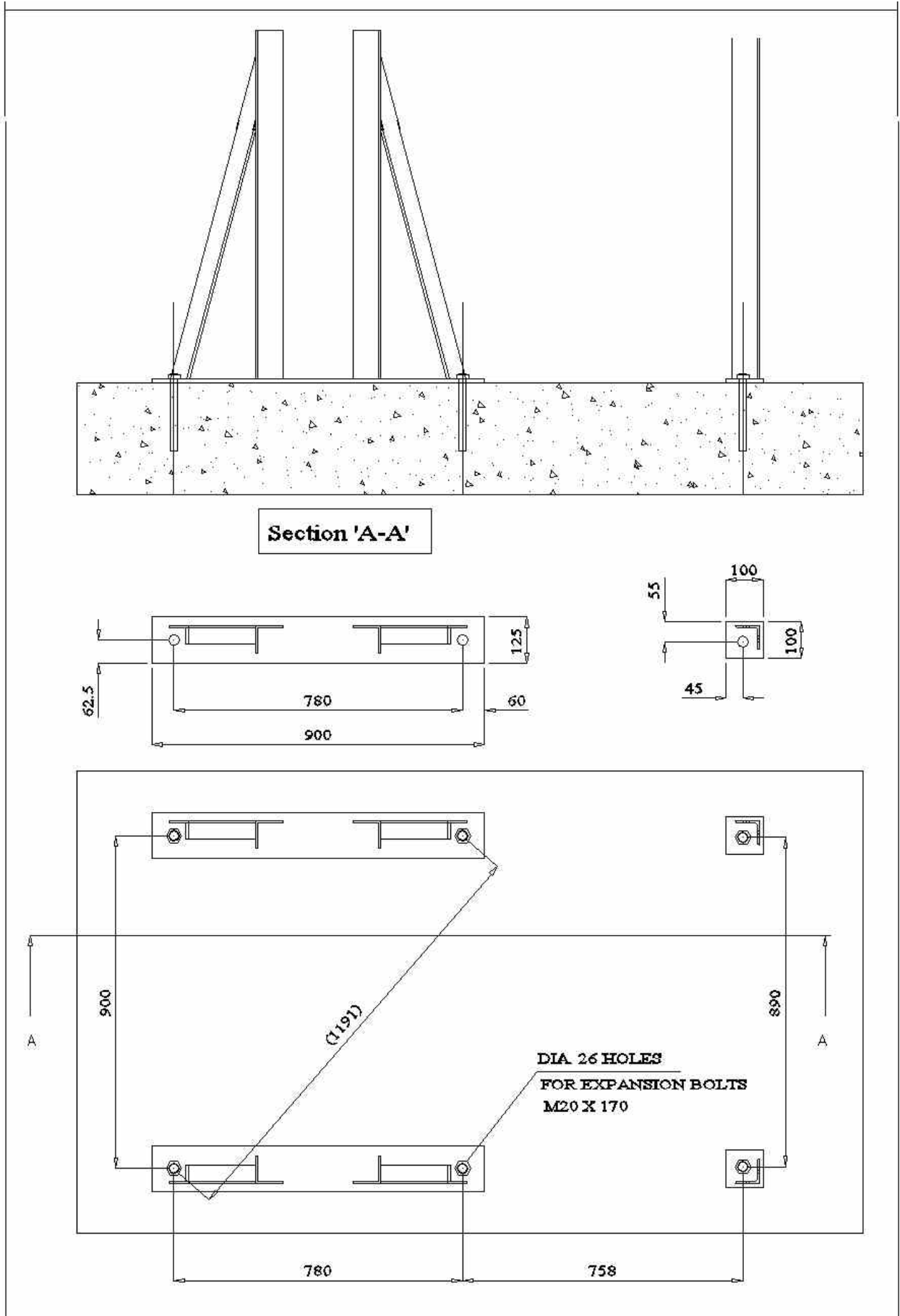


Fig. 7 Foundation details with expansion anchoring bolts (with CT structure)

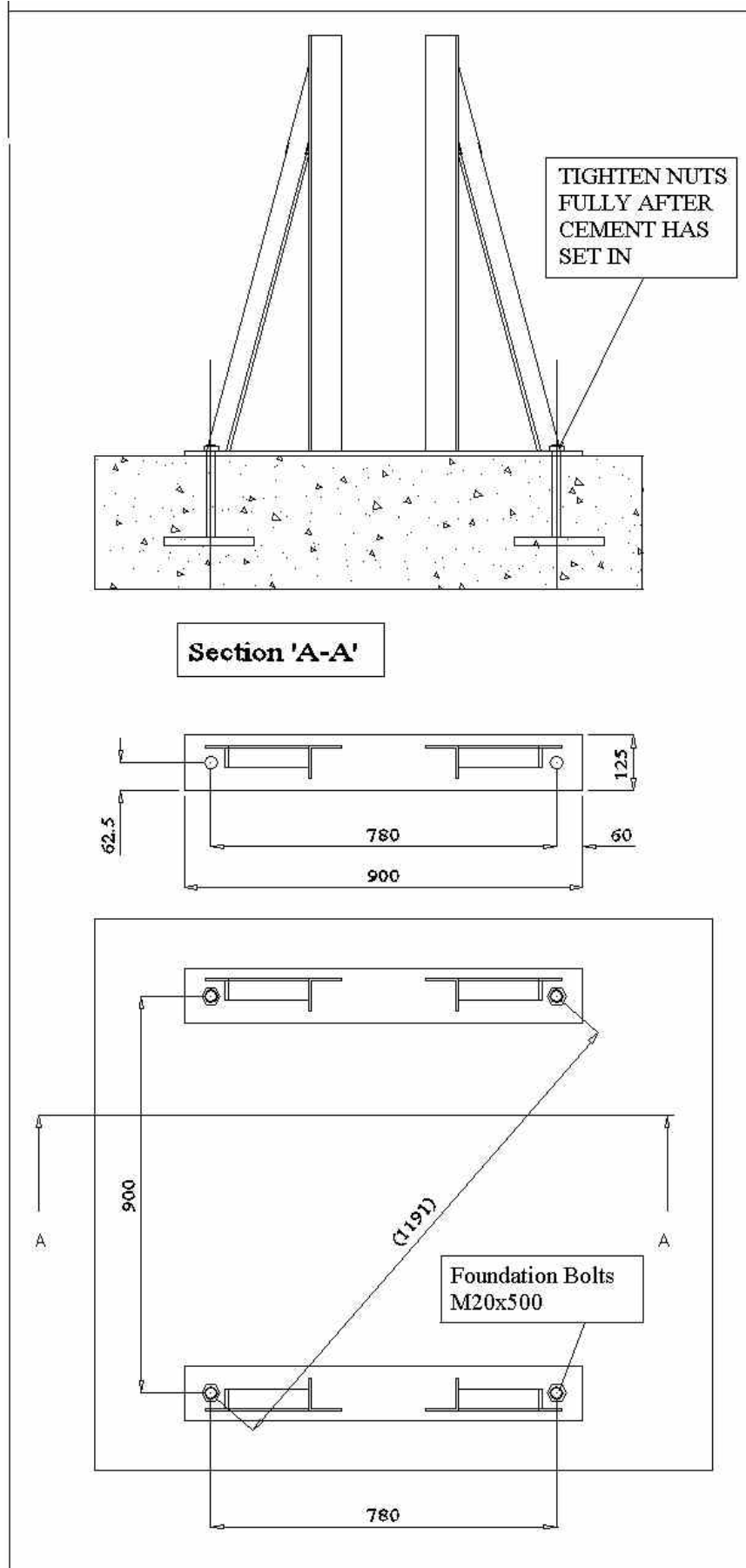


Fig. 8 Foundation details with log bolts (Foundation bolts) (without CT structure)

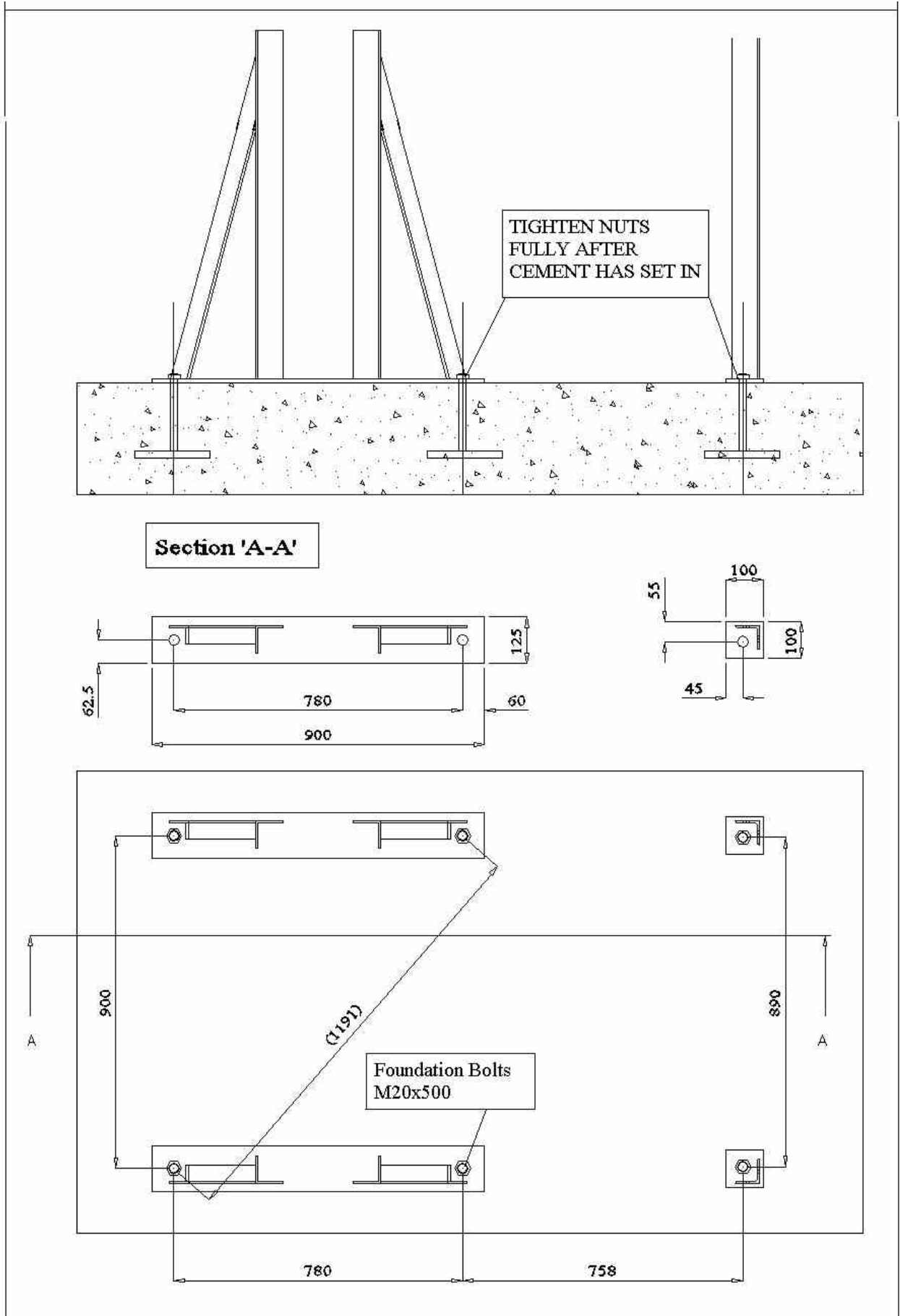


Fig. 9 Foundation details with log bolts (with CT structure)

## 7.5. Assembly of the telescopic structure:

### 7.5.1 Details of Structure parts

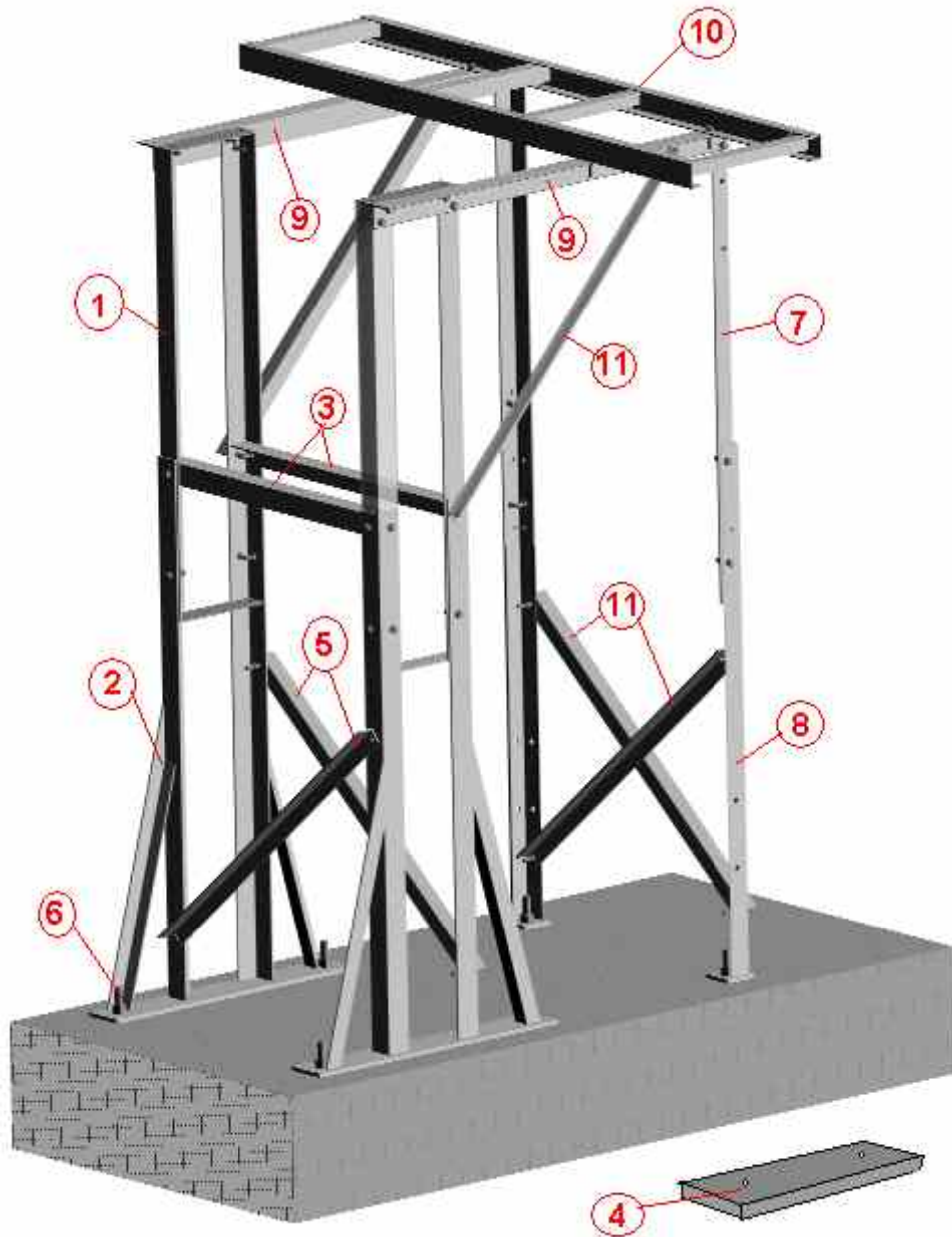


Fig. 10 Details of structure (with CT structure)

#### List of the parts of structure

1. Upper Leg Assly - 2 Nos.
2. Lower Legs Assly - 2Nos
3. Support Angles(front and rear) - 2 Nos
4. Stiffeners - 2Nos
5. Cross-Angles. - 2 Nos
6. Foundation Bolts - 4 Nos (2 Nos additional for CT structure)

#### List of the additional parts for CT structure

7. Lower Leg Assly - 2Nos
  8. Upper Leg - 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

## 7.5.2 Assembly sequence

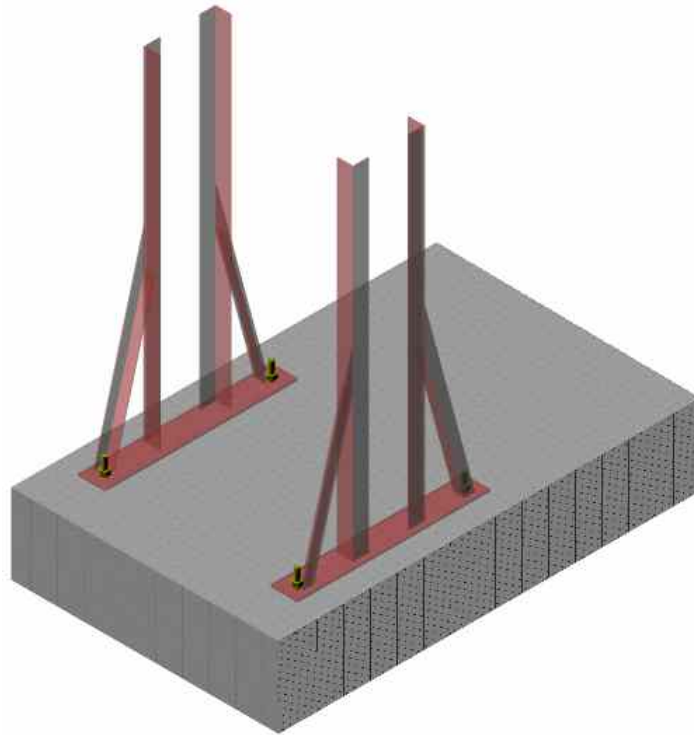


Fig. 11 Arrangement without CT structure

- Fix the Lower Leg Assly as shown in Fig. 11
- 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) as per Fig.12

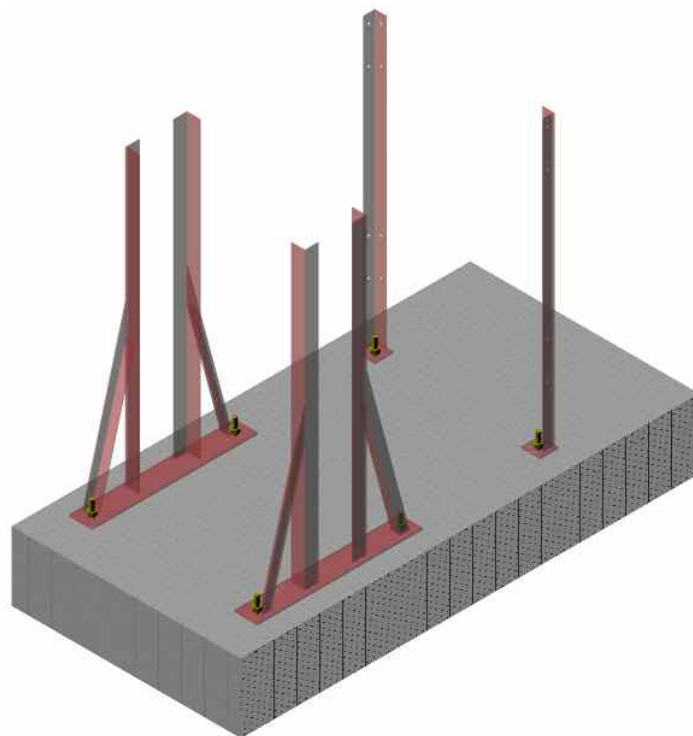


Fig.12 Arrangement with CT Structure (Optional)



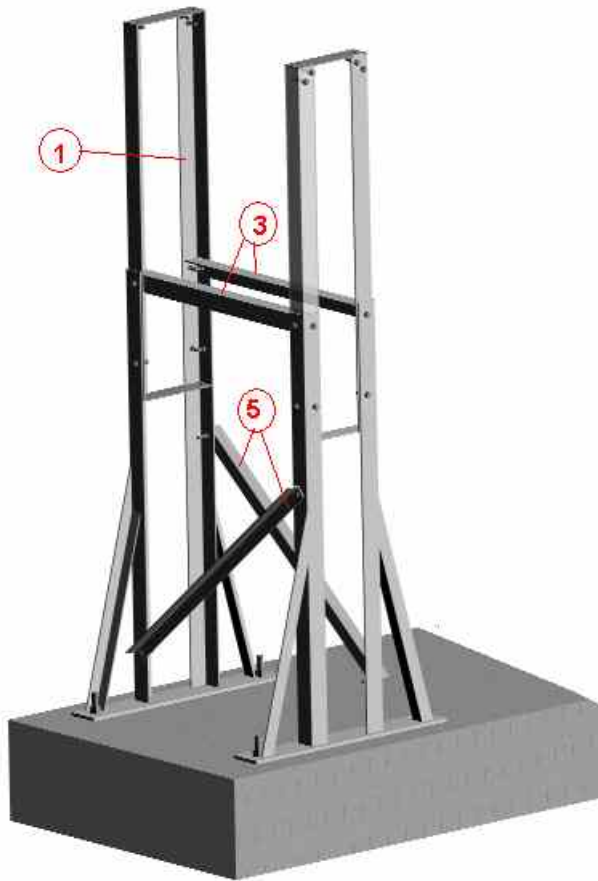


Fig 13 Circuit Breaker Structure Assembly

- Now fix Cross-Support Angles (5) as shown in Fig. Using M12 bolts, spring washers, plain washers & Hex Nuts .
- Slide Upper Leg Assembly (1) into Lower Leg Assembly to achieve height as per your requirement, Structure can be adapted to three different heights in pitch of 150 mm

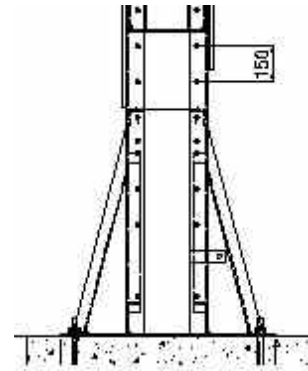


Fig.14Pitch for adapting required height

- Fix Support Angles(3) and M12 bolts, spring washers, plain washers & Hex Nuts.
- For the sake of flexibility, do not fully tighten the fasteners.

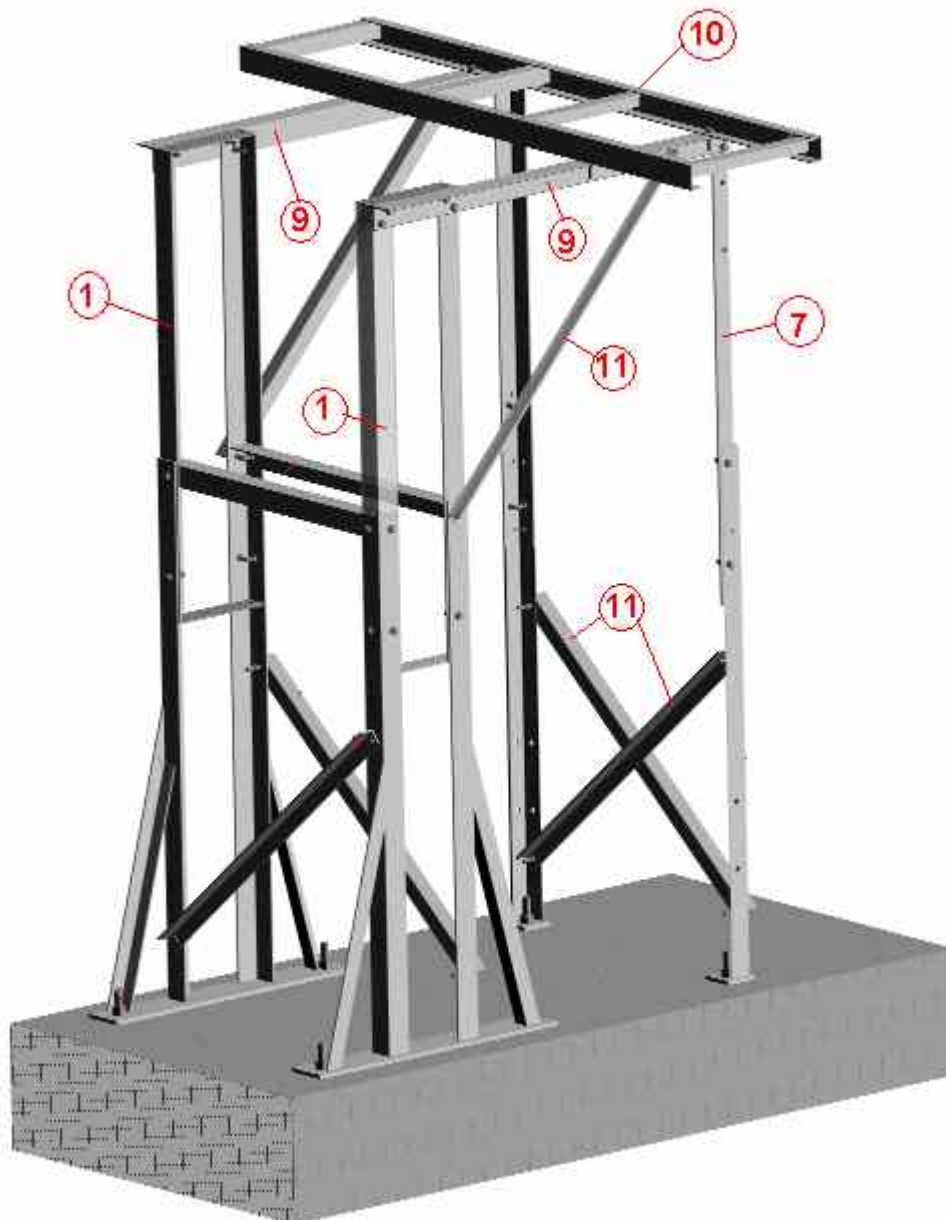


Fig. 15 Circuit-breaker Structure Assembly with CTs

- 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 in Fig.15
- Fix Cross-Angles (11)
- Fix CT Frame(10) on the Support Angles(9)
- For the sake of flexibility, do not fully tighten the fasteners.

## **7.6 Assembly of Poles-with-Duct on Cabinet:**

### **7.6.1 Unpacking of Cabinet**

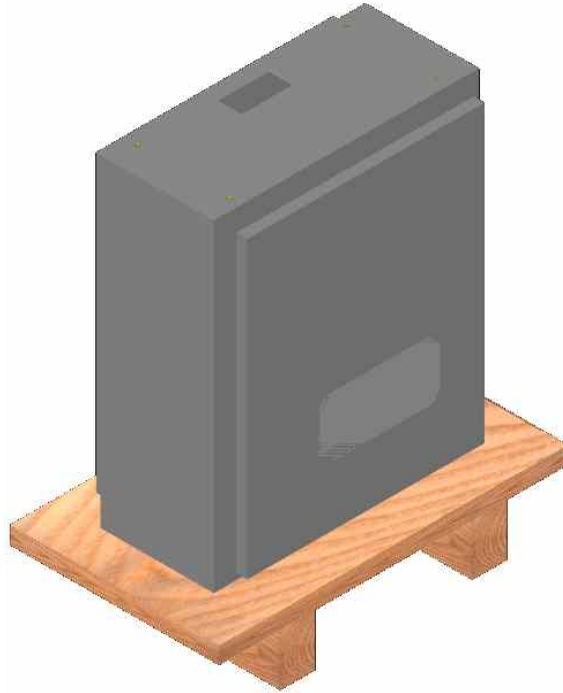


Fig.16. Cabinet Assembly on palate

- Remove top & all side covers of casing containing Cabinet Assembly.
- Do not remove the bottom pallet.
- Keep this ready for furthur assembly.

### 7.6.1 Unpacking of Poles-with-Duct Assembly

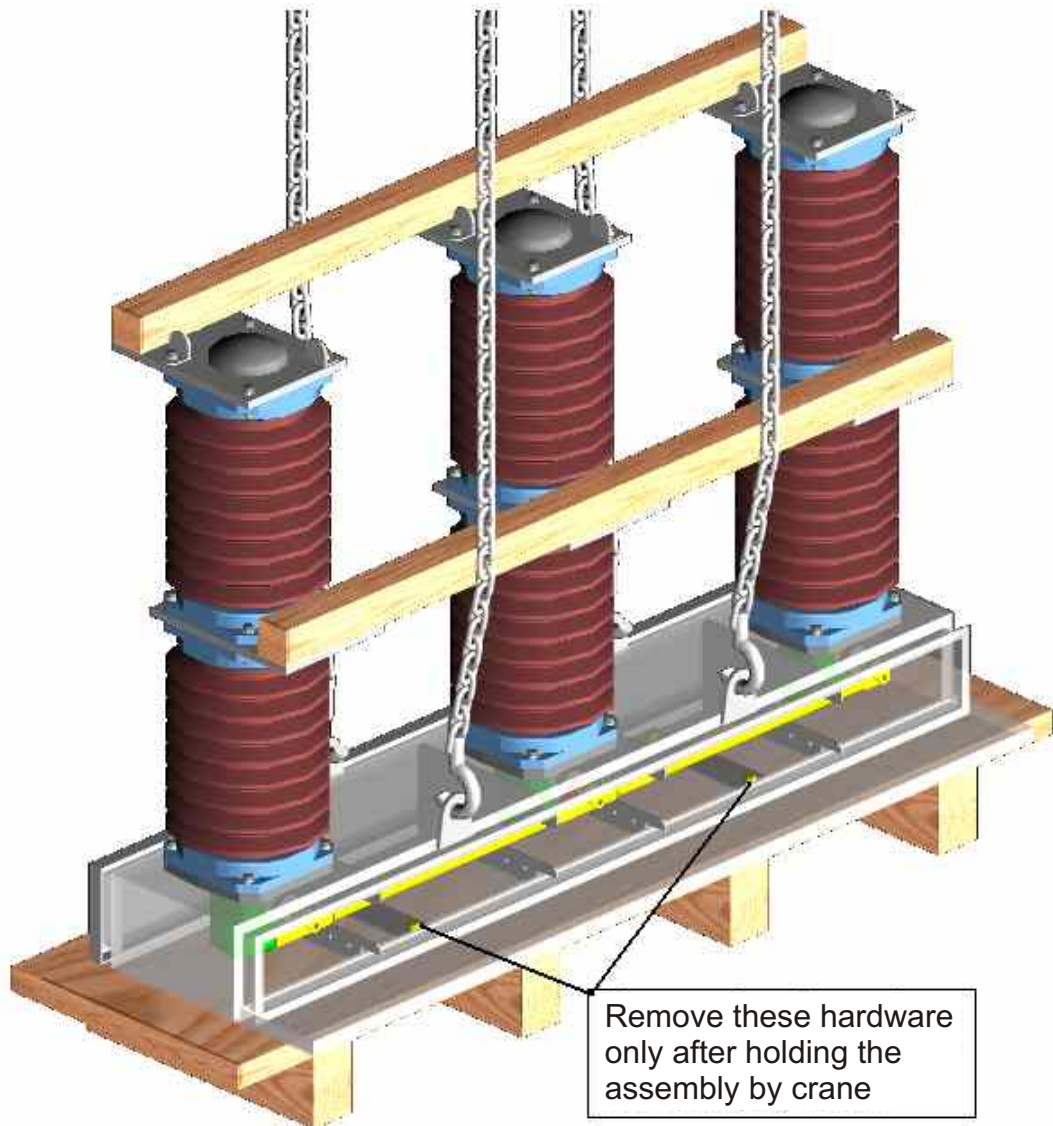


Fig. 17 Unpacking of Poles-with-Duct Assembly

- Remove top & all side covers of casing containing Poles-with-Duct Assembly.
- Hold Poles-with-Duct Assembly by lifting crane as shown in Fig.17
- Remove the M8 Bolts from the rear covers of the Duct & open the rear cover.
- Free Poles-with-Duct Assembly by removing bolts as shown in Fig.17
- Lift entire assembly & place it on the Cabinet.

## 7.6.2 Assembly of Poles-with-Duct Assembly on Cabinet

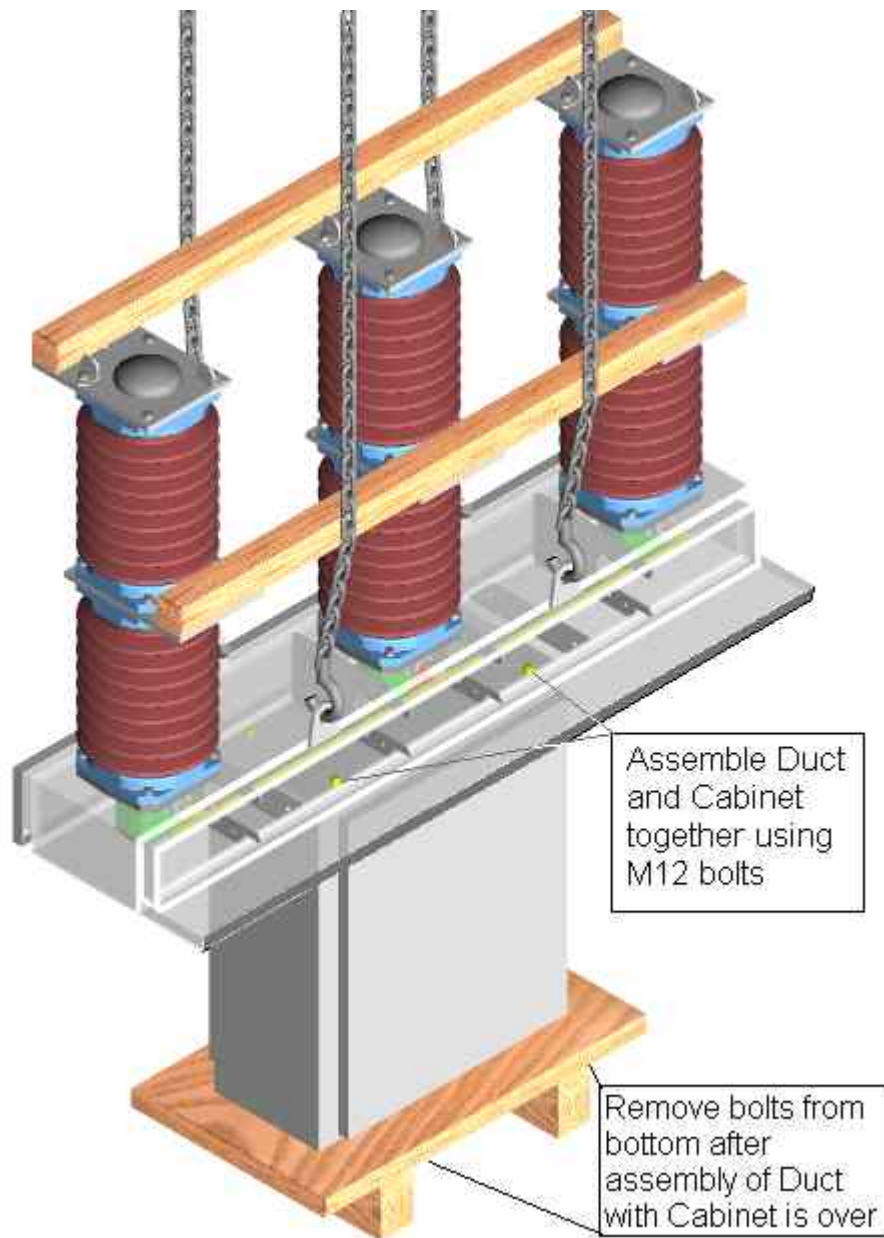


Fig. 18 Assembly of Poles-with-Duct & Cabinet

- Assemble Poles-with-Duct & Cabinet assembly together using M12 bolts, spring washers, plain washers.[M12 Nuts are welded inside the cabinet both at top & bottom]
- Now remove the bolts from the pallet as shown in Fig.18 [Bolts can be removed without opening the Cabinet]
- Lift the entire assembly to the ready structure



### 7.6.3 Assembly of entire Circuit-Breaker on structure

- Refer Fig. 19 before going for 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 Stiffener-Plates are put inside the duct & assemble the structure with duct using M12 bolts, spring washers, plain washers & Hex Nuts.
- 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 ropes until all hardware are fastened fully.
- Fix Current transformer on C-Channel frame (optional)

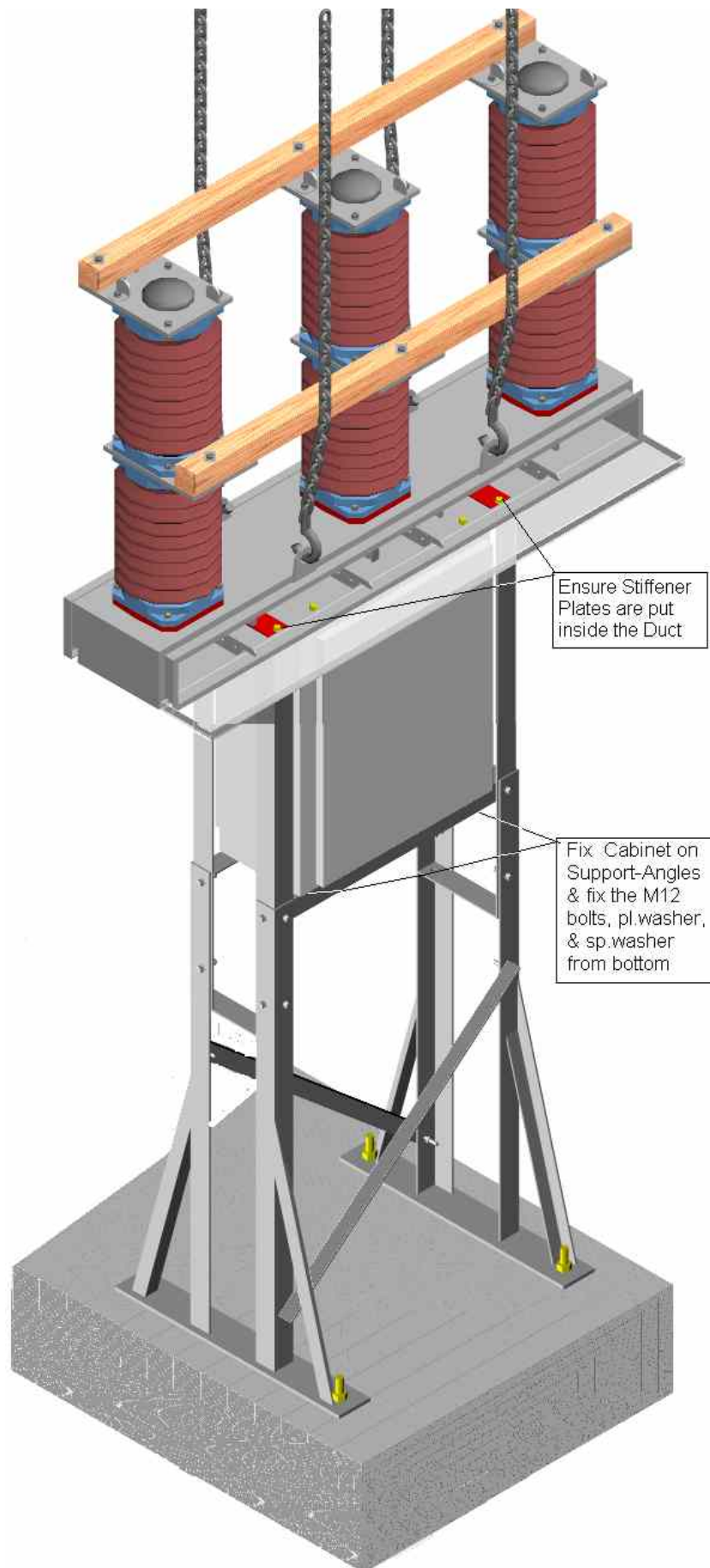


Fig.19 Fixing the breaker on the structure

## 7.8. Power circuit connections:

### 7.8.1. General instructions

- Select the conductor cross-section according to the service and short-circuit current of the installation.
- Near the circuit-breaker terminals, provide suitable support insulators sized according to the electrodynamic stresses that may arise from the short-circuit current of the installation.

### 7.8.2. Mounting the connections

- Check that the connection contact surfaces are perfectly flat and have no burrs, oxidation traces, or damages due to machining or handling.
- Depending on the conductive material and surface treatment used, carry out the operations indicated in the table on the contact surface of the conductor.

### Mounting procedures

- Place the connections in contact with the circuit-breaker terminals.
- Interpose a spring washer and a flat washer between the head of the bolt and the connection.
- Apply an adequate tightening torque and take care not to stress the insulating parts.
- Make sure that the connections do not exert forces on the terminals.
- In case of cable connections, carefully follow the manufacturer's instructions for making the cable termination.

Bare Aluminium	Bare Copper
<ul style="list-style-type: none"> <li>• Clean with fine file or emery cloth</li> <li>• Fully tighten &amp; smear a film of natural grease over the contact surfaces.</li> </ul>	<ul style="list-style-type: none"> <li>• Clean with a metallic brush or emery cloth</li> <li>• Immediately smear a film of conductive neutral grease over the contact surfaces.</li> <li>• Interpose the copper aluminum bi-metal with restored surfaces between the copper connection &amp; the Aluminium terminal (Aluminium side in contact with the terminal, copped side in contact with the connection)</li> </ul>

## 7.9 Earthing:

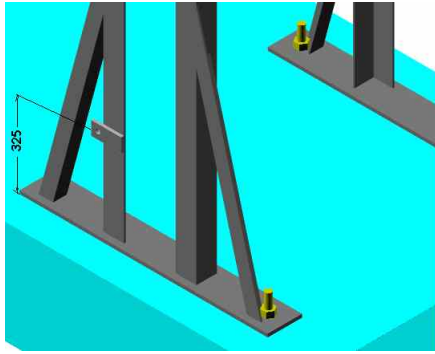


Fig. 20 Details of Earthing

- Carry out earthing by bolting the earthing conductor on the earthing point.
- Be sure to clean & degrease the area around the hole & on completion of assembly, cover the joint with Vaseline again.

## 7.10. Auxiliary circuit connection:

Before opening the operating mechanism cover make sure that the circuit-breaker is open and the closing springs discharged.

- The connection of the circuit-breaker auxiliary circuits must be made via the terminal box mounted inside the operating mechanism box.
- Outside the circuit-breaker the wires must run inside appropriately earthed metal tubes or ducts.
- The minimum cross-section of the wires used for the auxiliary circuits must not be less than that used for internal wirings. They must also be insulated for 2 kV test voltage.

### 7.11 Overall Dimensions:

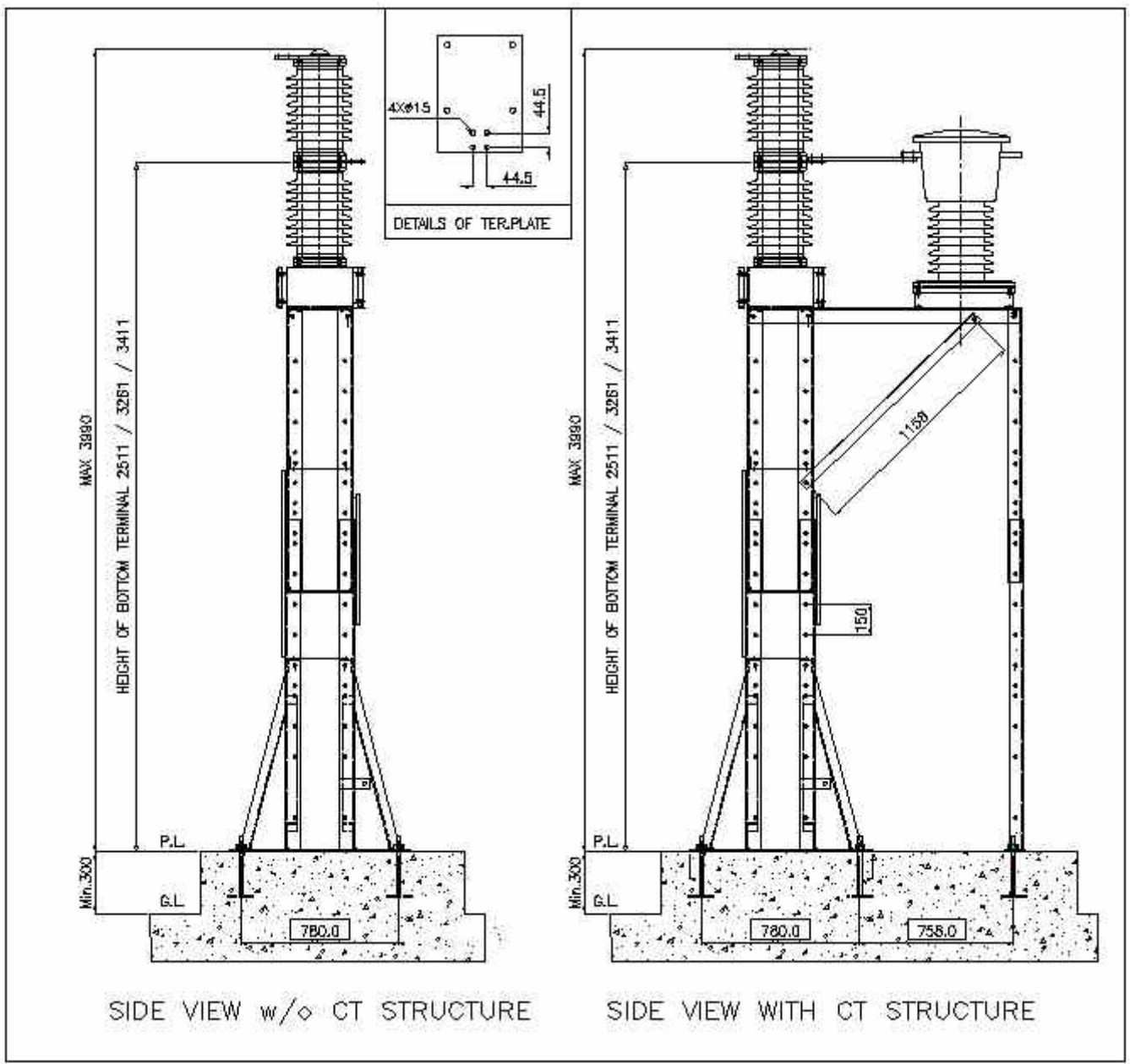


Fig. 21 Side View of the circuit Breaker

For front view refer next sheet.

Height of Breaker can be adjusted in the pitch of 150 mm from 3090 to 3990

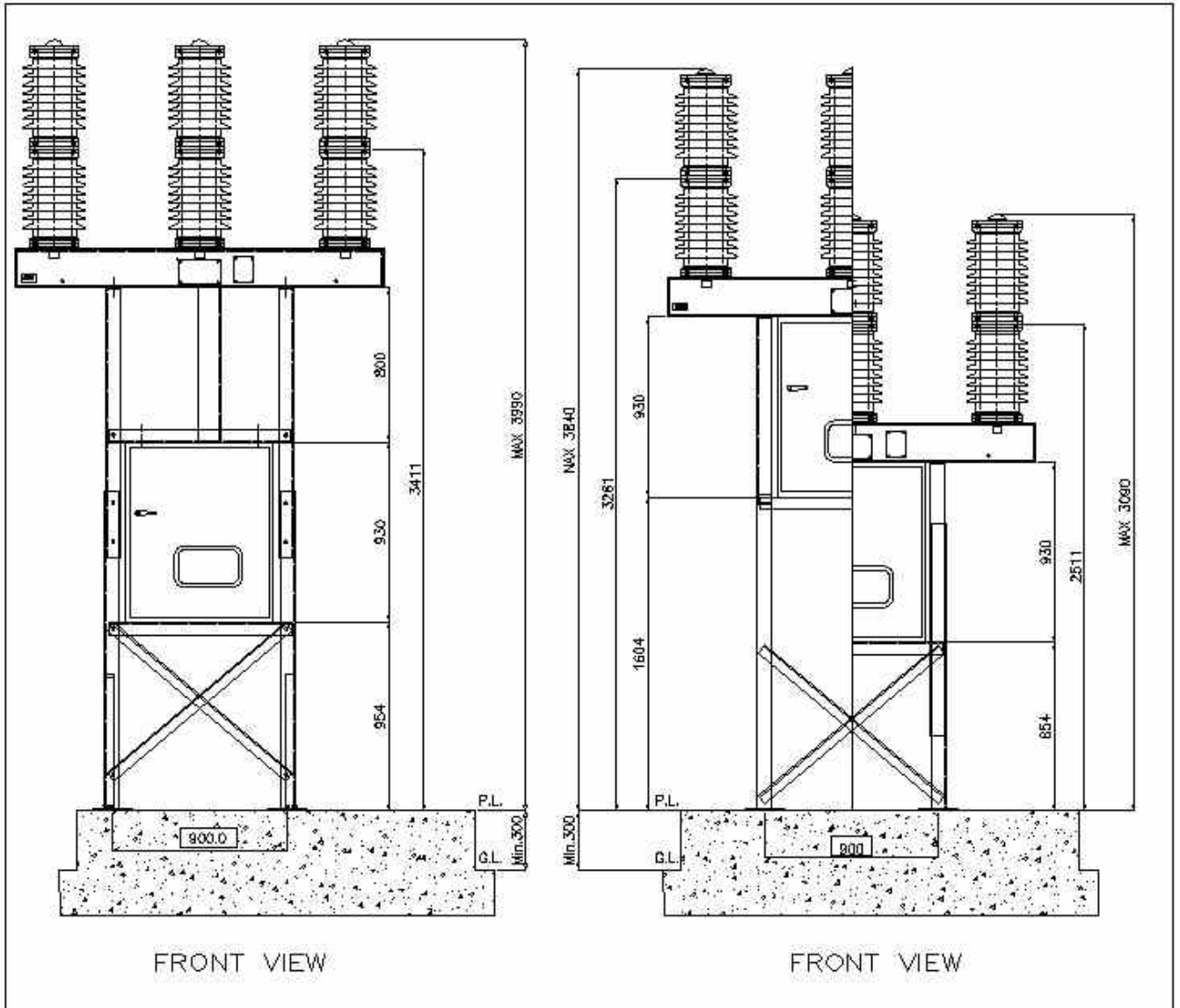


Fig.22 Front view of the circuit breaker



## 8. Commissioning:

### 8.1 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 disabled, 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 (0 Degree Celsius)
- Also carry out the checks indicated in the following table

Subject of inspection	Procedure	Positive check
Insulation Resistance	<b>Medium voltage circuits</b> 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 Mohm and, in any case, constant in time.
	<b>Auxiliary circuits</b> 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 (see chap. 6). N.B. Give rated auxiliary supply to the u/v release on the operating mechanism (if provided).	The operations and relative signals occur correctly.
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.

Subject of inspection	Procedure	Positive check
Under-Voltage release	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 The signal changes over
Shunt opening release	Close the circuit breaker manually Put the changeover switch on LOCAL (17 - fig.4) Locally control the electric opening of the circuit-breaker using the special pushbutton (alternatively opening can be set and controlled remotely).	The circuit breaker opens normally
Local-remote selector SW	Open the circuit breaker manually Put the changeover switch on LOCAL (17 - fig.4) 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	Open the circuit breaker Turn the key and remove it. Attempt the circuit breaker closing operation	Neither manual nor electric closing takes 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 operating mechanism enclosure door. Carry out a few opening and closing operations using the special remote controls.	The operations and signals are normal
	Open the operating mechanism enclosure door. Try to carry out the remote closing operation.	Remote closing is not possible
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
Cable glands	Check tightness 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

## 9. 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.**

### 9.1. General

During normal service, the circuit-breakers are maintenance-free. The frequency and sort of inspections basically depend on the service conditions. Various factors must be taken into account: frequency of operations, interrupted current values, relative power factor and the installation ambient.

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.

### 9.2 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. Screws, nuts, bolts, etc. must be tight.
Measuring the insulation resistance.	1 Yr/5000 operations	See par. 8.1. point 1.

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

## **10. Maintenance operations:**

Maintenance must only be carried out by ABB personnel or in any case by suitably qualified customer personnel who have in-depth knowledge of the apparatus. Should the maintenance be carried out by the customer's personnel, responsibility for any interventions lie with the customer.

Replacement of any parts not included in the "List of spare parts/accessories" (para. 12.1.) must only be carried out by ABB personnel.

In particular:

- Complete pole with bushings/connections
- Operating mechanism
- Closing spring unit
- Opening spring.

## **11. Indications for handling apparatus with SF6:**

SF6 in its pure state is an odourless, colourless, non-toxic gas with a density about six times higher than air. For this reason, although it does not have any specific physiological effects, it can produce the effects caused by lack of oxygen in ambience saturated with SF6. During the interruption phase of the circuit-breaker, an electric arc is produced which tends to decompose the SF6 gas. The decomposition products obviously remain inside the poles and are absorbed by special substances, which act as molecular sieves.

The probability of contact with decomposed

SF6 is practically nil (sealed-for-life poles). Its presence in the room is, in any case, immediately noticeable even in small quantities (1-3 PPM) because of its sour and unpleasant smell. In this case, the room must be suitably aired before anyone uses it. Should there be any doubts, please contact our service center.

## **12. Spare parts and accessories**

All assembly operations of spare parts/accessories must be carried out following the instructions enclosed with the spare parts, either by ABB personnel or suitably qualified customer personnel with in-depth knowledge of the apparatus. Should the maintenance be carried out by the customer's personnel, responsibility for any interventions lie with the customer. Before carrying out any operation, check that the circuit-breaker is open, the springs discharged and that there is no voltage (power circuit and auxiliary circuits).

To order accessories or spare parts always indicate:

- Circuit-breaker type
- Circuit-breaker rated voltage
- Circuit-breaker rated normal current
- Circuit-breaker breaking capacity
- Circuit-breaker serial number

Rated voltage of any electrical spare parts.

For availability and ordering of spare parts please contact our Service department.

## 12.1 List of spare parts

Replacement can only be carried out by trained personnel and/or in our workshops:

- Opening spring
- Closing spring
- Complete pole
- Basic operating mechanism
- Spring charging geared motor
- Operating mechanism auxiliary contacts
- Additional transmitted contacts
- Under-voltage release

Replacement/use possible directly by the customer:

- Geared motor limit switch contact
- K63 instantaneous relay
- K163 instantaneous relay
- Anti-condensation heater
- Shunt opening release
- Shunt closing release
- Thermostat
- SF6 gas refilling kit
- SF6 gas cylinder.

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