HVX

Vacuum circuit-breaker 36 kV (≤ 2000A, ≤ 31.5 kA)

Installation
Operation
Maintenance
Technical instruction

No. VDRAOMM01
Issue 06
IMPORTANT NOTE

The Technical Instructions, which are exclusively valid and always supplied by Schneider Electric together with the product in question. Our products may only be commissioned, operated, serviced, repaired or decommissioned together with Operating Instructions which have been directly enclosed to the product in question by the factory.

On the other hand, this electronic version of the Technical Instruction is provided to the customer at his/her request for information only. None of our products may be commissioned, operated, serviced, repaired or decommissioned on the basis of this electronic version.

Non-compliance with this instruction may entail serious damage to the product, the objects pertaining to it, as well as health hazard or mortal danger. Schneider Electric shall not be held liable for any such damage.

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1 Regulations and Provisions

1.1 Remarks on this Technical Instruction

This Technical Instruction describes transport, assembly, operation, handling and maintenance of the series HVX vacuum service breakers. It must be stored so that it is at any time readily accessible for and can be used by persons who are to work on the switchgear.

When re-selling the circuit-breaker or the switchgear with circuit-breaker, make sure that this Technical Instruction is transmitted as well.

The following additional documents must be observed for this circuit-breaker:
- Purchase agreement containing the stipulations on the specific equipment of the circuit-breaker and the legal details.
- Project notes regarding the HVX circuit breaker
- For assembly and operation of the circuit-breaker, the operating manual of the switchgear in which it is operated must be complied with.

As our products are subject to continuous further development, we reserve the right to changes regarding standards, illustrations and technical data. All dimensions not specified in detail are in millimeters.

1.2 Terms and symbols used

This Technical Instruction uses certain terms and symbols. They warn about dangers or provide important information which must be complied with at all costs so as to avoid danger and damage:

"WARNING" This symbol warns of dangerous electrical voltage. Contact with voltage may result in fatal injury!

"WARNING" This symbol is used for instructions non-compliance with which may result in serious injury, death or serious material damage.

"IMPORTANT" This symbol is used for information which is important to avoid damage.

1.3 Use in line with the intended purpose

The HVX vacuum circuit-breaker is intended exclusively as a switching unit in air-insulated medium-voltage switchgear. It may only be used in the scope of the specified standards and the switchgear-specific technical data. Any other use constitutes improper use and may result in dangers and damage.

IMPORTANT: Operating reliability and service life depend on correct operation.

Disclaimer of liability

The manufacturer shall not be held responsible for damage which occurs if:
- instructions in this Technical Instruction are not complied with,
- the circuit-breaker is not operated according to its intended use (see above),
- the circuit-breaker is assembled, connected or operated improperly,
- accessories or spare parts are used which have not been approved by the manufacturer,
- the circuit-breaker is converted without the manufacturer’s approval, or if inadmissible parts are attached.
1 Regulations and Provisions (contd.)

1.4 Applied standards

The three-phase HVX vacuum circuit-breaker:
- corresponds to the requirements for AC switchgear for voltages above 1 kV acc. to IEC 62271-100

Environmental and operating conditions

HVX circuit-breakers may only be operated under normal operating conditions acc. to IEC 62271-1. Operation under conditions deviating from these is only admissible upon consultation and with the written approval of the manufacturer.

<table>
<thead>
<tr>
<th>Ambient conditions</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature min./max.</td>
<td>-5 / 40°C ¹</td>
</tr>
<tr>
<td>Average value over 24 hours (max.)</td>
<td>35°C ¹</td>
</tr>
<tr>
<td>Max. installation altitude above sea level</td>
<td>1000m ¹</td>
</tr>
</tbody>
</table>

¹) higher values on request

1.5 Safety provisions

The work described in this Technical Instruction may only be performed by specialist electricians who have proved their experience with the HVX circuit-breaker and the EN 50110-1 standard.

Applicable standards and regulations:
- The locally applicable accident prevention, operating and work instructions must be complied with.
- Installation: IEC 61936-1 / HD 637 S1
- Operation of electrical equipment: EN 50110-1

Read these instructions carefully before you work on the circuit-breaker, and perform the work detailed in it according to the descriptions. Do not perform any work on the circuit-breaker which is not described in this Technical Instruction.

WARNING:

Before starting work on the circuit-breaker, de-energize the system, verify it for zero voltage and earth the system according to the applicable safety rules pursuant to EN50110-1.

WARNING:

Before performing work on the circuit-breaker, switch off the auxiliary voltage and prevent it from reclosing.

WARNING:

There is a risk of injury when working on the drive mechanism. Before commencing work, release the energy-storing device by performing the operating sequence OFF-ON-OFF.

1.6 Disposal after the end of service life

A manual on disposal after the end of the service life is available for disposal of the HVX vacuum circuit breaker.

Disposal at the end of the service life is performed as a service by the Service Center at the manufacturer’s which is subject to a fee.
2 Technical data

2.1 Type designation

The type designation on the rating plate (Fig. 2.1) specifies essential technical data. The type designation (1) is broken down in this example. The following data on the rating plate are relevant for replacement or in case of any queries:

- Type designation (1)
- Serial number (2)
- Year of manufacturing (3)

Example

Series HVX
Rated voltage 36 kV
Rated short-circuit breaking current 31.5 kA
Rated normal current 2000 A

Fig. 2.1
Example of rating plate
1 Type designation
2 Serial number
3 Year of manufacturing
4 Technical data

2.2 Technical data

<table>
<thead>
<tr>
<th>Rated voltage $U_r$ [kV]</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated impulse withstand voltage $U_i$ [kV]</td>
<td>170</td>
</tr>
<tr>
<td>Rated power frequency withstand voltage $U_d$ [kV]</td>
<td>70</td>
</tr>
<tr>
<td>Rated normal current $I_{max}$ [A]</td>
<td>2000</td>
</tr>
<tr>
<td>Rated cable-charging breaking current $I_{sc}$ [A]</td>
<td>50</td>
</tr>
<tr>
<td>Rated short-circuit breaking current $I_{sc, max}$ [kA]</td>
<td>31.5</td>
</tr>
<tr>
<td>Rated short-time current $I_{k}$ [kA]</td>
<td>31.5 (3 s)</td>
</tr>
<tr>
<td>Rated frequency $f$ [Hz]</td>
<td>50</td>
</tr>
</tbody>
</table>

2.3 Control and operating devices

The drive mechanism is designed on principle for manual charging of the energy storing device (closing spring). The drive can be equipped with additional operating and control devices. Component fitting options:
Motor
■ for charging the energy-storing device (spiral spring).

Opening release
■ 2 units max.

Under voltage release
■ 1 unit (optional).

Closing release
■ 1 unit.

Secondary release
(Transformed-operated release)
■ 1 unit max.

Blocking coil
■ Blocking coils prevent the circuit breaker from being closed and opened via the push-buttons "ON" or "OFF".

If the rated auxiliary voltage has fallen or is shut off, all blocking coils are in "blocked" position.

Technical data, auxiliary switch

<table>
<thead>
<tr>
<th>Rated auxiliary voltage [V]</th>
<th>DC [V] ≤ 48</th>
<th>125</th>
<th>220</th>
<th>AC [V] 120</th>
<th>230</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching capacity [A]</td>
<td>10</td>
<td>3.8</td>
<td>2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Time factor T=L/R [ms]</td>
<td>10</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-time current</td>
<td>250 A / 3 s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power consumption, solenoids and motor

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing release</td>
<td>≤ 250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening release</td>
<td>≤ 250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under voltage release</td>
<td>approx. 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor for energy-storage device</td>
<td>approx. 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information about the power consumption of solenoids and the motor is available from the manufacturer. The auxiliary voltage data is required to this effect.

Operating times *

<table>
<thead>
<tr>
<th>Times for solenoids and motor</th>
<th>[ms]</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum command time “OFF” el. tripping</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Minimum command time “ON” el. closing</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Motor charging time</td>
<td>[s]</td>
<td>≤ 12</td>
</tr>
</tbody>
</table>

* Rated frequency according to specification on rating plate (50/60 Hz)

Auxiliary switches

Auxiliary switches are always actuated directly by the switch shaft via an intermediate linkage. Their position always corresponds to that of the main contacts. As standard, the circuit-breaker is equipped with two auxiliary switches with 8 contact elements each.
The switching functions have been set in the factory according to the wiring diagram.

Anti-pumping relay

If an ON and OFF command is simultaneously and permanently present at the circuit-breaker, the latter returns to its initial position after closing. It remains in this initial position until the ON command is issued anew. This prevents continuous closing and opening ("pumping").
3 Variants

HVX/UTX model for following technical data (Fig. 3.1):

- $U_r \leq 36\, \text{kV}$
- $I_r \leq 1250\, \text{A}$
- $I_e \leq 31.5\, \text{kA}$

1. Conductor insulated in epoxy housing
2. Circuit-breaker/UTX housing
3. Rating plate
4. Operator interface (NA for UTX)
5. Low voltage plug with socket
6. Drive housing (NA for UTX)
7. Rollers
8. Withdrawable unit
9. Insertion opening for crank to move the circuit-breaker/UTX into its disconnected/service position manually
10. “IP” protection sheet
11. Shutter rails
12. Floor-rolling trolley

Fig. 3.1 Vacuum circuit-breaker HVX 36 kV – 31.5 kA - 1250A withdrawable unit with low voltage socket

HVX/UTX model for following technical data (Fig. 3.2):

- $U_r \leq 36\, \text{kV}$
- $I_r \leq 2000\, \text{A}$
- $I_e \leq 31.5\, \text{kA}$

1. Conductor insulated in epoxy housing
2. Circuit-breaker/UTX housing
3. Rating plate
4. Operator interface (NA for UTX)
5. Low voltage plug with socket
6. Drive housing (NA for UTX)
7. Rollers
8. Withdrawable unit
9. Insertion opening for crank to move the circuit-breaker/UTX into its disconnected/service position manually
10. “IP” protection sheet
11. Shutter rails
12. Floor-rolling trolley

Fig. 3.2 Vacuum circuit-breaker HVX 36 kV – 31.5 kA - 2000A withdrawable unit with low voltage socket
3 Variants (contd.)

MTX model for the following technical data (Fig. 3.3):

- \( U_r \leq 36 \text{kV} \)
- Voltage ratio: 33kV/110V

1. PT fuse contact
2. Voltage transformer
3. Rating plate
4. Low voltage plug with socket
5. Rollers
6. Withdrawable unit
7. Insertion opening for crank to move the truck into its disconnected/service position manually
8. “IP” protection sheet
9. Shutter rails
10. Floor rolling trolley

Fig. 3.3
PT truck MTX 36kV - withdrawable unit with low voltage socket

ETX model for the following technical data (Fig. 3.4):

- \( U_r \leq 36 \text{kV} \)
- Short circuit rating \( I_{sc} \leq 31.5kA \)

1. ETX arm
2. Phase barrier
3. Earthing switch
4. Rating plate
5. Low voltage plug with socket
6. Earthing switch ON-OFF indication
7. Rollers
8. Withdrawable unit
9. Insertion opening for crank to move the truck into its disconnected/service position manually
10. “IP” protection sheet
11. Shutter rails (Either one set applicable depending on whether it is circuit-earthing or bus earthing truck, both shown)
12. Floor rolling trolley

Fig. 3.4
Earthing truck ETX 36kV - withdrawable unit with low voltage socket
4 Delivery, storage and transport

4.1 Delivery
- Handle shipping units carefully when unloading and unpacking them.
- Shipping units must be unpacked immediately after receipt. Any damage occurred in transit must be recorded and reported immediately to the manufacturer.
- On delivery, the consignment must be checked for completeness.
- The supplier must be notified in writing about any discrepancies.

4.2 Storage
The transport packaging is not intended for storage. The risk of storing the parts in packed condition shall be the consignee’s responsibility!

4.3 Transport
Transport using a forklift truck. Only transport the circuit-breaker within its shipping unit on a pallet.

Transport without pallet:
Lift circuit-breaker acc. to Fig 4.3. A rope (not a metallic steel cable) Ø 12 to 15 mm or a strap is required to this effect.

WARNING:
Make sure the rope or strap is strong enough to bear the weight of the circuit-breaker and do not touch the circuit-breaker.

Weights [kg]

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated Current ≤ 1250 [A]</th>
<th>Rated Current ≤ 2000 [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>H VX - withdrawable Unit</td>
<td>26.3kA - 282 kg</td>
<td>26.3kA - 315 kg</td>
</tr>
<tr>
<td></td>
<td>31.5kA – 300 kg</td>
<td>31.5kA – 330 kg</td>
</tr>
</tbody>
</table>

(Guide values without packaging)
5.1 Instructions for assembly

- Dimension drawings are made available on request.
- Check technical data on rating plate.
- Check auxiliary voltage of the control and operating devices installed.

The circuit-breaker is supplied in position “OFF” and with the energy storing device “released”.

**WARNING:**

The energy storing device must not be charged until assembly is finished. Risk of injuries.

**WARNING:**

The safety provisions of chapter 1.5 must be observed.

5.2 HVX Mechanical assembly

Mounting on the ramp

A ramp is used to rack the circuit-breaker into the switchgear panel (Fig. 5.2).

For the design and method of operation of the ramp used, please refer to the instructions for the panel in question.

Placing circuit-breaker on ramp and inserting it into the switchgear in disconnected position (Fig. 5.3)

**IMPORTANT:**

When performing the following assembly steps, observe and comply with the instructions given for the panel used.

1. Place the ramp on the switchgear rails.
2. Push the circuit-breaker over the ramp with its wheels aligned with the ramp channels.
3. Grease the disconnecting fingers (Fig. 8.3) or the tulip contacts (Fig. 8.4) using appropriate lubricant.
4. Press the handles inside as shown (Fig. 5.4) by the arrows and push the breaker inside cubicle to test position.
5. Release the handles in order to lock the withdrawable unit in test position (Fig. 5.5). Please ensure that both the handles are securely locked before the circuit breaker is racked in. The circuit-breaker is now in disconnected position.
6. Release the ramp from the panel.
7. Insert the low-voltage connector (Fig. 5.6)-detailed in next section and close the door of the panel.
8. Rack in the circuit breaker into the panel using the racking handle until the service indication starts glowing on the panel and no further rack-in is possible.
9. For MTX and UTX, the above procedure is the same.
10. For ETX, the above procedure is also the same except that the door can be opened in the transit or service position to view the earth switch mechanical ON-OFF indication, but rack-in rack-out should not be attempted without re-closing the door.

**Earth terminal**

The circuit-breaker has a short-circuit proof scrap earthing connected to its floor-rolling trolley which in turn gets linked to the panel main earthing bar when circuit-breaker is in test or service position.
5.3 Connecting the control lines

The control lines are connected via control connectors (Fig. 5.6). The control lines are wired in the circuit-breaker up to the control connector. Single-wire conductors or strands can be connected in control connector up to 1.5 mm².

Terminal with control connector

Push the control connector onto the pin right-angle plug-and socket connector of the cubicle and lock it (Fig. 5.6).

**IMPORTANT:**

Comply with the tightening torques specified for screw-fastening (refer to Annex).

---

**Fig. 5.6**

Control connector
1. Insert control connector
2. Lock
6 Commissioning

- Check circuit-breaker for external damage.
- Make sure that there are no external parts in the circuit-breaker compartment.
- Check surface of insulating components for impurities. If necessary, clean (see Chapter 8).

**IMPORTANT:**
- Observe the operating and locking conditions (Chapter 7).

**IMPORTANT:**
- The energy storing device of motorized circuit-breakers is charged automatically once the auxiliary voltage is applied.

**IMPORTANT:**
- Under voltage releases / blocking coils (optional) enable switching tests only to be performed with the auxiliary voltage applied.

**HVX (withdrawable unit)**

Perform functional tests:
1. Charge energy-storing device using the crank (Fig. 9.1 rep. 2). Check the spring position indicator.
2. Switch circuit-breaker on and off several times by hand. Check position indicator.
3. Move the withdrawable unit to its service and disconnected position via the crank handle (Fig. 9.1 rep. 3).
   - Check mechanical interlocks between the HVX and the cell. Check position indication.
4. Check electrical functions of control and operating devices.
   - Apply auxiliary voltage.
   - Actuate the releases to perform switching operations and check functions / interlocks. Watch position indicators.
5. Racking the circuit-breaker in and out. At the same time, check the position indicators and the interlocks in the circuit-breaker and with regard to other devices.
7.1 Control elements and operator interface

Fig. 7.1
Operator interface of HVX circuit-breaker

Fig. 7.2
Control elements for the circuit-breaker

1 closed door of switchgear panel
2 ON/OFF operating rod
3 Spring charging crank for spring operating mechanism
4 Moving crank handle
Position indicators on circuit-breaker and possible operating sequences

<table>
<thead>
<tr>
<th>Item</th>
<th>Position indicator</th>
<th>Possible operating sequence (mechanical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>released</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>charged</td>
<td>C - O</td>
</tr>
<tr>
<td>3</td>
<td>released</td>
<td>O</td>
</tr>
<tr>
<td>4</td>
<td>charged</td>
<td>O - C - O</td>
</tr>
</tbody>
</table>

C = Switching  ON O = Switching OFF

7.2 Interlocks

WARNING:
You must be familiar with these interlocks before operating the circuit-breaker.

<table>
<thead>
<tr>
<th>Interlock</th>
<th>Function of interlock</th>
<th>Nature</th>
<th>Method of operation of interlock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between the circuit-breaker and the low-voltage connector</td>
<td>The withdrawable part cannot be moved to service position unless the low-voltage connector is inserted and locked</td>
<td>Mechanical</td>
<td>Racking is blocked automatically. Do not apply higher force!</td>
</tr>
<tr>
<td></td>
<td>The low-voltage connector can only be inserted or removed while the withdrawable part is in its disconnected position</td>
<td>Mechanical</td>
<td>Insertion of low-voltage connector is blocked automatically. Do not apply higher force!</td>
</tr>
<tr>
<td>Between the circuit-breaker and the earthing switch</td>
<td>The withdrawable part cannot be moved to service position in while the earthing switch of the panel is in &quot;ON&quot; position</td>
<td>Mechanical</td>
<td>Racking is blocked automatically. Do not apply higher force!</td>
</tr>
<tr>
<td></td>
<td>The earthing switch cannot be switched on once the withdrawable part has moved towards service position</td>
<td>Mechanical</td>
<td>The earthing switch cannot be switched on. Do not apply force!</td>
</tr>
<tr>
<td>Between the circuit-breaker and the withdrawable part</td>
<td>The circuit-breaker cannot be moved to service/disconnected position while it is switched on</td>
<td>Mechanical</td>
<td>Racking is blocked automatically. Do not apply higher force!</td>
</tr>
<tr>
<td></td>
<td>The circuit-breaker cannot be switched on unless it is completely set to its service/disconnected position</td>
<td>Mechanical</td>
<td>The circuit-breaker cannot be switched on.</td>
</tr>
<tr>
<td>Between the circuit-breaker and the panel door</td>
<td>The withdrawable part cannot be moved towards service position until the door is closed</td>
<td>Mechanical</td>
<td>The moving crank handle is blocked automatically. Do not apply higher force!</td>
</tr>
<tr>
<td></td>
<td>The door cannot be opened once the withdrawable part has moved towards service position</td>
<td>Mechanical</td>
<td>The door cannot be opened. Do not apply higher force!</td>
</tr>
</tbody>
</table>
7 Operation (contd.)

7.3 Actuate withdrawable unit

**IMPORTANT:**
Observe interlock conditions (see chapter 7.2).

Move circuit-breaker from disconnected into service position by hand:

**Initial situation:**
- Circuit-breaker: OFF
- Earthing switch: OFF
- LV plug / supply: CONNECTED
- Front door: CLOSED

1. Insert crank handle (Fig. 7.3) and move it clockwise to its stop or until blocking; the circuit-breaker is racked into its service position. Observe the position indicator on the switchgear panel.
2. Remove crank handle.

Move circuit-breaker from service into disconnected position by hand:

**Initial situation:**
- Circuit-breaker: OFF

1. Insert crank handle (Fig. 7.3) and move it counter-clockwise to its stop; the circuit-breaker is racked into its disconnected position. Observe the position indicator on the switchgear panel.
2. Remove crank handle.

7.4 Charging the energy storing device

**Manually**

Move circuit-breaker in "ready-for-closing" position.
1. Insert crank into opening for tensioning the energy storing device (Fig. 7.4)
2. Charge the spiral spring using the spring charging crank. As soon as the spiral spring is charged, the spring charging mechanism is decoupled and the position indicator signals "charged". If the motor starts during this process, this does not constitute a risk.
3. Remove crank. The circuit-breaker is ready for closing (Table, Chapter 7.1, item 2).

**Via motor**

The energy storing device of motorized circuit-breakers is charged automatically as soon as the auxiliary voltage is applied.
7.5 Switching operations

Closing (ON)

- Push button “ON” - or actuate closing release electrically.
  The position indicator shows the switch position “ON” (Table, Chapter 7.1, item 3).
- The position of the auxiliary switch has changed.
  The energy storing device can be charged immediately after switching ON (by hand or by motor). If voltage is applied to the motor, charging is performed automatically.
- The position indicator shows the energy storing device position “charged” (Table, Chapter 7.1, item 4).

Opening (OFF)

- Push button “OFF” - or switch off via opening release, under voltage release or secondary coil.
- The position indicator shows the switch position “OFF” (Table, Chapter 7.1, item 1 or 2).
- The position of the auxiliary switch has changed.
8 Servicing

8.1 Servicing schedule
Series HVX vacuum circuit-breakers require regular inspections. The intervals depend on the strain to which the switches are subject during operation, and on the operating conditions. In case of frequent condensation or air pollution (dust, smoke or corrosive gases), the maintenance intervals must be adapted to the actual conditions.

IMPORTANT:
The circuit-breaker operating company is responsible for complying with the specified maintenance intervals and for performing maintenance according to the actual operating and ambient conditions.

In case of queries or ambiguities, please contact the manufacturer.

8.2 Safety provisions
Only specialist electricians certified by the manufacturer for maintenance work regarding series HVX vacuum circuit-breakers and who have the required knowledge regarding operation of medium-voltage switchgear are permitted to perform maintenance and cleaning work.

WARNING:
The safety provisions of Chapter 1.5 must be observed.

WARNING:
The circuit-breaker must not be disassembled for maintenance work (see Disclaimer of liability, section 1.3).

Safety provisions
1. On principle, the 5 safety rules applicable for electrical engineering must be complied with before maintenance work on the circuit-breaker is started:
   - Isolate switchgear from power supply
   - Prevent it from reclosing
   - Verify it for zero voltage
   - Earth and short-circuit it
   - Cover or bar off adjacent live components.

   These rules apply for the upper and lower circuit-breaker terminals alike.

2. Switch off the auxiliary voltage for the circuit-breaker drive and secure it against reclosing.

3. Release the energy-storing device by performing the corresponding operating sequence on the circuit-breaker. ON - OFF - ON (see Chapter 7)
## Servicing schedule

<table>
<thead>
<tr>
<th>Maintenance intervals (ambient conditions according to IEC 60 694)</th>
<th>Maintenance work</th>
<th>Qualification / position performing the work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every 4 years</td>
<td>■ Check for contamination / condensation and damage ■ If necessary, clean circuit-breaker (see section 8.3) and perform several switching tests</td>
<td>Staff qualified accordingly for the work to be done</td>
</tr>
<tr>
<td>After 20 years</td>
<td>■ Clean, grease circuit-breaker (see Chapter 8.3 and 8.6) and perform several switching tests ■ Check releases and blocking coils for proper working order</td>
<td></td>
</tr>
<tr>
<td>Once the summation current limit has been reached (refer to Chapter 8.7)</td>
<td>Replace vacuum interrupters</td>
<td>Manufacturer’s Service Center</td>
</tr>
<tr>
<td>After 10,000 operating cycles of the circuit-breaker</td>
<td>Replacement of mechanism and / or parts of the circuit-breaker</td>
<td>Manufacturer’s Service Center</td>
</tr>
<tr>
<td>After 1000 operating cycles of the withdrawable part</td>
<td>Replacement of the withdrawable part and other relevant parts</td>
<td>Manufacturer’s Service Center</td>
</tr>
</tbody>
</table>

### 8.3 Cleaning insulating components

To ensure the specified insulating level, the insulating components must be clean. On principle, general cleanliness of the circuit-breaker or of its external parts should be ensured.

**Use a dry cleaning cloth for slight soiling:**

Clean by means of a dry, lint-free cloth. Depending on dirt collected, replace cloth as often as necessary.

**Use cleaning agents for severe soiling:**

Cleaning agent, 1 liter can (see Chapter 9.2).

**WARNING:**

The use of other cleaning agents is not admissible.

- Wear protective gloves
- Use cleaning agent according to manufacturer’s instructions
- Soak the cloth thoroughly and wipe the insulating components. Keep duration of exposure as short as possible.
- Expose the cleaned surface to the air for at least two hours.
8.4 Corrosion protection

Drive mechanisms and covers have a long-term protection against corrosion. Any damage to the paint, scratches and other damage must be repaired immediately to avoid corrosion. Contact the manufacturer’s Service Center.

8.5 Avoid condensation

To ensure the specified insulating level, the circuit-breaker - especially its insulating components - must not be exposed to condensation.

**Measures to take in case of condensation:**
1. If condensation of the circuit-breaker is detected, the switching device must be cleaned according to section 8.3.
2. Installation or inspection of the appropriate heating. It must provide a sufficient heating performance to prevent condensation on the circuit-breaker.

8.6 Lubrication instructions

**Preparations**

**WARNING:**
- Comply with safety provisions (Chapter 1.5).

**WARNING:**
- Circuit-breakers and drives must not be disassembled for service and maintenance work (see Disclaimer of liability, section 1.3).

Remove the withdrawable unit from the switchgear cubicle for inspection (see instructions for the panel concerned). Remove the cover plate of the circuit-breaker drive.

**Lubricants**

**IMPORTANT:**
- Only approved lubricants may be used (section 9.2).

- Cryogenic grease
- High-pressure grease
- Contact lubricant
- Silicon grease

**Lubrication procedure**

1. Clean the points of lubrication (Fig. 8.1 to 8.4) using a lint-free cotton cloth; in case of serious contamination, use a cleaning agent (see section 8.3).
2. Apply a thin coat of lubricant, using e.g. a paintbrush.

**Points of lubrication**

**IMPORTANT:**
- The following elements must not be lubricated:
  - Motor
  - Electric releases
  - Push switches
  - Blocking coils
  - Auxiliary switches
  - Ball bearings
8 Servicing (contd.)

- Points of lubrication on the drive (Fig. 8.1):
  All metallic surfaces sliding upon each other, especially cam discs, cogwheels and ratchet levers.

Fig. 8.1
Circuit-breaker drive mechanism
- High-pressure grease
- Cryogenic grease
  - Silicon grease
8 Servicing (contd.)

- Spindle of withdrawable unit mechanism (Fig. 8.2, item 1).

![Fig. 8.2](image)
Rack-in mechanism
- High-pressure grease
- 1 Spindle

- Finger contacts for 1250A rating (Fig. 8.3)

![Fig. 8.3](image)
- Contact lubricant
- Tulip contacts for 2000A rating (Fig. 8.4)

Final steps
Re-mount the cover plate and insert the circuit-breaker in the panel (see section 5).
Check circuit-breaker according to section 6 “Commissioning”.

8.7 Admissible numbers of breaking operations of vacuum chamber

The diagram defines exclusively the admissible summation current limit. It is a guide as to whether the vacuum interrupter chambers/pole sections need to be replaced or not.

Number of breaking operations $n$

$I_r$ = Rated (normal) current [A]

$I_{sc}$ = Short-circuit breaking current [kA]

For the data regarding the rated normal current $I_r$ and the short-circuit breaking current $I_{sc}$, please refer to the rating plate (Fig. 8.5).

**Fig. 8.5**
Data for rated normal current $I_r$ (1) and short-circuit breaking current $I_{sc}$ (2) on the rating plate
8.8 Replacement of motor at site*

1. Tools required (Fig.8.6):
   - Allen key set
   - Precision screw-driver set
   - Spanners-10/11 and 12/13

2. Open the front cover and then open the motor leads from the terminal block (Fig.8.7)

3. With allen key and spanner, open the two foundation bolts of the motor base plate (Fig.8.8)

4. Using allen key and spanner, open the bolts of the lateral plastic support and take out the motor (Fig.8.9)

* For fitting the motor, process shall be exact reverse of the above steps.
8.9 **Replacement of tripping coil/ closing coil at site**

1. Tools required (Fig.8.10):
   - Allen key set
   - Precision screw-driver set
   - Spanner-6/7

2. For tripping coil, open the front cover and then open the two small screws over the left hand side coil to release the leads (Fig.8.11).

3. Using allen key and spanner, open the two front bolts of the coil bracket (Fig.8.12).

4. Take out the coil (Fig.8.13). For closing coil, same procedure needs to be followed for the coil on the right hand side.

** For fitting the coils, process shall be exact reverse of the above steps.
9.1 Accessories

Fig. 9.1
Accessories for HVX circuit-breaker
The accessories depend on the panel type used, and must be enquired about if necessary.
1  ON/OFF operating rod
2  Spring charging crank for spring operating mechanism
3  Moving crank handle
4  Snatch gap gauge

9.2 Auxiliary products

Only the following auxiliary products may be used, which are available from Schneider Electric. The use of other auxiliary products is not admissible.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Symbol</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact lubricant, 0.3 kg can</td>
<td>∆</td>
<td>ST 312-340-833</td>
</tr>
<tr>
<td>High-pressure grease, 0.3 liter can</td>
<td>□</td>
<td>ST 312-101-833</td>
</tr>
<tr>
<td>Cryogenic grease, 0.3 liter can</td>
<td>○</td>
<td>ST 312-105-833</td>
</tr>
<tr>
<td>Silicon grease, 0.3 liter can</td>
<td>●</td>
<td>ST 312-504-001</td>
</tr>
</tbody>
</table>

**WARNING:**
Danger of injury when wrong handling the auxiliary products. Comply with the safety data sheets supplied by the manufacturers of the auxiliary products.

9.3 Screw fastenings

The following elements must be used for all metal screw couplings:
- Screws and bolts: Grade ≥ 8.8
- Nuts: Grade 8.

<table>
<thead>
<tr>
<th>Thread size</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min.</td>
</tr>
<tr>
<td>M6</td>
<td>7</td>
</tr>
<tr>
<td>M8</td>
<td>16</td>
</tr>
<tr>
<td>M10</td>
<td>36</td>
</tr>
<tr>
<td>M12</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 1:
Hex. bolts and socket-head cap screws (except slotted screws) and nuts (except self-locking nuts)

<table>
<thead>
<tr>
<th>Thread size</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min.</td>
</tr>
<tr>
<td>M6</td>
<td>5,5</td>
</tr>
<tr>
<td>M8</td>
<td>15</td>
</tr>
<tr>
<td>M10</td>
<td>30</td>
</tr>
<tr>
<td>M12</td>
<td>60</td>
</tr>
</tbody>
</table>

Table 2:
Screw coupling between switching device and conductor bar with copper as conductor material.
9.4 Spare part list

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Spare part</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coil-Closing/Tripping</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Motor</td>
<td>1</td>
</tr>
</tbody>
</table>

9.5 End of service life of equipment

1. Valorization of the equipment

Our functional units are composed of recyclable elements as shown in Fig.9.2 alongside.

Detailed information regarding the major types of material used in the equipment, their weights and their methods of valorization are described below:

<table>
<thead>
<tr>
<th>Material</th>
<th>App. Wt (%)</th>
<th>Valorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel (pole, mechanism, fabrication)</td>
<td>61.6%</td>
<td>Blast cleaning, then metallurgical treatment</td>
</tr>
<tr>
<td>Copper (VI, connections, pole housings)</td>
<td>5.9%</td>
<td>-do-</td>
</tr>
<tr>
<td>Aluminium (pole housings, mechanism)</td>
<td>3.4%</td>
<td>-do-</td>
</tr>
<tr>
<td>Epoxy (pole housings)</td>
<td>24.1%</td>
<td>Crushing/grinding =&gt; filler for new plastics</td>
</tr>
<tr>
<td>Thermoplastic (polycarbonate, PVC, nylon etc.)</td>
<td>1.8%</td>
<td>Energetic utilization (thermal utilization, pyrolysis, dry stabilizing method etc.)=&gt; production of energy</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>3.2%</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

The above table can be used for:
- Calculation to be made of the capacities for valorization
- Optimizing the valorization process

2. Safety instructions regarding dismantling:
- Do not dismantle the mechanical control mechanism springs without releasing the device
- Do not open the poles
- Regarding decommissioning, please consult SE concerned service engineer and design department.
- All electrical equipments (coils, drives etc.) must be removed.
- During disassembly, the materials must be sorted and routed to the appropriate recycling procedures.
9.6 How to treat the contact surfaces

**WARNING:**
Caution when handling bars insulated by heat-shrinkable sleeves: The heat-shrinkable sleeve must not get into contact with lubricant (swelling).

**IMPORTANT:**
Contact areas coated with lubricant Kontasynth should not be touched, if possible.

1. Contact surfaces must be subjected to preliminary treatment before screw-fastening:

<table>
<thead>
<tr>
<th>Material of contact surfaces</th>
<th>Pre-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver-plated contact surfaces</td>
<td>Clean</td>
</tr>
<tr>
<td>Copper or copper alloy</td>
<td>Clean ¹, expose metallic surface ²</td>
</tr>
<tr>
<td>Aluminium</td>
<td>Clean ¹, expose metallic surface ²</td>
</tr>
<tr>
<td>Zinc-plated steel</td>
<td>Remove passivation, not, however, the zinc layer ³</td>
</tr>
<tr>
<td>Hot-galvanized sheet-metal</td>
<td>Clean ¹, passivation need not be removed</td>
</tr>
</tbody>
</table>

¹ Clean by means of lint-free cloth; use cleaning agent in case of serious contamination (see above)
² Expose metallic surface
   □ by treating the entire surface with emery cloth or a rotating grinding tool (grain size 100 or 80) or
   □ using a wire brush which is clearly marked for use exclusively for aluminium or exclusively for copper
   □ using a brass brush, steel brush
³ Remove passivation, not, however, the zinc layer

2. Immediately after the pre-treatment, coat the contact surfaces with lubricant Kontasynth so that the space between the contact surfaces is completely filled once the screws have been fastened.

9.7 How to check the snatch gap

Using the snatch gap gauge (No.4 of Fig.9.1) of 2 mm, insert the “U” in the gap shown below the spring (Fig. 9.3) during breaker “ON” condition. If this gauge does not go inside, then do not operate the circuit-breaker further and immediately contact Schneider Electric service personnel.