Vacuum Circuit-Breakers, Type HVX
12 – 24 kV, of cassette design,
cassette with motor drive

Operating Instructions
No. 531 321, Edition 09/00
# Table of Contents

1  **General**  
1.1 Operating Conditions  

2  **Design, supplementary Accessories and Method of Operation**  
2.1 Design  
2.2 Supplementary accessories available on request  
2.3 Method of operation  

3  **Transport, Reception and Storage**  
3.1 Transport  
3.2 Reception  
3.3 Storage  

4  **Assembly and Commissioning**  
4.1 Assembly of circuit-breaker types HVX  
4.2 Test run  
4.3 Commissioning  

5  **Operating Instructions**  
5.1 Operating instructions for circuit-breaker types HVX  
5.2 Operating instructions for the spring mechanism  

6  **Operating Errors**  

7  **Servicing**  
7.1 Servicing schedule  
7.2 Spare parts  

8  **Malfunctions**  

9  **Circuit-Breakers and Spring Mechanisms - Drawings and Keys**  
9.1 Circuit-breaker – drawing and key (630 A)  
9.2 Circuit-breaker – drawing and key (1250 A)  
9.3 Circuit-breaker – drawing and key (1600 A, 2000 A, 2500 A)  
9.4 Mechanism of cassette with motor drive – drawing and key  
9.5 Spring mechanism – drawing and key  
9.6 Rack-in / rack-out mechanism – drawing and key  
9.7 Accessories  
9.8 Drawing with reference dimensions for rail  

10  **Inspection Record for Vacuum Circuit-Breaker HVX**  

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General</td>
<td>4</td>
</tr>
<tr>
<td>1.1</td>
<td>Operating Conditions</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Design, supplementary Accessories and Method of Operation</td>
<td>5</td>
</tr>
<tr>
<td>2.1</td>
<td>Design</td>
<td>5</td>
</tr>
<tr>
<td>2.2</td>
<td>Supplementary accessories available on request</td>
<td>6</td>
</tr>
<tr>
<td>2.3</td>
<td>Method of operation</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Transport, Reception and Storage</td>
<td>8</td>
</tr>
<tr>
<td>3.1</td>
<td>Transport</td>
<td>8</td>
</tr>
<tr>
<td>3.2</td>
<td>Reception</td>
<td>8</td>
</tr>
<tr>
<td>3.3</td>
<td>Storage</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Assembly and Commissioning</td>
<td>9</td>
</tr>
<tr>
<td>4.1</td>
<td>Assembly of circuit-breaker types HVX</td>
<td>9</td>
</tr>
<tr>
<td>4.2</td>
<td>Test run</td>
<td>9</td>
</tr>
<tr>
<td>4.3</td>
<td>Commissioning</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Operating Instructions</td>
<td>10</td>
</tr>
<tr>
<td>5.1</td>
<td>Operating instructions for circuit-breaker types HVX</td>
<td>10</td>
</tr>
<tr>
<td>5.2</td>
<td>Operating instructions for the spring mechanism</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Operating Errors</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>Servicing</td>
<td>12</td>
</tr>
<tr>
<td>7.1</td>
<td>Servicing schedule</td>
<td>13</td>
</tr>
<tr>
<td>7.2</td>
<td>Spare parts</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>Malfunctions</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>Circuit-Breakers and Spring Mechanisms - Drawings and Keys</td>
<td>16</td>
</tr>
<tr>
<td>9.1</td>
<td>Circuit-breaker – drawing and key (630 A)</td>
<td>16</td>
</tr>
<tr>
<td>9.2</td>
<td>Circuit-breaker – drawing and key (1250 A)</td>
<td>17</td>
</tr>
<tr>
<td>9.3</td>
<td>Circuit-breaker – drawing and key (1600 A, 2000 A, 2500 A)</td>
<td>18</td>
</tr>
<tr>
<td>9.4</td>
<td>Mechanism of cassette with motor drive – drawing and key</td>
<td>19</td>
</tr>
<tr>
<td>9.5</td>
<td>Spring mechanism – drawing and key</td>
<td>20</td>
</tr>
<tr>
<td>9.6</td>
<td>Rack-in / rack-out mechanism – drawing and key</td>
<td>21</td>
</tr>
<tr>
<td>9.7</td>
<td>Accessories</td>
<td>22</td>
</tr>
<tr>
<td>9.8</td>
<td>Drawing with reference dimensions for rail</td>
<td>23</td>
</tr>
<tr>
<td>10</td>
<td>Inspection Record for Vacuum Circuit-Breaker HVX</td>
<td>24</td>
</tr>
</tbody>
</table>
The HVX series circuit-breakers are vacuum circuit-breakers for application in 12 to 24 kV indoor switchgear units.

1.1 Operating conditions

The circuit-breakers operate perfectly under the following climate conditions corresponding to IEC 60694:

1.1.1 Admissible ambient temperature

- The maximum temperature of the ambient air is 40 °C, the average measured over a 24 h period not exceeding max. 35 °C.
- The minimum temperature of the ambient air is -5 °C.

1.1.2 Installation altitude

The circuit-breakers can be installed at altitudes up to 1000 m above sea level. At higher installation altitudes reduced withstand voltage must be taken into account. It may be necessary to use circuit-breakers of the next-higher voltage series.

1.1.3 Admissible air pollution

The ambient air is not essentially polluted by dust, smoke, corrosive or inflammable gases and vapours, or by salt.

1.1.4 Admissible atmospheric humidity

- The average relative humidity, measured during a 24 h period, does not exceed 95 %.
- The average vapour-pressure, measured over a 24 h period, does not exceed 22 mbar.
- The average relative humidity, measured over a one-month period, does not exceed 90 %.
- The average vapour pressure, measured over a one-month period, does not exceed 18 mbar.

→ Under these conditions, condensation may occur:
- Condensation must be expected if sudden temperature fluctuations occur in periods with high atmospheric humidity.
- Condensation can be prevented by appropriate design and ventilation of the building and heating the switchgear, or by means of dehydrators.

→ These measures are recommended if an atmospheric humidity in excess of 75 % is to be expected.

Remarks

→ If circuit-breakers are to be used under conditions differing from those described above, the manufacturer must be consulted!
2 Design, supplementary Accessories and Method of Operation

2.1 Design

2.1.1 Circuit-breaker complete
The circuit-breaker consists of the drive housing (127), the three poles with current path (104-108, 123-124), the three switching mechanisms (112-119), the cassette with motor drive (128) and the spring mechanism (102).

2.1.2 Drive casing
The drive casing (127) accommodates the main shaft with the spring mechanism (102), control and operating devices and the connection elements to the three pole frames (101).

2.1.3 Pole with current path
The primary current path (104-108, 123-124) consists of the upper conductor (104), the vacuum interrupter (105), the shield or the contact terminal (106), the flexible connector (107), the lower conductor (108), the isolating contact (123) and the insulating conduit (124).

2.1.4 Switching mechanism
The switching mechanism (112-119) consists of the spacer with screw (112), the contact pressure spring (113), the spacer (114), the pressure rod (115), the bearing (116), the lever (117), the connection to the drive unit (118) and the coupling (119).

2.1.5 Cassette with motor-drive
The cassette with motor drive (128) accommodates the rack-in and rack-out mechanism, the connector carrier (201) with connector and the interlock between the rack-in and rack-out mechanism and the spring mechanism (102).

2.1.6 Spring mechanism
The HVX circuit-breakers are driven via a motorized spring mechanism FK 2-01.

2.1.6.1 Mechanical equipment
Every FK drive is equipped with the following mechanical elements:
- Hexagon socket for manual charging of the spiral spring
- “ON” pushbutton (10)
- “OFF” pushbutton (12)
- Circuit-breaker position indicator
- Closing spring position indicator

2.1.6.2 Electrical control of the circuit-breaker drive
The electrical equipment for the spring mechanism (102) FK 2-01 is described in the circuit diagram supplied with the unit.

2.1.6.3 Control, protection
The drive FK 2-01 can be used for auto-reclosing (OFF-reclosing). In conjunction with the appropriate electrical equipment, a control system can be designed together with the secondary relays.

2.1.7 Motorization
Refer to illustration on page 19.
The multi-stage spur reduction gearing (210) is fixed in the cassette with motor drive (128) via the spindle (208) which is mounted to the gearing. The motor is fixed in the gearing (210). An auxiliary crank for HVX (306) can be slipped onto one shaft of the bearing (210) (refer to illustration on page 22). The 2nd gearing stage is designed as an overload coupling. This allows the final stops of the spindle (208) to be approached without damaging the spindle or the gearing (210).

2.1.7.3 Electrical control of the rack-in and rack-out motor
The contactors K1 – K2 control the motor. They are mounted onto the head plate of the circuit-breaker drive. The limit switches S4 and S5 are mounted to the gearing (210). (Refer to corresponding diagrams).

2.1.7.4 Rack-in and rack-out mechanism

2.1.7.4.1 Spindle
Refer to illustration on page 21.
The spindle (208) is located in the cassette with motor drive (128) and the spindle bearing (205), where it is also held axially by means of a locking ring. The two interlock rockers (205) are slipped on the cassette with motor drive (128) for longitudinal protection, and suspended on the 2 journals (206).
2.1.8 Connector carrier
Refer to illustrations on page 21.
The connector carrier (201) is screw-fastened tightly in the cassette with motor drive (128). The control connector (positive) on the circuit-breaker end (202) is secured in the connector carrier (201). The control connector (negative) on the panel end (203) is fixed in the connector support (204). The connector support (204) is slipped onto the connector carrier (201).

2.1.9 Interlocks
Mechanical interlocks are located between the circuit-breaker drive, the rack-in and rack-out mechanism and the connector.

2.1.10 Position indicator
Control cams for 7 different contact diagrams can be inserted on 8 tracks on the position indicator plate (125) fixed in the cassette with motor drive (128). In case of the HVX, tracks number 7 and 8 are required for the control. (Refer to corresponding diagram). Deck 6 is required if the earthing switch drive is motorised. The remaining 5 decks can be used as necessary. The position indicator pack on the panel end, which features the integral limit switches, is suspended in rotary and laterally sliding position. A spring presses the position indicator pack with integrated limit switches against the position indicator plate (125). A groove in the position indicator plate (125) provides for lateral centring of the position indicator pack. Thus, the limit switches of the position indicator pack are aligned to the control cams of the position indicator plate (125).

2.2 Supplementary accessories available on request
Circuit-breaker coding

2.2.1 Circuit-breaker coding
To enable circuit-breaker coding, the position indicator plate (125) is required on the circuit breaker, and the position indicator pack without limit switch on the panel end. This provides 5 different coding variants.

2.3 Method of operation
2.3.1 Circuit-breaker
The closing and opening movement is transmitted by the spring mechanism (102) via the switching mechanisms (112-119) to the vacuum interrupters (105). On closing, the movable contacts (110) touch the fixed contacts (109), tensioning the contact pressure springs (113) embedded in the switching mechanism (112-119), so that the fixed contacts (109) and the movable contacts (110) are pressed together with the necessary closing force.

2.3.2 Spring mechanism
The spring mechanism (102) features a single shaft for closing and opening. The spiral spring (7) supplies the power for closing and opening. The cam disc (1) transmits the energy to the switching mechanisms (112-119). The shaft and the cam disc (1) rotate by 360° for a closing and opening operation. (To permit the operating cycle OFF-ON-OFF, the spiral spring (7) is retensioned after the vacuum circuit-breaker is switched ON).

2.3.2.1 Closing (ON)
The circuit-breaker is switched ON when the mechanical rocker is actuated to ON (10), or by means of a control pulse emitted to the closing release (11).

2.3.2.2 Opening (OFF)
The circuit-breaker is switched OFF when the mechanical rocker is actuated to OFF (12) or by means of a control pulse emitted to the opening release (13) or the no-volt release or the indirect over-current release.

2.3.3 Rack-in and rack-out mechanism
The spindle nut (209) latches on the panel end. When the motor rotates the spindle (208) via the gearing (210), the circuit-breaker moves. A cam, mounted to the spindle nut (209), moves the lock rocker (205) if the circuit-breaker is not in service position “I” or isolating position “O”. The interlock rocker (205) actuates the limit switch S4 (refer to corresponding diagram), which stops the motor. The final stops of the spindle nut (209) are mounted onto the spindle (208).
2.3.4 Electrical control of the rack-in and rack-out motor

If the “rack-in command” is issued as a pulse or as a maintained contact, contactor K1 picks up and changes into locking state. In response to K1, the motor turns in “rack-in” direction. Now, if the motor turns the spindle (208), the limit switch S4 is actuated. The locking state of K1 now also includes S4. Just before the position “racked-in” is reached, the position indicator on the panel end interrupts the maintained “rack-in” contact and the locking condition of K1 via its own contact. However, the limit switch S4 continues to maintain K1, and S4 only opens when the “racked-in” position is reached completely. Thus, K1 is dropped out and the motor switches off.

On “racking-out”, the same applies, however in conjunction with contactor K2 instead of K1.

2.3.5 Interlocks

2.3.5.1 Circuit-breaker coding

Circuit-breaker coding helps ensure that the circuit-breakers can only be racked into panels for which they are designed.

2.3.5.2 Cassette interlock

The circuit-breaker which is racked in the panel by the transport trolley (303) only latches in the moving rocker if the spindle nut (209) is in the position corresponding to the isolating position.

2.3.5.3 Earthing switch interlock

Only applicable to PID panels or panel equipment made by ALSTOM AG.

The detachable lever used to operate the earthing switch can only be inserted while the circuit-breaker is in isolating position “0”, or while it is not in the panel.

2.3.5.4 Connector interlock

The control connector (negative) on the panel end (203) can only be inserted or removed while the circuit-breaker is in isolating position “0”.

2.3.5.5 Drive interlock

The circuit-breaker drive can only be switched when the circuit-breaker is in isolating position “0” or in service position “1” and while the auxiliary crank (306) for the rack-in and rack-out mechanism has been removed.

2.3.5.6 Interlock for HVX auxiliary crank (306) for the rack-in and rack-out mechanism

The HVX auxiliary crank (306) which serves to actuate the rack-in and rack-out mechanism can only be inserted if the circuit-breaker has been switched off.

2.3.5.7 Rack-in interlock

The circuit-breaker is mechanically locked in isolating position, if the earthing switch is in position “ON”. After approx. 4 turns of the HVX auxiliary crank (306), the circuit breaker reaches this blocking mechanism.

2.3.5.8 Electrical interlocks

Auxiliary contacts and limit switches have been mounted to provide electrical interlocks between the circuit-breaker drive, the rack-in and rack-out motor drive and the earthing switch.

(Refer to the corresponding diagrams).
3 Transport, Reception and Storage

3.1 Transport
The circuit-breakers are dispatched with packing. The weight of the circuit-breaker must correspond to the final dimension drawing, which has binding character. When supplied, the circuit-breakers are completely assembled and adjusted.

3.2 Reception
- Unloading and unpacking the circuit-breakers requires maximum care!
- After reception, the circuit-breakers must be unpacked without delay! The insurance company must be informed immediately about damage which may have occurred in transit.
- The circuit-breakers must be checked for completeness! The manufacturer should be contacted in case of deviations.
- The circuit-breaker must not be subjected to mechanical strain (placing abruptly on the floor, knocking against obstacles, etc.)!

3.3 Storage
- The circuit-breakers must be stored in unpacked condition as specified under items 1.1.3 and 1.1.4!
- The transport packing is not packing for storage! The risk of storing the circuit-breakers in packed condition shall be the consignee’s responsibility!

The circuit-breaker must be lifted as shown in the Figure. This work requires a rope (no bright steel rope) of 12...15mm dia., or a strap.

⚠️ Make sure that the rope is strong enough to bear the weight of the circuit-breaker!
4 Assembly and Commissioning

The circuit-breakers must be used under the conditions specified under item 1.1!

4.1 Assembly of the circuit-breaker types HVX

The circuit-breakers are delivered in ready-to-operate condition. They do not require additional assembly or adjustment work.

4.2 Test run

4.2.1 Mechanical function test

- Vacuum test (refer to 7.1.3)
- Set circuit-breakers externally to disconnected position “0”. Before coupling the transport trolley (303) to the panel (refer to Assembly and Operating Instructions, transport trolley 531 341), the following items in the panel must be checked:
  - The moving rocker is fixed by a spring; it can be pressed down.
  - The position indicator pack can be pushed down and shifted laterally.
    
    Attention: Control voltage in the position indicator pack is “ON”.
  - The codings of circuit-breaker and panel correspond.
  - There are no foreign bodies in the circuit-breaker compartment.
  - Check the dimensions of the rail as shown in the drawing on page 23.
- Insert the control connector on the panel end (negative) (203) until the snap hook (216) is engaged.
- Switch circuit-breaker ON and OFF several times by hand (Operating Instructions, refer to 5.2). At the same time, check the following:
  - Check position of position indicator (Switch position OFF)
  - Check interlock feature according to items 2.3.5.4. to 2.3.5.7.
  - Check any mechanical interlocks provided between the circuit-breaker and other devices.
  - Move circuit-breaker to service position “I” using the HVX auxiliary crank (306) and switch it ON and OFF by hand.
  - Move circuit-breaker in disconnected position “0” using the HVX auxiliary crank (306).

4.2.2 Electrical function check

- Switch control voltage ON. The motor (9) of the spring mechanism (102) starts to charge the spiral spring (7) immediately.
- Switch circuit-breaker ON and OFF (remote-controlled, as far as the electrical equipment of the spring mechanism (102) so permits). To this effect, check control and signal circuits as well as any electrical interlocks between the circuit-breaker and the other devices.
- Rack in and out the circuit-breaker using the motor. To this effect, check control and signal circuits as well as any electrical interlocks which might exist between the circuit-breaker and the other devices.

4.3 Commissioning

Before commissioning, complete the inspection record (cf. Section 10) based on the checks actually performed. After these checks have been completed, the circuit-breaker can be put into operation.
5 Operating Instructions

5.1 Operating instructions for circuit-breaker types HVX

5.1.1 Move circuit-breaker from transport trolley to disconnected position “0”

Prerequisite:
The transport trolley (303) is coupled to the panel according to operating manual 531 341.

• Set spindle nut (209) to disconnected position “0”.
• Push circuit-breaker to disconnected position by hand until the moving rocker is engaged.
• Uncouple and remove the transport trolley (303).
• Insert control connector on panel end (negative) (203) until the snap hook (216) is engaged.

5.1.2 Move circuit-breaker from disconnected position “0” to service position “I”

With motor:
Commands are entered via local or remote control.

With HVX auxiliary crank (306):
• Switch circuit-breaker OFF.
• Insert HVX auxiliary crank (306) and turn it counter-clockwise to its stop.

(The circuit-breaker moves to disconnected position “0”).

5.1.3 Move circuit-breaker from service position “I” to disconnected position “0”

With motor:
Commands are entered via local or remote control.

With HVX auxiliary crank (306):
• Switch circuit-breaker OFF.
• Insert HVX auxiliary crank (306) and turn it counter-clockwise to its stop.

(The circuit-breaker moves to disconnected position “0”).

5.1.4 Move circuit-breaker from disconnected position “0” onto the transport trolley

• Remove the control connector on the panel end (negative) (203) and place it in the cable tray of the PID switchgear
• Couple transport trolley (303) to the panel.
• Move unlocking wedge to its stop under the moving rocker.
• Pull circuit-breaker off the panel onto the transport trolley (303), until the transport trolley (303) can be uncoupled from the panel.

5.2 Operating instructions for the spring mechanism

The HVX vacuum circuit-breakers can only be switched ON with the disconnecting mechanism in one of its end positions “I” or “0”.

5.2.1 Switching ON
With motor:
The spiral spring (7) is charged by the charging motor (9) immediately after closing. Switching ON takes place via the command pulse to the closing release (11) or actuation of the rocker ON (10) by means of the operation rod (302).

Manually:
Charge the spiral spring (7) by means of the spring charging crank (304). As soon as the spiral spring (7) is charged, the spring charge mechanism is uncoupled. Switching ON takes place via the command pulse to the closing release (11) or actuation of the rocker ON (10) by means of the operation rod (302).

5.2.2 Switching OFF
To switch OFF, actuate the rocker OFF (12) by means of the operation rod (302), or issue the command pulse to the opening release (13) or actuate the no-volt release or the secondary release.
## 6 Operating Errors

<table>
<thead>
<tr>
<th>Determination</th>
<th>Possible reason</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The circuit-breaker cannot be pushed from the transport trolley (303) to the disconnected position “0”.</td>
<td>Wrong circuit-breaker, or the coding prevents racking-in. The spindle nut (209) is not in its final position “0”.</td>
<td>Use the appropriate circuit-breaker. Move the spindle nut (209) to the appropriate position.</td>
</tr>
<tr>
<td>The moving rocker does not engage in the spindle nut (209).</td>
<td>The moving rocker does not return to its appropriate position by spring force. Foreign matter is caught underneath the moving rocker.</td>
<td>The moving rocker must be able to spring back to its stop.</td>
</tr>
<tr>
<td>The control connector on the panel end (negative) (203) cannot be inserted.</td>
<td>The spindle nut (209) is not in its end position “0”.</td>
<td>Move the spindle nut (209) to its appropriate position.</td>
</tr>
<tr>
<td>The HVX auxiliary crank (306) cannot be inserted.</td>
<td>The circuit-breaker is switched ON. The control connector on the panel end (negative) (203) is not inserted correctly.</td>
<td>Switch the circuit-breaker OFF. Insert the control connector on the panel end (negative) (203) until the snap hook is engaged (216).</td>
</tr>
<tr>
<td>The circuit-breaker cannot be switched ON.</td>
<td>The spindle nut (209) is not in its end position “I” or “0”. The spiral spring (7) is not charged. The HVX auxiliary crank (306) has been left in the spindle (208).</td>
<td>Move the spindle nut (209) to its appropriate position. Charge the spiral spring (7). Remove the HVX auxiliary crank (306).</td>
</tr>
<tr>
<td>The circuit-breaker cannot be moved from its disconnected position “0” onto the transport trolley (303).</td>
<td>The control connector on the panel end (negative) (203) has not been removed. The unlock clip is not slipped underneath the moving rocker.</td>
<td>Remove the control connector on the panel end (negative) (203). Insert the unlock clip correctly.</td>
</tr>
<tr>
<td>The circuit-breaker cannot be moved from disconnected position “0” to service position “I” via the HVX auxiliary crank (306).</td>
<td>The earthing switch is still turned ON.</td>
<td>Switch the earthing switch OFF.</td>
</tr>
<tr>
<td>The rack-in/rack-out motor is not running.</td>
<td>The connector has not been inserted or has not been inserted properly. The HVX auxiliary crank (306) has been inserted. The circuit-breaker is switched ON.</td>
<td>Insert connector properly. Remove the HVX auxiliary crank (306). Switch OFF.</td>
</tr>
</tbody>
</table>
Servicing comprises all measures to determine and assess the actual condition, and maintain and restore the target condition of a system’s technical equipment. It only covers the following areas:

− Inspection:
  measures to determine and assess the actual condition
− Maintenance:
  measures to maintain and restore the target condition
− Repair:
  measures to restore the target condition

The vacuum circuit-breakers HVX are characterized by their being equipped with zero-maintenance vacuum interrupters (105) and with a zero-maintenance spring mechanism (102).

7.1 Servicing schedule

7.1.1 General

→ Before starting any maintenance or repair work, the circuit-breakers must be isolated, discharged by switching OFF-ON-OFF by hand with the motor and control voltage disconnected, and must then be removed from the panel.

→ The hood must not be removed on any account as long as the circuit-breaker is in the panel.

→ The protective cover of the switch lock must not be removed on any account.

**ATTENTION!**

- Actuation by hand only via the rocker.
- Electric actuation only via the auxiliary switches.

→ Maintenance and repair work may only be performed by trained staff.

→ Screws marked with paint must not be released!
### 7.1.2

**Inspection schedule for monitoring the current status**

The time for inspection and the maintenance work involved depends on the following factors:
- the service life
- the operating frequency
- the number of breaking operations

<table>
<thead>
<tr>
<th>Intervals</th>
<th>Inspection</th>
<th>Maintenance or repair work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annually</td>
<td>Visual inspection of the circuit-breaker.</td>
<td>Clean insulating components if contaminated.</td>
</tr>
<tr>
<td>Every 10 years</td>
<td>Vacuum test according to 7.1.3.</td>
<td>In case of loss of vacuum, replace vacuum interrupters (105).</td>
</tr>
<tr>
<td></td>
<td>Visual inspection of the spring mechanism (102).</td>
<td>Clean spring mechanism (102) if contaminated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perform approx. 10 no-load switching operations.</td>
</tr>
<tr>
<td>After approx. 10,000 cycles</td>
<td>Vacuum test according to 7.1.3.</td>
<td>In case of loss of vacuum, replace vacuum interrupters (105).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Revise spring mechanism (102) as directed by the manufacturer.</td>
</tr>
<tr>
<td>After 20,000 operating cycles</td>
<td>-</td>
<td>Replace vacuum interrupters (105)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Revise spring mechanism (102) as directed by the manufacturer.</td>
</tr>
<tr>
<td>After reaching the admissible number of breaking operations according to graph 7.1.4</td>
<td>-</td>
<td>Replace vacuum interrupters (105).</td>
</tr>
<tr>
<td>After 1,000 rack-in / rack-out movements of the circuit-breaker</td>
<td>-</td>
<td>Revise gearing according to the manufacturer’s instructions.</td>
</tr>
</tbody>
</table>

### 7.1.3

**Vacuum test on the vacuum interrupter**

Prepare circuit-breaker according to 7.1.1 (Circuit-breaker in position OFF).

Pull lever (117) on the press rod (115) down until all bearing clearances are eliminated (stroke approx. 0.5 mm). If the lever is returned to its initial position by the vacuum, the vacuum interrupter (105) is perfectly sealed. If it is possible to press the lever (117) on the press rod (115) upwards (approx. 0.5 mm) and if it moves down again when released, this indicates that the vacuum interrupter (105) is leaking.
7.1.4 Number of admissible short-circuit breaking operations

The graph shown here indicates whether the interrupter might require replacement. It refers exclusively to short-circuit currents and purely inductive load currents with a $\cos \Phi < 0.1$ [e.g. shunt reactor], not, however, to normal load currents.

7.2 Spare parts

No spare parts are provided.
In case of serious malfunctions, the manufacturer should be informed immediately.
9 Circuit-Breakers and Spring Mechanisms
Drawing and Keys

9.1 Circuit-breaker –
drawing and key (630 A)
(Switch position ON)
9.2
Circuit-breaker -
drawing and key (1250 A)
(Switch position ON)
9.3  
Circuit-breaker - drawing and key (1600 A, 2000 A, 2500 A)  
(Switch position ON)

101 Panel frame  
102 Spring mechanism  
103 Conductor fastening  
104 Conductor on top  
105 Vacuum interrupter  
106 Contact terminal  
107 Flexible connector  
108 Conductor at the bottom  
109 Fixed contact of vacuum interrupter  
110 Movable contact element of vacuum interrupter  
111 Heat dissipator at the bottom  
112 Spacer sleeve with screw  
113 Contact pressure spring  
114 Spacer  
115 Pressure rod  
116 Centring of vacuum interrupter  
117 Lever  
118 Connection to drive  
119 Coupling  
120 Heat dissipator on top  
121 Isolating contact  
122 Insulating conduit  
123 Position indicator plate  
124 Bearing  
125 Drive casing  
126 Cassette with motor drive
9.4
Mechanism of cassette with motor drive –
drawing and key

201 Connector carrier
204 Connector support
206 Journals
208 Spindle
209 Spindle nut
210 Gearing
216 Snap hook
217 Castors

Auxiliary crank
9.5
Spring mechanism –
drawing and key

Note:
The drawing shows the spring mechanism for a pole center space (PCS) of 185.

1  Cam disc  
7  Spiral spring  
9  Motor  
10  Pushbutton ON  
11  Closing release  
12  Pushbutton OFF  
13  Opening release  
105  Vacuum interrupter  
109  Fixed contact of vacuum interrupter  
110  Movable contact element of vacuum interrupter  
113  Contact pressure spring  
112 - 119  Switching mechanism  
304  Spring charging crank
9.6  
Rack-in / rack-out mechanism  
- drawing and key

201  Connector carrier  
202  Control connector on circuit-breaker end (positive)  
203  Control connector on panel end (negative)  
204  Connector support  
205  Interlock rocker  
206  Journals  
208  Spindle  
209  Spindle nut

212  Interlock clip  
213  Disconnecting interlock contact  
214  Interlock rod  
215  Tension spring with eyelets  
(for interlock rockers)  
216  Snap hook
9.7
Accessories

→ Remove control elements after completion of the switching operation.

302 Operation rod
303 Transport trolley (not shown)
304 Spring charging crank FH/FK 2-01
306 HVX auxiliary crank
9.8
Drawing with reference dimensions for rail

Note:
The reference dimensions only refer to a pole center space (PCS) of 210.
This form must be completed based on the inspections actually performed before commissioning the vacuum circuit-breaker.

**General**

- Test run performed .................................................................
- Surface of insulating components cleaned by means of dry cloth ..................................................
- All assembly tools removed from the switchgear ..................................................
- Vacuum circuit-breaker of cassette design can be racked in and out in perfectly functioning condition ..................................................
- Isolating contact engages as defined in the dimension drawing (only in case of panels provided by customers) ..........................................
- Protection sleeves removed from isolating contacts ..................................................
- Protection sleeves removed from pole tubes ..................................................

Remarks: ..............................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................
Switchgear ...............................................................................................................................................................
Circuit-breaker type ............................................................................................................................................
Serial no. ................................................... /Index .................................................. Year of construction ..................................................
Type of spring mechanism ........................................... Wiring diagram ..........................................................
State of operations counter ......................................................................................................................................
Company: ................................................................................................................................................................
Place and date: .......................................................... Signature of fitter: ..........................................................