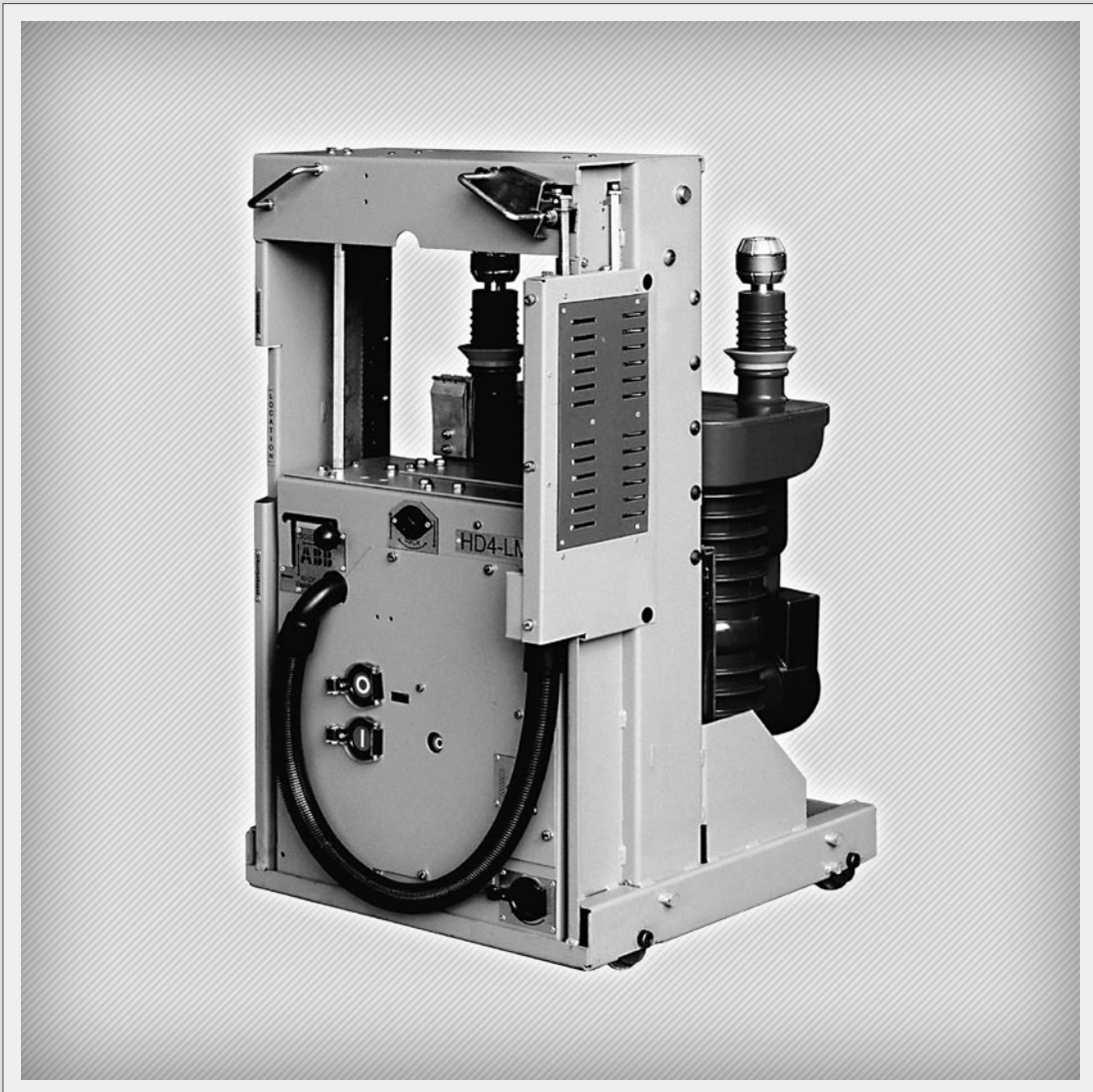


# HD4-LMT

**MV SF<sub>6</sub> Circuit Breaker**  
**Installation and Service Instructions**  
**17.5 kV – 1,250 A – 31.5 kA**



**ABB**

## For your safety !

- Make sure that the installation room (i.e. spaces, divisions and the atmosphere) are suitable for the electrical apparatus.
- Check that the installation, putting into service and maintenance of this apparatus is carried out by qualified personnel with an in-depth knowledge of the apparatus and all the procedures as laid out in this installation and service instruction manual.
- Make sure that the standard and legal prescriptions are adhered to during installation, putting into service and maintenance, so that all procedures are carried out in strict compliance to the rules of good working practice and safety in the work place.
- Strictly follow the information given in this instruction manual.
- Check that the rated performance of the apparatus is not exceeded during service.
- Pay special attention to the danger notes as indicated in this manual by the following symbol :



- Check and ensure that the personnel operating the apparatus have this instruction manual on hand, as well as the necessary information for correct intervention.

**Please remember that responsible behaviour  
will safeguard your life and that of others!**

**Should you be in any doubt whatsoever, please  
contact your Local ABB Service Centre.**

**24hr Service Support Line ( South African users ) :**

**0861 488 488**

# Introduction

This publication contains the information necessary for the installation and putting into service of HD4-LMT medium voltage circuit breakers.

For the correct usage of the HD4-LMT, please read this manual carefully.

For the correct mounting of accessories and spare parts, please refer to the relevant instructions.

Like all the apparatus manufactured by ABB, the HD4-LMT circuit breaker is designed for different installation configurations. The HD4-LMT does however, allow for further technical and constructional variations to suit specific customer installation requirements. For this reason, the information given herein does not always cover specific customer configurations.

Apart from this manual, it is therefore always necessary to refer to the latest technical documentation available (circuit diagram, wiring diagrams, assembly and installation drawings, any studies of protection co-ordination, etc.), especially with regard to any variations from standard configurations requested.



All procedures regarding installation, putting into service, operation and maintenance service, must be carried out by suitably qualified personnel with an in-depth knowledge of the apparatus.

Use only original spare parts for maintenance operations. For further information, please refer to the technical catalogue on the circuit breaker and the spare parts catalogue.

## Programme for environmental protection

HD4-LMT circuit breakers comply with ISO 14000 Standards (Guidelines for Environmental Management).

ABB's production system in the manufacture of medium voltage switchgear complies with environmental protection regulations in terms of energy consumption, raw materials and waste.

The environmental impact during the product's life cycle is assessed by the LCA (Life Cycle Assessment) procedure, which has resulted in a well-focused involvement in the selection of materials, processes and packaging.

Production techniques are carried out in a manner that achieves easy dismantling and separation of all components at the end of the circuit breaker's life, while optimising the recycling process.

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## 1. Packing and transport

The circuit breaker is shipped in special packaging in the open position with the springs discharged and with absolute pole pressure corresponding with the service value.

Each piece of apparatus is protected by a plastic film to prevent any infiltration and ingress of water and dust during the loading, transport, unloading and storage phases.

## 2. Checking on receipt



Before doing anything to the apparatus, 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.

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 possible and within five days of receipt.

The apparatus is supplied with accessories specified at the time of order and confirmed in the order acknowledgement sent by ABB.

Check that the following accompanying documents are included in the shipping packing:

- Instruction manual (this document).
- Test certificate.
- Identification tag.
- Fiscal copy of shipping note.
- Electrical diagram.

Other documents that are sent prior to shipment:

- Order acknowledgement.
- Original copy of shipping note.
- Any drawings or documents regarding special configurations/conditions.

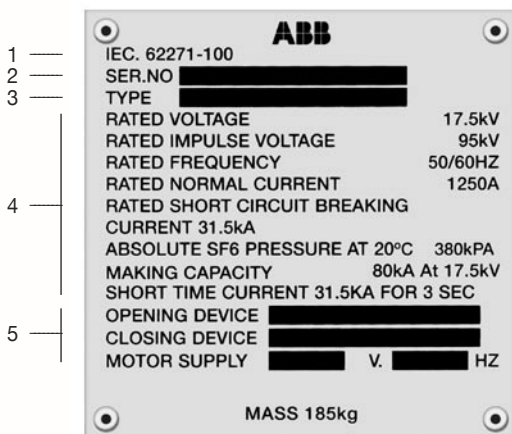


Figure 1. Rating Plate

- 1 Symbols and compliance with Standards
- 2 Serial number
- 3 Type of apparatus
- 4 Circuit breaker characteristics
- 5 Characteristics of the operating auxiliaries

## 3. Storage

When a period of storage is foreseen, on request our workshops can provide suitable packing for the specified storage conditions.

On receipt of the apparatus, it must be carefully unpacked and checked as described in point 2. "Checking on receipt."

If immediate installation is not possible, the packing must be properly replaced using the original material supplied.

Additionally, 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 the apparatus in a covered, well-ventilated, dry, dust-free and non-corrosive atmosphere, away from any flammable materials at a temperature of between -5°C and +45°C. Avoid any accidental impacts or positioning that will stress the structure of the apparatus.

## 4. Handling

Before carrying out any handling, always check that the operating mechanism springs are discharged and that the apparatus is in the open position.



The apparatus must not be handled by inserting a lifting device directly underneath the apparatus itself.

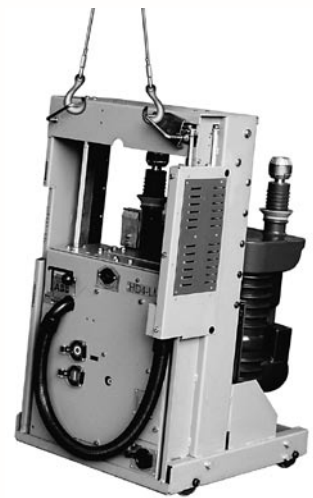


Figure 2. Lifting method

## 5. Description

### 5.1. General features

The HD4-LMT series of sulphur hexafluoride circuit breakers are for indoor installation. For electrical performance figures, please refer to the corresponding technical catalogue code 649292. For special installation conditions please refer to ABB.

### 5.2. Reference standards

HD4-LMT circuit breakers comply with the following Standards:

- EC pubbl. 62271
- EC pubbl. 60056
- EC pubbl. 60694
- CEI 17-1 (file 1375)
- CEI EN 60694 (file 4032)
- CENELEC HD 348 S3

### 5.3. HD4-LMT circuit breaker

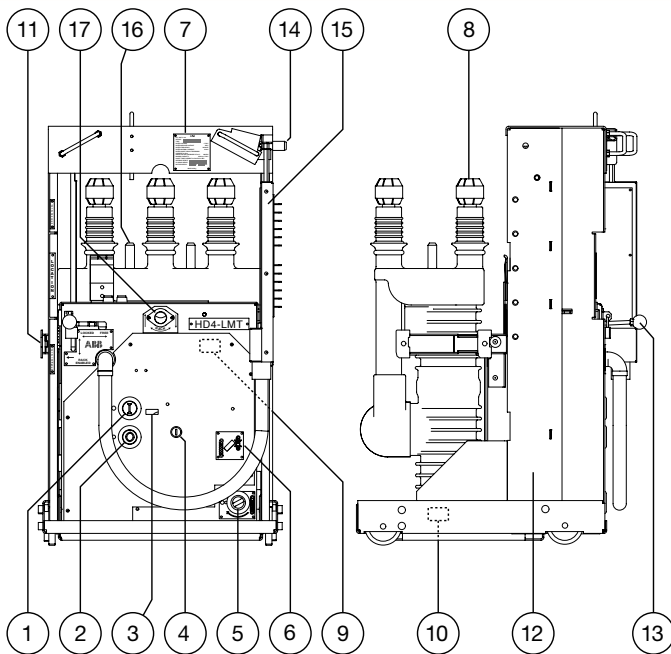
HD4-LMT circuit breakers are available for LMT, LMS, LMR and LMRP switchboards.

The pilot pins for aligning the contacts (connected/isolated), located in the CB enclosure or in the switchboard, are fixed

in the top part of the circuit breaker. The slides for activating the segregation shutters of the medium voltage contacts of the enclosure or switchboard are fixed on the side of the circuit breaker. The crosspiece for hooking the circuit breaker for the connection/isolation operation, is by means of a special operating lever mounted on the front of the circuit breaker truck.

The circuit breaker is complete with tulip isolating contacts. The HD4-LMT circuit breaker is fitted with a special lock on the front crosspiece, which allows hooking into the corresponding joints in the enclosure or fixed part. The lock can only be activated by the handle with the truck resting completely on the fixed portion rail.

The activating lever (connection/isolation) must be fully inserted. A lock prevents the truck from advancing into the enclosure of fixed part. When the truck is in the middle position between isolated and connected, the lock prevents closure of the circuit breaker either mechanically or electrically.



**Figure 3.** HD4-LMT circuit breaker  
The figure shows the version for UniVer C switchboards

- 1 Opening push button
- 2 Closing push button
- 3 Operations counter
- 4 Signalling device for circuit breaker open/closed
- 5 Shaft for manual closing spring charging
- 6 Signalling device for closing springs charged/discharged
- 7 Rating plate
- 8 Isolating contacts
- 9 Built-in pressure switch
- 10 Valve for checking the SF6 gas pressure
- 11 Slide for activating the enclosure shutters
- 12 Truck
- 13 Lock activating handle
- 14 Lock for hooking into the fixed part
- 15 Connector (plug or side connector)
- 16 Pilot pins for guiding the contacts located in the enclosure
- 17 Interlock up/down racking mechanism

## 6. Instructions for circuit breaker operation

### 6.1. Safety indications



HD4-LMT circuit breakers ensure a minimum degree of protection in accordance to IP3X, if installed under the following conditions:

The HD4-LMT must be installed in a switchboard to achieve IP3X.

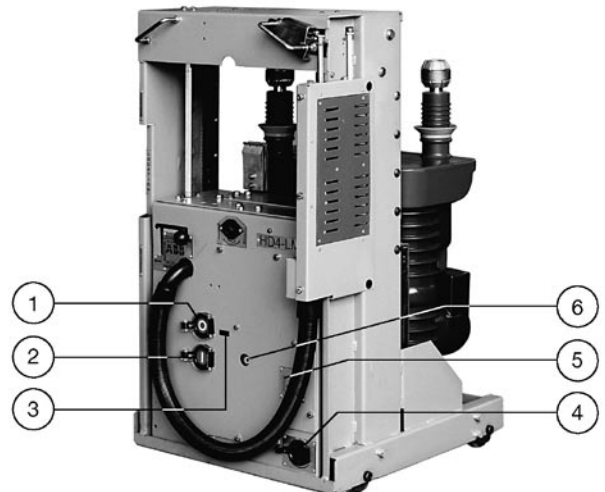
Under these conditions, the operator is fully guaranteed against accidental contact with moving parts.

Should any mechanical operations be carried out on the circuit breaker outside the switchboard, or with the protection covers removed, be very careful of any moving parts.

If the operations are prevented, do not force the mechanical interlocks and check that the operation sequence is correct.

The racking-in and racking-out operations of the circuit breaker must be carried out gradually to prevent any impacts which might deform the mechanical interlocks.

### 6.2. Operating and signalling parts



**Figure 4.** HD4-LMT operating and signalling parts

- 1 Opening push button
- 2 Closing push button
- 3 Operations counter
- 4 Shaft for manual closing spring charging
- 5 Signalling device for closing springs charged/discharged
- 6 Signalling device for circuit breaker open/closed

### 6.3. Circuit breaker closing and opening operations (figure 4)

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 (4) and turn it clockwise until the yellow indicator (5) appears.

The force which can normally be applied to the charging lever is 130 N. The maximum force which can be 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 (5) appears. Should there be no voltage 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, push the push button (2).

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 (6) shows that closing has been accomplished.

### (d) Circuit breaker opening

For manual opening, push the push button (1).

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 (6) shows that opening has been accomplished.

## 7. Installation

### 7.1. General



Correct installation is of prime importance. Instructions given must be carefully studied and followed. It is good practice to wear gloves during installation.

### 7.2. Normal installation conditions

Maximum atmospheric air temperature	+ 40°C
Minimum atmospheric air temperature	- 5°C
Relative humidity	% d 95
Altitude	d 1000 m

The installation room must be well ventilated.

For other installation conditions, please follow what is indicated in the product standards of IEC 60694. For special installation requirements please contact ABB.

Areas affected by the passage of power conductors or auxiliary circuit conductors must be protected against the possible access of animals, which could cause damage or abnormal service.

### 7.3. Preliminary operations

- Clean the insulating parts with clean dry rags.
- Check that the upper and lower terminals are clean and free of any deformation caused by possible shocks received during transport or storage.

### 7.4. Installation of HD4-LMT circuit breaker

The HD4-LMT circuit breakers are preset for insertion in the LM range of switchboards.

Insertion and racking of the circuit breakers must be gradual to avoid any shocks, which could deform the mechanical inter-locks.

If the operations are prevented, do not force the interlocks and check that the operating sequence is correct. The force normally applicable for insertion or racking is 260 N. The maximum force applicable must never exceed 400 N.

Please refer to the technical documentation of the enclosures and switchboards for the circuit breaker installation operations.

## CAUTION !

**The insertion and racking operations must always be carried out with the circuit-breaker in the open position.**

Bare Copper	Bare Aluminium
<ul style="list-style-type: none"> <li>■ Clean with a fine file or emery cloth.</li> <li>■ Fully tighten and smear a film of grease type NYE 76G 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-aluminium bi-metal with restored surfaces between the aluminium connection and the copper terminal. (copper side in contact)</li> </ul>

### 7.5. Auxiliary circuit connection

- The minimum cross-section of the wires used for the auxiliary circuits must not be less than that used for internal wiring. They must also be insulated for a 3kV test voltage.
- Before carrying out the connection of the auxiliary circuits, it is advisable to check on the selected type of automatism provided for operation of the pressure switch, by referring to the latest technical documentation supplied by ABB.



Before removing the operating mechanism cover to access the terminals make sure that the circuit breaker is open and the closing springs discharged.

### 7.6. HD4-LMT circuit breaker

The auxiliary circuits of the HD4-LMT circuit breaker are fully cabled up to the side or plug connector, in our factory. For the external connections, please refer to the electric diagram of the CB enclosure or switchboard.

## 7.7. Overall dimensions

<b>Type</b>	HD4-LMT
<b>Ur</b>	17.5 kV
<b>Ir</b>	1250 A
<b>Isc</b>	31.5 kA

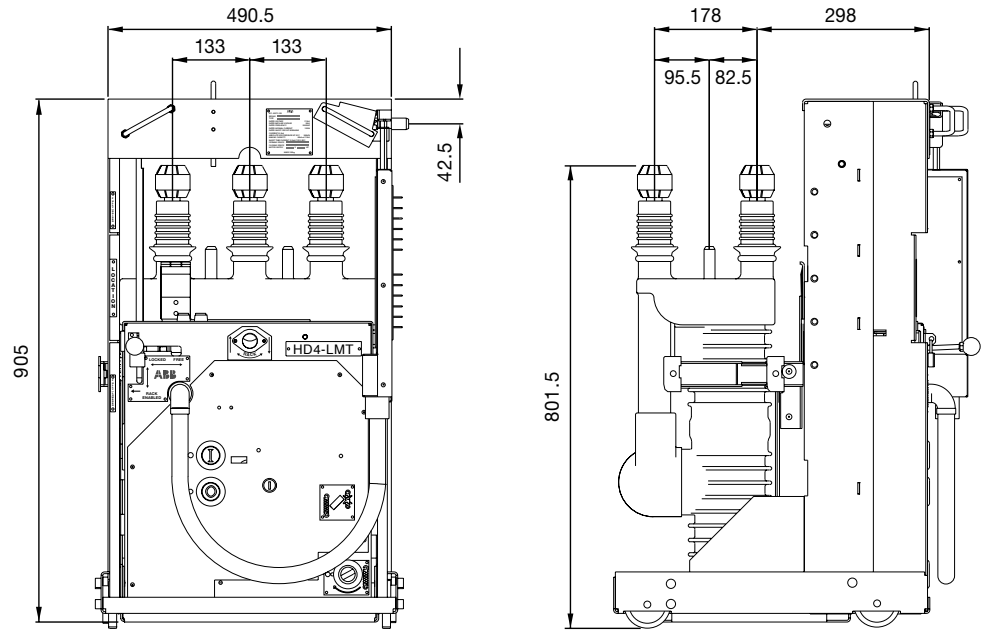


Figure 5. Overall dimensions

## 8. Putting into service

### 8.1. General procedures



All procedures regarding putting into service, must be carried out by ABB personnel or the customer personnel, who are suitably qualified and have an in depth knowledge of the apparatus and its installation. If the operations are prevented, do not force the mechanical interlocks, but check that the operation sequence is correct.

Operating forces that can be applied are indicated in paragraph 6.3 (a).

Before putting the circuit breaker into service carry out the following operations:

- Check the tightness of the power connections on the circuit breaker terminals.
- Establish the setting of the direct solid-state over-current release (if provided).
- 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 packaging, has got into the moving parts.
- Check that air circulation in the circuit breaker installation site is adequate, so that there is no danger of overheating.
- Carry out the checks indicated in the following table.

Subject of inspection	Procedure	Positive check
1 Insulation resistance.	<b>Medium Voltage Circuits</b> With a 2500V Megger, measure the insulation resistance between phases and exposed conductive part of the circuit.	The insulation resistance should be at least 50 MW and constant at any time.
	<b>Auxiliary Circuits</b> With a 500V Megger (installed equipment permitting), measure the insulation resistance between the auxiliary circuits and the exposed conductive part.	The insulation resistance should be a few MW and constant at any time.
2 Auxiliary Circuits.	Check that the connections to the control circuits are correct and proceed with relative supply.	Normal switching and signalling.
3 Manual operating mechanism.	Carry out a few closing and opening operations. (refer to paragraph 6.3)	The operations and relative signals occur correctly.
4 Motor operator. (if provided)	Supply the geared motor for spring charging at the relative rated voltage.	The springs are charged correctly. The signals are correct. The geared motor cuts off when the springs are charged.



<b>5</b> Under voltage release. (if provided)	Supply the under voltage release at the relative rated voltage and carry out the circuit breaker closing operation.  Disconnect the power supply to release.	The circuit breaker closes correctly. The signals are correct.  The circuit breaker opens. The signal changes over.
<b>6</b> Shunt opening release and additional shunt opening release. (if provided)	Close the circuit breaker. Supply the shunt opening release at the relative rated voltage.	The circuit breaker opens correctly. The signals are correct.
<b>7</b> Shunt closing release. (if provided)	Open the circuit breaker. Supply the shunt closing release at the relative rated voltage.	The circuit breaker closes correctly. The signals are correct.
<b>8</b> Key lock. (if provided)		Both electric and manual closing take place correctly. In this position the key cannot be removed.
<b>9</b> 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.

## 9. Periodical checking



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 type of inspections basically depends on the service conditions. Various factors must be taken into account. Frequency of operations, interrupted current values, relative power factor and the installation atmosphere.

The following paragraph gives the checking programme table showing the relevant checking time intervals.

As far as the time interval between these checks are concerned, it is advisable to comply with the specifications given in the table, at least during the first check. On the basis of the results obtained during the periodic inspections, set the optimal time limits for carrying out the following operations.

### 9.2. Checking programme

Checking operation	Intervals	Criteria
<b>1</b> Carry out five mechanical opening and closing operations.	1 year.	The circuit-breaker must operate normally without stopping in the intermediate positions.
<b>2</b> Visual inspection of the poles (resin parts).	1 year, or 5000 operations.	The resin parts must be free of any accumulation of dust, dirt, cracks, discharges or traces of surface discharge.
<b>3</b> Visual and physical inspection of the opening mechanism and transmission.	1 year, or 5000 operations.	The elements must be free of any deformation. Screws, nuts, bolts etc., must be tight.
<b>4</b> Visual inspection and lubrication of the isolating contacts.	5 years, or 5000 operations.	The isolating contacts must be free of any deformation or erosion. Lubricate the contact elements with grease type 5RX Moly.
<b>5</b> Measuring of the insulation resistance.	5 years, or 5000 operations.	See paragraph 8.1 inspection point 1.
<b>6</b> Checking interlock operation.	5 years.	The interlocks must operate correctly.

After 10,000 operations or 10 years, for installation in polluted and aggressive atmosphere, it is advisable to contact your ABB service centre to have the circuit breaker checked.

## 10. Maintenance operations



Maintenance must only be carried out by ABB personnel, or suitably qualified customer personnel who have in-depth knowledge of the apparatus and IEC 60694, CEI EN 60694 paragraph 10.4.2.

Should any maintenance be done by the customer's personnel, responsibility for any intervention lies with the customer.

Replacement of any parts not included in the "List of spare parts and accessories" (paragraph 12), must only be carried out by ABB personnel and in particular :

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

## 11. Cautions in the handling of apparatus with SF<sub>6</sub>

SF<sub>6</sub> in its pure state is an odourless, colourless, non-toxic gas with a density of 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 a lack of oxygen in atmospheres saturated with SF<sub>6</sub>.

During the interruption phase of the circuit breaker, an electric arc is produced that decomposes a very small amount of SF<sub>6</sub>. The decomposed products remain inside the poles and are absorbed by a special substance, which acts as molecular sieve.

The probability of contact with decomposed SF<sub>6</sub> is extremely rare and its presence in small quantities of 1-3 ppm, is immediately noticeable, because of its sour and unpleasant smell. In this case, the room must be well ventilated before anybody enters it.

## 12. Spare parts and accessories



All assembly operations of spare parts/accessories regarding installation, putting into service, service and maintenance must be carried out by ABB personnel, or suitably qualified customer personnel with an in-depth knowledge of the apparatus and IEC 60694, CEI EN 60694 paragraph 10.4.2.

Should any maintenance be carried out by customer personnel, the responsibility for any interventions lies with the customer.

Before carrying out any maintenance, check that the circuit breaker is open, the springs discharged and that there is no voltage on the medium voltage circuit or auxiliary circuits.

To order accessories or spare parts, please refer to the commercial ordering codes given in the Technical Catalogue and always indicate :

- Circuit breaker type.
- Circuit breaker rated voltage.
- Circuit breaker rated thermal current.
- Circuit breaker breaking capacity.
- Circuit breaker serial number.
- Rated voltage of any electrical accessories.

For the availability of spare parts, please contact our Service Department.

### List of Spare Parts

- Shunt opening release.
- Additional shunt opening release.
- Under voltage release.
- Contact signalling under voltage release energised / de-energised.
- Shunt closing release.
- Spring charging geared motor with electric signalling of springs charge.
- Contact signalling closing springs charged / discharged.
- Transient contact with momentary closure during circuit breaker opening.
- Auxiliary circuit breaker contacts.
- Opening solenoid.
- Protection for opening push button.
- Protection for closing push button.
- Opening / closing knob.
- Set of six tulip contacts.

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**Reserve:** Due to ongoing developments, the information contained herein is subject to change.

**24hr Technical Support Line ( South African Users ) : 0861 488 488**

**For Technical Support elsewhere contact your Local ABB Service Centre.**



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