HVX 12-17.5-24kV
Embedded pole vacuum circuit-breaker
Medium Voltage Switching Device

Technical Instruction

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2011/08
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Schneider Electric's strong support for the high investment in China's economic construction and to provide Chinese customers with advanced technical and product support and improve. Technical services, the low-voltage electrical appliances, converter, contacts and other industrial products, extensive use of economic construction in China, promoting China's industrial progress of the process.

Currently, Schneider Electric China had established 77 offices, 26 factories, 6 logistics centers, 1 learning institute, 3 R & D center, 1 laboratory, 500 distributors and sales network all over the country. Schneider Electric China has nearly 22,000 employees. By working with partners and the cooperation of a large number of dealers, Schneider Electric China has created tens of thousands of jobs.

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With its deep understanding of the five markets, the careful care of corporate clients, as well as in the field of energy management experience, Schneider Electric from a good supplier of products and equipment have grown to a total solution provider. This year, the first integration of Schneider Electric in construction of buildings, IT, security, power and industrial processes and equipment, and other five major areas of expertise and experience, its high quality products and solutions integrated in a unified framework, through the standard Interface for various industries to provide an open, transparent, energy saving and efficient EcoStruxure™ Energy management platform for enterprise customers to save up to 30% of investment costs and operational costs.
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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 Regulations and provisions

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.

1.4 Application standards

- The three-pole FP SF6 gas insulation 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 60694.

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></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td></td>
</tr>
<tr>
<td>“minus 5 indoors”</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature min/max</td>
<td>-5/40°C</td>
</tr>
<tr>
<td>Average value over 24 hours (max)</td>
<td>35°C</td>
</tr>
<tr>
<td>Max. installation altitude above sea level</td>
<td>1000m</td>
</tr>
</tbody>
</table>

1) higher values on request
1 Regulations and provisions

1.5 Safety provisions

The work described in this Technical Instruction may only be performed by specialist electricians who have proGved 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.
2.1 Type designation

The type designation on the rating plate (Fig. 2.1) specifies essential technical data. The type designation is broken down in this example.

Fig. 2.1
Example of rating plate

1 Type designation
2 Serial numbers
3 Year of construction
4 Technical data
2.2 Technical data

<table>
<thead>
<tr>
<th></th>
<th>[kV]1</th>
<th>12</th>
<th>17.5</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated lightining impulse</td>
<td>[kV]</td>
<td>75</td>
<td>95</td>
<td>125</td>
</tr>
<tr>
<td>withstand voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated power frequency</td>
<td>[kV]</td>
<td>42</td>
<td>38</td>
<td>65</td>
</tr>
<tr>
<td>withstand voltage (U_s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated current (I_{Lr})</td>
<td>[A]</td>
<td>630,1250,1600</td>
<td>630,1250,1600</td>
<td>630,1250,1600,2000,2500,3150,4000*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2000,2500,3150,4000*</td>
<td>2000,2500,3150,4000*</td>
<td>2500,3150,4000*</td>
</tr>
<tr>
<td>breaking current (I_{Lk})</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(I_{Lk}/4s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated frequency (f_r)</td>
<td>[Hz]</td>
<td>50</td>
<td>50</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.

2.4 Component fitting options:

**Motor**
- for charging the energy-storing device (spiral spring)

**Opening release**
- 3 each max.

**Under voltage release**
- 1 each

**Closing release**
- 1 each

**Blocking coil**
- Blocking coils prevent the circuit breaker from being closed and opened via the push-buttons "ON" or "OFF", as well as manual actuation of the withdraw able unit.
- If the rated auxiliary voltage has fallen or is shut off, all blocking coils are in "blocked" position.

**Push switches**
- are snap-action switches on the drive and are installed depending on the customized design.
HVX 12-17.5-24kV
Embedded pole vacuum circuit-breaker

2 Technical data

Technical data, auxiliary switch

<table>
<thead>
<tr>
<th>Rated auxiliary voltage</th>
<th>DC[V]</th>
<th>AC [V]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;48</td>
<td>125</td>
</tr>
<tr>
<td>Switching capacity</td>
<td>10</td>
<td>3,8</td>
</tr>
<tr>
<td>Time factor $T=\frac{L}{R}$</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Rated short-time current</td>
<td>250A/3s</td>
<td></td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

Power consumption, solenoids and motor

<table>
<thead>
<tr>
<th>solenoids/motor</th>
<th>power consumption [W]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DC [W]</td>
</tr>
<tr>
<td>Closing release</td>
<td>≤ 250</td>
</tr>
<tr>
<td>Opening release</td>
<td>≤ 250</td>
</tr>
<tr>
<td>Undervoltage release</td>
<td>approx. 12</td>
</tr>
<tr>
<td>Motor for energy-storage device</td>
<td>approx. 100</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>[s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum command time <em>OFF</em></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>e.tripping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum command time <em>ON</em></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>e.tripping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor charging time</td>
<td>≤ 12</td>
<td></td>
</tr>
</tbody>
</table>

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

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").

Operating counter

- The operating counter indicates the number of switching operations.
HVX model for the following technical data (Fig. 3.1):

- $12 \, \text{kV} \leq U \leq 24 \, \text{kV}$
- $1250 \, \text{A} \leq I \leq 3150 \, \text{A}$
- $25 \, \text{kA} \leq I_{sc} \leq 50 \, \text{kA}$

1. Conductor bar terminal / moving contact
2. Circuit-breaker poles
3. Rating plate
4. Operator interface
5. Secondary terminal
6. Drive housing
7. Rollers
8. Withdrawable unit
9. Insertion opening for crank to move the circuit-breaker into its disconnected/service position / manually
10. "IP" protection sheet
11. Shutter rail
12. Secondary terminal locking rail

Fig. 3.1
Vacuum circuit-breaker HVX-E - withdraw able unit with secondary terminal
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.

Fig.4.1
shipping unit
4 Delivery, storage and transport

4.2 Storage

Storage unit should not be shipping unit. Circuit breaker storage with transportation of packaging that appears the question belongs to 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:

- Use the hanging holes to maintain the circuit breaker roughly in horizontal position when hanged.
- No other hanging point allowed.

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.

WARNING:

Remove the lifting brackets before entering in cubicle.

Weights[kg]

<table>
<thead>
<tr>
<th>Type</th>
<th>HVX-E withdrawable Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage [kV]</td>
<td>12 &amp; 17.5</td>
</tr>
<tr>
<td>Rated current[A]</td>
<td>≤ 1600</td>
</tr>
<tr>
<td>Weights[kg]</td>
<td>120</td>
</tr>
</tbody>
</table>

Guide values without packaging
5 Assembly

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".

Fig. 5.1
Move the circuit-breaker in front of the panel

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-E Mechanical assembly Mounting the transport truck

A transport truck (optional) is used to rack the circuit-breaker into the switchgear panel (Fig. 5.1). For the design and method of operation of the transport truck used, please refer to the instructions for the panel in question.

Placing circuit-breaker on transport truck and racking it into the switchgear

IMPORTANT:

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

- Place the circuit-breaker on the transport truck rails.
- Lock the circuit-breaker on the transport truck.
- Make sure that the lifting brackets are removed.
- Grease the disconnecting fingers (fig. 8.3).
- Couple the transport truck to the panel.
- Unlock the circuit-breaker from the transport truck.
- Push the circuit-breaker into the panel until it is engaged in the interlock rocker.
- Release the transport truck from the panel.

5.3 Connecting the control lines

The control lines are connected, depending on design, via control connectors (Fig. 5.2).

The control lines are wired in the circuit-breaker up to the control connector or up to the terminal strip.

Single-wire conductors or strands can be connected

- to terminal strip up to 2.5 mm²
- 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. 5.9).

Connection to terminal strip

Remove the cover plate.

Connect external control lines via the terminal strip.

The specific circuit diagram valid for the unit in question has been enclosed with each circuit-breaker. If additional control lines are placed in the drive casing, leave a sufficient distance from the movable parts of the drive.

After connecting the external control line, mount the cover plate.

IMPORTANT:

Comply with the Tightening torques specified for crew fastening (refer to Annex).
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).
- Check whether the transport securing devices have been removed (see Chapter 5.2).

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.

6.1 HVX-E (withdrawable unit)

Perform functional tests:

- Charge energy-storing device using the crank (Fig. 9.1 rep. 2). Check the spring position indicator.
- Switch circuit-breaker on and off several times by hand. Check position indicator.
- 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-E and the cell. Check position indication.
- 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.
- 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 Operation

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 HVX-E
Position indicators on circuit-breaker and possible operating sequences

<table>
<thead>
<tr>
<th>Item</th>
<th>Position indicator</th>
<th>Energy-storing device (closing spring)</th>
<th>Position indicator</th>
<th>ON/OFF Switch position</th>
<th>Position operating sequence (mechanical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>released</td>
<td></td>
<td></td>
<td>OFF</td>
<td>none</td>
</tr>
<tr>
<td>2</td>
<td>charged</td>
<td></td>
<td></td>
<td>OFF</td>
<td>c-o</td>
</tr>
<tr>
<td>3</td>
<td>released</td>
<td></td>
<td></td>
<td>ON</td>
<td>o</td>
</tr>
<tr>
<td>4</td>
<td>charged</td>
<td></td>
<td></td>
<td>ON</td>
<td>o-c-o</td>
</tr>
</tbody>
</table>

C = Switching ON  O = Switching OFF

7.2 Interlocks (where applicable)

**Mechanical interlocks**

The HVX switch features basic interlocks to prevent operating errors.

**WARNING:**

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

**Electrical interlocks**

have been designed according to the circuit diagram.
7.3 Actuate withdrawable unit (only HVX-E)

**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

- 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.
- Remove crank handle.

![Fig. 7.3](image1.png)
Crank handle to rack the circuit-breaker in and out

![Fig. 7.4](image2.png)
Charge the energy storing device

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

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

- 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.
- Remove crank handle.
7.4 Charging the energy storing device

Manually

- Move circuit-breaker in "ready-foreclosing" position.
  - Insert crank into opening for tensioning the energy storing device (Fig. 7.4)
  - 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.
  - 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.
8.1 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.

<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</td>
<td>Staff qualified accordingly for the work to be done</td>
</tr>
<tr>
<td></td>
<td>● if necessary, clean circuit-breaker (see section 8.3) and perform several switching tests</td>
<td></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</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● 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 circuit-breaker pole</td>
<td>Manufacturer’s Service Center</td>
</tr>
</tbody>
</table>

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.

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

Safety provisions

On principle, the 5 safety rules applicable for electrical engineering must be complied with before maintenance work on the circuit-breaker is started:
8 Servicing

- 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.

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

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

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 Servicing

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:

● If condensation of the circuit breaker is detected, the switching device must be cleaned, according to section 8.3.
● 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 Kontasynth

Lubrication procedure

● Clean the points of lubrication (Fig. 8.1 to 8.3) using a lint-free cotton cloth; in case of serious contamination, use a cleaning agent (see section 8.3).
● 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

● Points of lubrication on the drive (Fig. 8.1):

All metallic surfaces sliding on each other, especially cam discs, cogwheels and ratchet levers.

---

**Fig. 8.1**

Circuit-breaker drive mechanism

- High-pressure grease
- Cryogenic grease
Spindle of withdrawable unit mechanism (Fig. 8.2, item 1).

- Moving contacts (Fig. 8.3).

Fig. 8.2
Rack-in mechanism
- High-pressure grease
- Spindle

Fig. 8.3
Moving contacts
- Contact lubricant Kontasynth
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.

\[
\begin{align*}
I_r &= \text{Rated (normal) current [A]} \\
I_{sc} &= \text{Short-circuit breaking current [kA]}
\end{align*}
\]

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. 8.4).

**Fig. 8.4**

Data for rated normal current \( I_r \)

- (1) and short-circuit breaking current \( I_{sc} \)
- (2) on the rating plate
9.1 Accessories

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 (in case of HVX-E only)
4 Lifting bracket (x2)
5 Lifting beam
6 Transport truck (optional)

9.2 Auxiliary products

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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact lubricant Kontasynth, 0.5kg can</td>
<td>S 008167</td>
</tr>
<tr>
<td>High-pressure grease, 0.3 liter can</td>
<td>ST 312-101-001</td>
</tr>
<tr>
<td>Cryogenic grease, 0.3 liter can</td>
<td>ST 312-105-001</td>
</tr>
<tr>
<td>Cleaning agent, 1 liter can</td>
<td>S 008152</td>
</tr>
</tbody>
</table>

9.3 Screw fastenings

The following elements must be used for all metal screw couplings:

- **Screws and bolts:**
  - Grade ≥ 8.8
- **Nuts:**
  - Grade 8.
### 9.4 Treatment of firmly screw-connected contact surfaces

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

#### Clean
- use a lint-free cloth,
- in case of severe contamination:
  - use detergent.

#### Polish to achieve a bright surface:

<table>
<thead>
<tr>
<th>Material of contact surfaces</th>
<th>Pre-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper, silver-plated</td>
<td>-</td>
</tr>
<tr>
<td>Copper</td>
<td>A</td>
</tr>
<tr>
<td>Aluminium, silver-plated</td>
<td>-</td>
</tr>
<tr>
<td>Aluminium</td>
<td>B</td>
</tr>
<tr>
<td>Steel or steel, galvanized</td>
<td>C</td>
</tr>
</tbody>
</table>

- use emery cloth (grainsize 100 or finer)
- or use a steelbrush which is only used for copper
- use emery cloth (grainsize 100 or finer)
- or use a steelbrush which is only used for aluminium
- remove any existing passivation using a steel brush which is only used for steel.

Immediately after cleaning the material metallically bright, coat it with lubricant KL so that the space between the contact surfaces is completely filled once the screws have been fastened.
10.1 Outline Embedded pole

HVX-F Fixed circuit breaker (12&17.5kV ≤ 1250A ≤ 31.5kA)

<table>
<thead>
<tr>
<th>Rated current</th>
<th>Rated short circuit current</th>
<th>P</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>630</td>
<td>25</td>
<td>210</td>
<td>576</td>
<td>520</td>
</tr>
<tr>
<td></td>
<td>31.5</td>
<td>275</td>
<td>706</td>
<td>650</td>
</tr>
<tr>
<td>1250</td>
<td>25</td>
<td>210</td>
<td>576</td>
<td>520</td>
</tr>
<tr>
<td></td>
<td>31.5</td>
<td>275</td>
<td>706</td>
<td>650</td>
</tr>
</tbody>
</table>
HVX-F Fixed circuit breaker (12kV ≤ 4000A ≤ 50 kA)

<table>
<thead>
<tr>
<th>Rated current</th>
<th>Rated short circuit current</th>
<th>P</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 2000</td>
<td>25 31.5</td>
<td>210</td>
<td>576</td>
<td>520</td>
</tr>
<tr>
<td>1250 1600 2000</td>
<td>25 31.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1250 1600 2000</td>
<td>25 31.5</td>
<td>275</td>
<td>704</td>
<td>650</td>
</tr>
<tr>
<td>2500 3150 4000*</td>
<td>25 31.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HVX 12-17.5-24kV
Embedded pole vacuum circuit-breaker

HVX-E Draw-out circuit breaker (12&17.5kV ≤ 1250A ≤ 31.5 KA)

<table>
<thead>
<tr>
<th>Rated current</th>
<th>Rated short circuit current</th>
<th>P</th>
<th>A</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>630 1250</td>
<td>25 31.5</td>
<td>150</td>
<td>502</td>
<td>457</td>
<td>492</td>
<td>503</td>
<td>494</td>
</tr>
<tr>
<td></td>
<td>210</td>
<td>502</td>
<td>650</td>
<td>605</td>
<td>640</td>
<td>653</td>
<td>638</td>
</tr>
<tr>
<td></td>
<td>275</td>
<td>850</td>
<td>801</td>
<td>836</td>
<td>853</td>
<td>844</td>
<td></td>
</tr>
</tbody>
</table>
HVX-E Draw-out circuit breaker (12&17.5kV ≤ 4000A ≤ 50 KA)

**Note 1:** For rated current ≤ 2000A
**Note 2:** For rated current ≤ 2500A
**Note 3:** Heat sink for rated current ≥ 2500A
**Note 4:** For rated current ≤ 2000A
**Note 5:** The rated current 4000A is guaranteed with force cooling in panel

<table>
<thead>
<tr>
<th>Rated current</th>
<th>Rated short circuit current</th>
<th>P</th>
<th>A</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>L</th>
<th>H</th>
<th>M</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 2000</td>
<td>25 31.5</td>
<td>210</td>
<td>650</td>
<td>582</td>
<td>640</td>
<td>653</td>
<td>638</td>
<td>691.5</td>
<td>118</td>
<td>79</td>
</tr>
<tr>
<td>1250 1600 2000</td>
<td>50</td>
<td>210</td>
<td>650</td>
<td>582</td>
<td>640</td>
<td>653</td>
<td>638</td>
<td>691.5</td>
<td>128</td>
<td>79</td>
</tr>
<tr>
<td>1600 2000</td>
<td>25 31.5</td>
<td>275</td>
<td>850</td>
<td>777</td>
<td>836</td>
<td>853</td>
<td>844</td>
<td>729.5</td>
<td>118</td>
<td>79</td>
</tr>
<tr>
<td>1250 1600 2000</td>
<td>50</td>
<td>275</td>
<td>850</td>
<td>777</td>
<td>836</td>
<td>853</td>
<td>844</td>
<td>729.5</td>
<td>128</td>
<td>79</td>
</tr>
<tr>
<td>2500 3150 4000*</td>
<td>25</td>
<td>275</td>
<td>850</td>
<td>777</td>
<td>836</td>
<td>853</td>
<td>844</td>
<td>729.5</td>
<td>148</td>
<td>79</td>
</tr>
<tr>
<td>2500 3150 4000*</td>
<td>31.5 40</td>
<td>275</td>
<td>850</td>
<td>777</td>
<td>836</td>
<td>853</td>
<td>844</td>
<td>729.5</td>
<td>148</td>
<td>109</td>
</tr>
<tr>
<td>1250 1600 2000</td>
<td>50</td>
<td>275</td>
<td>850</td>
<td>777</td>
<td>836</td>
<td>853</td>
<td>844</td>
<td>729.5</td>
<td>128</td>
<td>79</td>
</tr>
<tr>
<td>2500 3150 4000*</td>
<td>50</td>
<td>275</td>
<td>850</td>
<td>777</td>
<td>836</td>
<td>853</td>
<td>844</td>
<td>729.5</td>
<td>158</td>
<td>109</td>
</tr>
</tbody>
</table>
HVX 12-17.5-24kV
Embedded pole vacuum circuit-breaker

10 Drawings

HVX-E Draw-out circuit breaker (24kV ≤ 1250A ≤ 31.5 KA)

![Diagram of the HVX-E Draw-out circuit breaker](image)

<table>
<thead>
<tr>
<th>Rated current</th>
<th>Rated short-circuit breaking current</th>
<th>PD</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>kA</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>630</td>
<td>1250</td>
<td>25</td>
<td>31.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P</th>
<th>A</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>210</td>
<td>650</td>
<td>606</td>
<td>646</td>
<td>653</td>
<td>648</td>
</tr>
<tr>
<td>275</td>
<td>850</td>
<td>796</td>
<td>836</td>
<td>853</td>
<td>844</td>
</tr>
</tbody>
</table>

HVX 24 Vacuum circuit breaker
Rated Voltage: 24KV
Rated short-circuit breaking current: 25KA, 31.5KA
Rated current: 630A, 1250A
HVX 12-17.5-24kV
Embedded pole vacuum circuit-breaker

10 Drawings

HVX-E Draw-out circuit breaker (24kV ≤ 3150A ≤ 40 KA)

Note: 3150A is guaranteed by forced cooling in panel
1) Heat sink for current ≥ 2500A

<table>
<thead>
<tr>
<th>Rated current (A)</th>
<th>4000*</th>
<th>3150*</th>
<th>2500</th>
<th>2000</th>
<th>1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΦM mm</td>
<td>167</td>
<td>167</td>
<td>135</td>
<td>135</td>
<td>135</td>
</tr>
<tr>
<td>ΦW mm</td>
<td>109</td>
<td>109</td>
<td>79</td>
<td>79</td>
<td>79</td>
</tr>
</tbody>
</table>

HVX 24 Vacuum circuit breaker
Rated Voltage: 24KV
Rated short-circuit breaking current: 25KA, 31.5KA
Rated current: 1600A, 2000A, 2500A, 3150A*
10.2 Recommend dimensions of HVX-E vacuum circuit breaker assembly with panel

Assemble schematic diagram of 12 & 17.5 kV HVX (≤ 1250 A ≤ 31.5 kA) and panel (650, 800, 1000) Fig.1

Fig.1 Assemble dimensions of HVX-E vacuum circuit breaker and panel(1)
Assemble schematic diagram of 12&17.5kV HVX(≤4000 A ≤50kA) and panel(800, 1000)

Fig.2

<table>
<thead>
<tr>
<th>Rated current(A)</th>
<th>1250</th>
<th>1600, 2000</th>
<th>2500, 3150</th>
<th>4000*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-circuit breaking current(kA)</td>
<td>40, 50</td>
<td>...50</td>
<td>...50</td>
<td>...50</td>
</tr>
<tr>
<td>Fixed contact(mm)</td>
<td>φ 79</td>
<td></td>
<td>φ 109</td>
<td></td>
</tr>
</tbody>
</table>

The rated current 4000A is guaranteed with force cooling in panel

Fig.2 Assemble dimensions of HVX-E vacuum circuit breaker and panel(2)
Assemble schematic diagram of 24kV HVX(≤ 1250 A ≤ 25kA) and panel (800, 1000) Fig.3

Fig. 3 Assemble dimensions of 24kV HVX-E vacuum circuit breaker and panel (1)
Assemble schematic diagram of 12&17.5kV HVX(≤4000 A ≤50kA) and panel(800、1000) Fig.2

Fig.4 Assemble dimensions of 24kV HVX-E vacuum circuit breaker and panel (2)
10.3 Wiring diagram

Fixed type

1. This wiring diagram (ASX000525-03) shows the maximum switchgear equipment. The standard equipment doesn't include option items, if the customer requires option items, please state it when placing the order.

2. Circuit breaker is in discharge and open position, trolley is in service position.

3. If Circuit breaker without blocking magnet for closing Y1, circuit diagram according to dash §U showing.

- Q0 Units incorporated in the circuit breaker in compliance with order
- M1 Motor for energy storing device
- S11/12 Auxiliary switch position indicator
- S2 Micro switch for motor control
- S6 Micro switch for blocking magnet
- Y1 Blocking magnet for closing (option)
- F11 1. Auxiliary opening release
- F12 2. Auxiliary opening release (option)
- F2 Auxiliary closing release
- F3 Indirect overcurrent release (option)
- F4 Undervoltage release (option)
- K01 Anti-pumping-relay

Drawing number: ASX000525-03
1. This circuit diagram (ASX000525-04) shows the maximum switchgear equipment. The standard equipment doesn’t include option items, if the customer requires option items, please state it when placing the order.

2. Circuit breaker is in discharge and open position, trolley is in service position.

3. If Circuit breaker without blocking manget for closing Y1, circuit diagram according to dash Ѳ Ū showing.

- Q0 Units incorporated in the circuit breaker in compliance with order
- M1 Motor for energy storing device
- S11/12 Auxiliary switch position indicator
- S2 Micro switch for motor control
- S6 Micro switch for blocking magnet
- Y1 Blocking magnet for closing (option)
- F11 1. Auxiliary opening release
- F12 2. Auxiliary opening release (option)
- F2 Auxiliary closing release
- F3 Indirect overcurrent release (option)
- F4 Undervoltage release (option)
- K01 Anti-pumping-relay

Drawing number: ASX000525-04
1. This circuit diagram (ASX000525-01) shows the maximum switchgear equipment. The standard equipment doesn't include option items, if the customer requires option items, please state it when placing the order.

2. Circuit breaker is in discharge and open position, trolley is in service position.

3. If Circuit breaker without blocking manget for closing Y1, circuit diagram according to dash ¥U showing.

- Q0 Units incorporated in the circuit breaker in compliance with order
- M1 Motor for energy storing device
- S11/12 Auxiliary switch position indicator
- S2 Micro switch for motor control
- S6 Micro switch for blocking magnet
- Y1 Blocking magnet for closing (option)
- F11 1. Auxiliary opening release
- F12 2. Auxiliary opening release (option)
- F2 Auxiliary closing release
- F3 Indirect overcurrent release (option)
- F4 Undervoltage release (option)
- K01 Anti-pumping-relay
- Q1 Units incorporated in the switchgear truck in compliance with order
- S8 Test position switch
- S9 Service position switch
- Y0 Blocking magnet blocking for trolley (option)

Drawing number: ASX000525-01
1. This circuit diagram (ASX000525-02) shows the maximum switchgear equipment. The standard equipment doesn't include option items, if the customer requires option items, please state it when placing the order.

2. Circuit breaker is in discharge and open position, trolley is in service position.

3. If Circuit breaker without blocking manget for closing Y1, circuit diagram according to dash §Ú showing.

- Q0 Units incorporated in the circuit breaker in compliance with order
- M1 Motor for energy storing device
- S11/12 Auxiliary switch position indicator
- S2 Micro switch for motor control
- S6 Micro switch for blocking magnet
- Y1 Blocking magnet for closing (option)
- F11 1. Auxiliary opening release
- F12 2. Auxiliary opening release (option)
- F2 Auxiliary closing release
- F3 Indirect overcurrent release (option)
- F4 Undervoltage release (option)
- K01 Anti-pumping-relay
- Q1 Units incorporated in the switchgear truck in compliance with order
- S8 Test position switch
- S9 Service position switch
- Y0 Blocking magnet blocking for trolley (option)

Drawing number: ASX000525-02
1. This circuit diagram (ASX000525-05) shows the maximum switchgear equipment. The standard equipment doesn't include option items, if the customer requires option items, please state it when placing the order.

2. Circuit breaker is in discharge and open position, trolley is in service position.

3. If circuit breaker without blocking manget for closing Y1, circuit diagram according to dash ų showing.

4. If circuit breaker without blocking manget for trolley Y0, circuit diagram according to showing.

- Q0 Units incorporated in the circuit breaker in compliance with order
- M1 Motor for energy storing device
- S11/12 Auxiliary switch position indicator
- S2 Micro switch for motor control
- S6 Micro switch for blocking magnet
- Y1 Blocking magnet for closing(option)
- F11 1.Auxiliary opening release
- F12 2.Auxiliary opening release(option)
- F2 Auxiliary closing release
- F3 Indirect overcurrent release(option)
- F4 Undervoltage release(option)
- K01 Anti-pumping-relay
- Q1 Units incorporated in the switchgear truck in compliance with order
- S8 Test position switch
- S9 Service position switch
- Y0 Blocking magnet blocking for trolley(option)
- M2 Motor for control trolley

Drawing number: ASX000525-05
1. This circuit diagram (ASX000525-06) shows the maximum switchgear equipment. The standard equipment doesn’t include option items, if the customer requires option items, please state it when placing the order.

2. Circuit breaker is in discharge and open position, trolley is in service position.

3. If circuit breaker without blocking manget for closing Y1, circuit diagram according to dash U showing.

4. If circuit breaker without blocking manget for trolley Y0, circuit diagram according to showing.

- Q0 Units incorporatred in the circuit breaker in compliance with order
- M1 Motor for energy storing device
- S11/12 Auxiliary switch position indicator
- S2 Micro switch for motor control
- S6 Micro switch for blocking magnet
- Y1 Blocking magnet for closing(option)
- F11 1.Auxiliary opening release
- F12 2.Auxiliary opening release(option)
- F2 Auxiliary closing release
- F3 Indirect overcurrent release(option)
- F4 Undervoltage release(option)
- K01 Anti-pumping-relay
- Q1 Units incorporated in the switchgear truck in compliance with order
- S8 Test position switch
- S9 Service position switch
- Y0 Blocking magnet blocking for trolley(option)
- M2 Motor for control trolley

Drawing number: ASX000525-06