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I. For your safety!

Make sure that the installation room (available space, divisions and ambient) is suitable for the electrical apparatus.
Check that all the installation, putting into service and maintenance operations are carried out by qualified personnel with sufficient knowledge of the apparatus. Make sure that the standards and laws in force are complied with when the apparatus is installed and put into service, and that the rules of good workmanship and safety in the workplace are applied.
Check that the rated performance of the apparatus is not exceeded during service.
Check that the personnel who operate the apparatus have this instruction manual to hand as well as all the information they need to operate correctly.
Pay special attention to the danger notes indicated in the manual by the following symbol:

![Warning Symbol]

Responsible behavior safeguards your own and others' safety!
Please contact the ABB Assistance Service for any further requirements.

II. Introduction

This publication contains the information required to install medium voltage controlgear and switchgear for circuit-breakers, as well as instructions for putting them into service. Carefully read this document to ensure the product is used correctly.

This apparatus allows further technical-construction modifications (at the customer’s request) to be made so as to adapt to special installation requirements. Consequently, the information given in this document may not contain instructions concerning special customized configurations. Besides this manual, you must always consult the latest technical documentation (drawings, electrical circuit and wiring diagrams, assembly and installation drawings, applicable protection coordination studies, etc.), especially regarding any variants to the standard configurations that may be necessary. Only use original spare parts for maintenance operations. For further information, please also consult the technical catalog of the circuit-breaker and the spare parts catalog.

III. Environment Protection Scheme

HD4-HXA-SFAsg circuit-breakers are manufactured in accordance with ISO 14000 Standards (Guidelines for environmental management). The manufacturing processes are implemented in accordance with the environmental protection standards when it comes to reducing energy consumption and the production of waste.
All this is achieved thanks to the environmental management system adopted in the production facility.

All the installation, putting into service and maintenance operations must be performed by skilled personnel with in-depth knowledge of the equipment.
1. Applicability and Characteristics of HD4-HXA Retrofit

HD4-HXA-SFAsg instructions

The HD4-HXA-SFAsg retrofit circuit-breaker is based on the fixed version of HD4-HXA.

So much so, most of the information in the HD4-HXA instruction manual is also applicable to this retrofit version. The contents of this supplement are also applicable to the following sections of the manual. Please refer to the instruction manual of the HD4-HXA circuit-breaker (code 647027) for specific information.

Section 1 – Packing and transport
Section 2 – Checking on receipt
Section 3 – Storage
Section 4 – Handling
Section 5 – Description
Section 6 – Instructions for circuit-breaker operation
Section 7 – Installation
Section 8 – Putting into service
Section 9 – Routine inspections
Section 10 – Maintenance operations
Section 11 – Instructions for handling apparatus containing SF6 gas
Section 12 – Spare parts and accessories

Specific information about the HD4-HXA-SFAsg circuit-breaker retrofit kit is given in this supplement.

General description:

The HD4-HXA circuit-breaker is part of a series of gas circuit-breakers for installation indoors. Consult installation instruction manual 647027 for the electrical specifications. Please contact ABB if special installation requirements are involved.

Regulatory framework

HD4-HXA circuit-breakers conform to IEC 62271-100 Standards and to those in force in the major industrialized countries.
2. How to handle the Retrofit kit

2.1 Packing and transport
The circuit-breaker is shipped in special packing, in the open position and with the spring discharged. Each piece of apparatus is protected by a plastic cover to prevent water from infiltrating during the loading and unloading stages and to keep the dust off during storage.

2.2 Checking on receipt
Before proceeding with any operation, always make sure that the spring of the operating mechanism is discharged and that the apparatus is in the open position.

As soon as the equipment arrives, check the condition of the apparatus, that the packing is undamaged and that the nameplate data (see fig. 2) correspond to the information in the order confirmation and shipping note. Also make sure that all the materials described in the shipping note are included in the supply.
If you discover any damage or discrepancy once the equipment has been unpacked, notify ABB (directly or through the agent or supplier) as soon as possible and in any case within five days of receipt.
The apparatus is only supplied with the accessories specified at the time of ordering and validated in the order confirmation sent by ABB.
The following documents accompany the apparatus when it is shipped:
- instruction manual (this document).
- test certificate
- identification label
- copy of the shipping documents
- circuit diagram.
Other documents, sent prior to shipment of the apparatus, are:
- order confirmation
- original shipping notification
- drawings or documents referring to special configurations/conditions (if applicable).

2.3 Storage
When the apparatus must be stored for a certain period of time, our workshops can (on request) provide packing to suit the specified storage conditions.
On receipt the apparatus must be carefully unpacked and checked as described in Checking on receipt (chap. 2.2).
If the apparatus cannot be installed immediately, it must be re-packed in its original packing materials.
Insert at least one standard packet of hygroscopic substance per piece of apparatus inside the packing.
If the original packing is no longer available and the apparatus cannot be installed immediately, it should be stored indoors in a well-ventilated, dry, dust-free, non-corrosive place, well away from any easily flammable materials and at a temperature between -5 °C and +40 °C. Avoid accidental shocks or positions which stress the structure of the apparatus.
2. How to handle the Retrofit kit

2.4 Handling

Before proceeding with any operation, always make sure that the spring of the operating mechanism is discharged and that the apparatus is in the open position.

Proceed as described below to lift and handle the circuit-breaker (fig. 3):
- use lifting equipment (not supplied) with ropes and safety hooks (fig. 4)
- insert the hooks into the eyebolts fixed to the frame of the circuit-breaker and lift (fig. 5).
- once the operation has terminated (and in any case before putting into service), release the lifting equipment and remove the eyebolts from the frame.

When handling the apparatus, take great care to prevent the insulating parts and terminals of the circuit-breaker from being stressed.

Before carrying out any operation, always make sure that the springs of the operating mechanism are discharged and that the apparatus is in the open position.

- Use the lifting equipment (Figure 4) to lift and handle the circuit-breaker.
- Screw the lifting tool into the holes in the frame of the circuit-breaker and lift (Figure 6) or harness this as illustrated in (Figure 5), with reference to the lifting notice (Figure 3).
- When the operation has terminated (and in any case before putting into service) remove the lifting tool (Figure 6) or hooks (Figure 5). When handling the apparatus, take great care to prevent the insulating parts and terminals of the circuit-breaker from being stressed.
- The lifting equipment (Figure 4) must be periodically tested, as required by the local laws in force.
Screw the four M12 screws into the base

<table>
<thead>
<tr>
<th>Tecnomovint CODE</th>
<th>Max height mm</th>
<th>Max width mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y376100</td>
<td>1600</td>
<td>1391</td>
</tr>
<tr>
<td>Y200001</td>
<td>1200</td>
<td>1000</td>
</tr>
</tbody>
</table>

Before handling, make sure that the circuit-breaker is fastened by the relative plates.

Do not handle the apparatus by inserting lifting devices directly under it. If this is unavoidable, place the circuit-breaker on a sturdy bearing surface (see Figure 7).
3. Operation of the Retrofit kit

Safety indications

All HD4-HXA-SFAsg circuit-breakers provide at least the IP2X degree of protection when installed in switchgear. In these conditions the operator is absolutely protected against accidental contact with moving parts. Pay great attention to moving parts if mechanical operations must be performed when the circuit-breaker is outside the switchgear. If the operations are obstructed in any way, do not force the mechanical interlocks but check that the operating sequence is correct.

The circuit-breaker must be racked in and out of the switchgear in a gradual way so as to avoid shocks that could deform the mechanical interlocks.

3.1 Preliminary operations

Clean the insulating parts with a clean, dry cloth. Make sure that the upper and lower terminals are clean and free from deformation caused by shocks received during transport or storage.

3.2 Installation of HD4-HXA SFAsg Retrofit kit in the switchgear

Consult the technical documentation of the switchgear for instructions about how to install the circuit-breaker. When the circuit-breaker has reached the isolated for test position, the switchgear can be considered isolated. Before putting into service, you are advised to load the breaker operating mechanisms in the manual mode so as to prevent the auxiliary supply circuit from being overloaded.

3.3 Switching and signaling devices of HD4-HXA breaker for operations (see Figure 8)

Consult installation and operating manual 647027 (sect.5) for instructions about how to operate the circuit-breaker.
The sequence of operations for racking the circuit-breaker in and out of the switchgear is described below.

Make sure that the installation room (available space, divisions and ambient) is suitable for the electrical apparatus.

Check that all the installation, putting into service and maintenance operations are carried out by qualified personnel with suitable knowledge of the apparatus.

Make sure that the standards and laws in force are complied with when the apparatus is installed and put into service, and that the rules of good workmanship and safety in the workplace are applied.

Check that the rated values of the apparatus are not exceeded during service.

3.4 Description of racking-in/out operations

3.4.1 Circuit-breaker racking-in to switchgear

Initial condition
Switchgear with door closed, circuit-breaker open and outside switchgear

Sequence of operations
– Open door of switchgear.
– Set the circuit-breaker racking-in/out plate in position.
– Move circuit-breaker to test position inside switchgear in the manual mode
– Connect the auxiliary contact socket.
– Switch fail-safe device from position 2 “Unlocked” to position 1 “Locked” (see figure 9)
– Remove racking-in/out plate from circuit-breaker.
– Close circuit-breaker door.
– Set circuit-breaker to service position using:
  - the manual device for racking-out the circuit-breaker with the door closed (574250)
  - the motor-operated TruckMaster device (1VCS016729)
– Close circuit-breaker by means of the remote control.

3.4.2 Circuit-breaker racking-out of switchgear

Initial condition
Circuit-breaker closed, in service position with door closed.

Sequence of operations
– Open circuit-breaker with the remote control
– Rack-out circuit-breaker to test position using:
  - the manual device for racking-out the circuit-breaker with the door closed (574250)
  - the motor-operated TruckMaster device (1VCS016729)
– Open door of switchgear.
– Set the circuit-breaker racking-in/out plate in position.
– Disconnect the auxiliary contact socket.
– Unlock the fail-safe device by moving the lever from position 1 “Locked” to position 2 “Unlocked” (see figure 10)
– Remove circuit-breaker from switchgear in the manual mode.
– Remove racking-in/out plate from circuit-breaker.
– Close door of switchgear.

The circuit-breaker must be gradually racked-in and out to avoid shocks that could deform the mechanical interlocks and limit switches.

If the operations are obstructed in any way or difficult to perform, do not apply force but check that the operating sequence is correct.

**WARNING!**
Racking-in and out must always be performed with the circuit-breaker open. Before proceeding with any of the operations, position the special racking-in/out plate in front of the enclosure or fixed part (if necessary) and position the circuit-breaker correctly on the plate guides.
4. Overall dimensions of HD4-HXA-SFAsg Retrofit

HD4-HX-SFAsg withdrawable circuit-breakers for UniVer/G12

Fig. 11

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN Retrofit overall dimensions</td>
<td>1VCS010600.R0000</td>
</tr>
<tr>
<td>Retrofit assembly</td>
<td>1VCS010610.G0000</td>
</tr>
<tr>
<td>Circuit diagram</td>
<td>1VCS010723.R0000</td>
</tr>
<tr>
<td>Fixed rating</td>
<td>17.12.40</td>
</tr>
<tr>
<td>Retrofit rating</td>
<td>17.12.40</td>
</tr>
<tr>
<td>Switchgear</td>
<td>UniVer G.</td>
</tr>
<tr>
<td>Unlock operation</td>
<td>Door closed pedal</td>
</tr>
<tr>
<td>Weight</td>
<td>235 kg</td>
</tr>
</tbody>
</table>
Fig. 12

TN Retrofit overall dimensions: 1VCS010810.R0000
Retrofit assembly: 1VCS010810.G0000
Fixed TN overall dimensions: TN 7348 pole HXA with radian heads p.250
Circuit diagram: 1VCS010723.R0000
Fixed rating: 17.32.40
Retrofit rating: 17.32.40
Switchgear: Unver G
Unlock operation: Door closed pedal
Weight: 325 kg
5. Electric circuit diagram

Circuit diagram symbols (Standards IEC 60617 and EN 60617)

- **Thermal effect**
- **Electromagnetic effect**
- **Push-button control**
- **Earth (general symbol)**
- **Conductor connection**
- **Terminal or clamp**
- **Socket and plug (female and male)**
- **Resistor (general symbol)**
- **Capacitor (general symbol)**
- **Motor (general symbol)**
- **Rectifier with two half-waves (with bridge)**
- **Break position contact (limit)**
- **Circuit-breaker with automatic opening action**
- **Control coil (general symbol)**
- **Lamp (general symbol)**
- **Make contact**
- **Break contact**
- **Change-over break before make contact**
- **Make position contact (limit)**

![Electric circuit diagram image]
5. Electric circuit diagram

Operating state shown
The diagram illustrates the components in the following conditions:
- circuit-breaker open
- circuits de-energized
- closing springs discharged
- SF₆ gas pressure at rated service value (level A).

Key
☐ = Figure number of the diagram
* = See note indicated by letter
-BER = Device for monitoring continuity of shunt opening release winding (see note E)
-BGB1, -BGB2 = Auxiliary contacts of circuit-breaker
-BGC = Position contact for signaling auxiliary circuit connector connected
-BGD3 = Contact for signaling truckmaster connected to circuit-breaker truck
-BGL/1,...,3 = Position contacts of Fail-Safe device, only activated in Test position
-BGS1 = Limit contact of spring loading motor
-BGS2 = Contact for signaling closing springs loaded
-BGT3 = Position contact operated by circuit-breaker position striker rod
-BGT3/1, 2 = Position contacts activated by pedal striker pin
-BPS = Pressure switch with two trip thresholds:
- tripping due to low gas pressure
Contact 11-12-14 switches, in relation to position shown in diagram, when gas pressure drops from level A to a value below absolute B level. If rated pressure is restored, this same contact changes over again when, starting from a value below level B, the value of level D is reached.
- tripping due to insufficient gas pressure.
Contact 21-22-24 changes over when gas pressure drops from level A to a value below level C. If rated pressure is restored, this contact changes over again when, starting from a value below level C, the value of level B is reached.

-KFI = Integrated circuit for gas pressure control, including:
- PFG = Green led for signaling normal gas pressure
- PFR = Red led for signaling insufficient gas pressure
- PFY = Yellow led for signaling low gas pressure
-KFA1 = Auxiliary relay for duplicating the contacts of pressure switch -BPS, with tripping for low gas pressure
-KFA2 = Auxiliary relay for duplicating the contacts of pressure switch -BPS, with tripping for insufficient gas pressure

QAB = Main circuit-breaker
-SFC = Pushbutton or contact for closing circuit-breaker
-SFO = Pushbutton or contact for opening circuit-breaker
-TB1 = Rectifier for release -MBO1
-RF = Filter (only applicable with 220 VDC power supply voltage)
-RLE1 = Locking magnet on operating mechanism. Mechanically inhibits circuit-breaker closing if de-energized
-XDB = Delivery terminal box of the circuit-breaker circuits
-XDB1 = Connector for circuit-breaker circuits (22 pins)
-XDB2 = Connector for circuit-breaker circuits (22 pins)
-XDB3, ... -XDB62 = Connectors of applications

<table>
<thead>
<tr>
<th>Rated absolute service value [kPa] (A)*</th>
<th>Pressure level [kPa] (B)</th>
<th>Pressure level [kPa] (C)</th>
<th>Pressure level [kPa] (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>380</td>
<td>310</td>
<td>280</td>
<td>340</td>
</tr>
<tr>
<td>430</td>
<td>360</td>
<td>330</td>
<td>390</td>
</tr>
<tr>
<td>480</td>
<td>410</td>
<td>380</td>
<td>440</td>
</tr>
</tbody>
</table>

* Second circuit-breaker rating plate
Description of figures

Fig. 1 = Circuit of motor for loading the closing springs (see note C).
Fig. 2 = Shunt closing release (anti-pumping is obtained mechanically).
Fig. 3 = Locking magnet on operating mechanism. Mechanically inhibits circuit-breaker closing if de-energized.
Fig. 7 = Circuit of shunt opening release with continuous monitoring of the winding (see note E).
Fig. 9 = Circuit of second shunt opening release with continuous monitoring of the winding (see note E).
Fig. 14 = Integrated gas pressure monitoring circuit. Includes:
- tripping due to insufficient gas pressure with circuit-breaker opening and closing locked by means of auxiliary contacts of relay -KFA2 (install locking magnet of fig. 3)
- 3 leds for local signaling of normal, low and insufficient gas pressure.
- contacts for remote signaling of normal, low and insufficient gas pressure.
Consult key for tripping values of pressure switch -BPS.
Fig. 22 = Contact for electrical signaling of springs loaded.
Fig. 30 = Position contacts for truckmaster.
Fig. 32 = Available auxiliary contacts of circuit-breaker.

Notes

A) The circuit-breaker comes equipped solely with the specific applications in the order confirmation. Consult the catalog of the device for instructions about how to make out the order.
C) Check power of auxiliary circuit to find out whether several motors for loading the closing springs can operate at the same time. To prevent excessive power consumption, the springs must be loaded by hand before the auxiliary circuit is powered.
E) The circuit for monitoring the continuity of the release winding must only be used for that purpose. With a power supply of less than 220 V, connect the ABB SACE “Control Coil Continuity” device or a relay or signaling lamp which absorbs a current of not more than 20 mA. With a power supply of 220 V or more, connect a relay or signaling lamp which absorbs a current of not more than 10 mA. Other uses compromise the soundness of the release.

6. Inspection schedule

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Intervals</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perform five mechanical closing and opening operations.</td>
<td>Once a year</td>
</tr>
<tr>
<td>2</td>
<td>Visual inspection of the poles (resin parts) and all insulating parts.</td>
<td>Once a year or after every 5,000 operations</td>
</tr>
<tr>
<td>3</td>
<td>Visual inspection of operating mechanism and transmission.</td>
<td>Once a year or after every 5,000 operations</td>
</tr>
<tr>
<td>4</td>
<td>Visual inspection of the isolating contacts.</td>
<td>Every 5 years or 5,000 operations</td>
</tr>
<tr>
<td>5</td>
<td>Measurement of insulation resistance.</td>
<td>Every 5 years or 5,000 operations</td>
</tr>
<tr>
<td>6</td>
<td>Checking of interlock operation.</td>
<td>Every 5 years.</td>
</tr>
</tbody>
</table>

Contact the ABB Assistance Service and have the circuit-breaker checked after 10,000 operations or after 10 years in polluted and aggressive environments.