Three-pole, minimum-oil circuit-breakers

Types:
SBS 12.08.20 V/L
SBS 24.08.12 V/L

Instructions for erection and operation

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A DESCRIPTION

1. General

The type SBS minimum-oil circuit-breaker is intended for medium-voltage networks. Fitting flush with the front of the switchboard, it is easy to install. Equipped with plug contacts the breaker can also perform the function of an isolator.

The breaker is designed for indoor installation and conforms to IEC-codes.

1.1 Type designation

Minimum-oil circuit-breaker for indoor installation

Code letter for model

12 Rated voltage
24 in kV

08 Rated current, 800 A

20 Rated breaking current
12 in kA

L Breaker, loose, without interlock
V Breaker, loose, with truck interlock

(Truck-mounted breakers do not include these letters in the type designation)
1.2 Choice of type

SBS 12.08.20 V/L
SBS 24.08.12 V/L

1.3 Breaker solenoids

Circuit-breakers of type SBS can be equipped with the following control solenoids:

Closing solenoid (DC or AC)
for open-circuit current, for remote closing of pre-charged spring operating mechanism of circuit-breakers type SBS

Opening solenoid (DC or AC)
for opening all circuit-breakers type SBS

In the following forms:
- opening solenoid, open-circuit current
- opening solenoid, no delay, closed-circuit current
- opening solenoid, delayed, closed-circuit current
- opening solenoid for current-transformer trip

Locking solenoid
for closed-circuit current, prevents closure of circuit-breakers type SBS

The control solenoids can be fitted in the mechanism compartment of the breaker, either singly or in the following combinations:

<table>
<thead>
<tr>
<th>Combinations for breakers type SBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing solenoid (open-circuit current)</td>
</tr>
<tr>
<td>Opening solenoid (opening-circuit current)</td>
</tr>
<tr>
<td>Opening solenoid (Closed-circuit current)</td>
</tr>
<tr>
<td>Opening solenoid for current-transformer trip</td>
</tr>
<tr>
<td>Locking solenoid</td>
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</table>
2. Technical data

2.1 Electrical data

<table>
<thead>
<tr>
<th>SBS 12.06.20</th>
<th>SBS 24.08.12</th>
<th>Unit</th>
</tr>
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<tbody>
<tr>
<td>10/12</td>
<td>20/24</td>
<td>kV</td>
</tr>
<tr>
<td>800</td>
<td>800</td>
<td>A</td>
</tr>
<tr>
<td>1000</td>
<td>1000</td>
<td>A</td>
</tr>
<tr>
<td>350</td>
<td>500</td>
<td>MVA</td>
</tr>
<tr>
<td>20,2/16,8</td>
<td>14,5/12</td>
<td>kA</td>
</tr>
<tr>
<td>52/43</td>
<td>49/31</td>
<td>kA_{peak}</td>
</tr>
<tr>
<td>20,2</td>
<td>20,2</td>
<td>kA</td>
</tr>
<tr>
<td>75</td>
<td>125</td>
<td>kV_{peak}</td>
</tr>
<tr>
<td>35</td>
<td>55</td>
<td>kV</td>
</tr>
</tbody>
</table>

* without autoreclosure

2.2 Weights

- Weight of breaker (with oil)
  - 232
  - 238 lbs
- 202
  - 210 lbs
- .05
  - .05 cuft

3. Construction

3.1 General

The type SBS circuit-breaker is a front-mounted, three-pole minimum-oil breaker. The load-bearing element for the whole breaker is the operating-mechanism frame. Fixed to this are the support insulators, to which the three breaker poles are bolted. Movement of the actuating shaft incorporated in the operating mechanism assembly is transferred to the three poles individually by way of the actuating rods.
3.3 The breaker pole

The construction of one breaker pole is shown in the section drawing (Fig. 2).

Fig. 2 Construction of breaker pole

The load-bearing element of the breaker pole 5200 is the insulating tube 5300 of glass-fibre reinforced epoxy resin. It carries the two terminal flanges 5301/5305 (bottom and top) which provide the link for the current path between the pole and the busbars, and at the same time enable the breaker chamber 5300 to be mounted on the operating mechanism frame via the moulded-resin support insulators 1101/1501/1601. The operating linkage housing 5400 is attached to the bottom terminal flange 5301. It contains the links needed to actuate the
moving contact rod 5430. The contact rod 5430 has an arcing tip 5431 of erosion-resistant material. The movement of the contact rod 5430 is buffered on opening. The roller contact 5440 is a rotating, low-friction contact which ensures the transfer of current from the bottom terminal flange 5301 via the linkage housing 5400 to the contact rod 5430. The contact holder 5100 is mounted on the top terminal flange 5305 and carries the fixed contact, which comprises a number of contact fingers 5103 arranged as a tulip cluster, and the arcing finger 5110. The interrupting chamber 5200 is also attached to the contact holder 5100 via a spacer tube 5104. At the top is a cap 5002, containing an oil-level indicator 5021 and oil separator 5030.

3.4 The operating mechanism

The circuit-breaker 1000 is equipped with a spring-powered operating mechanism 2000 (Fig. 3 and 4). When combined with a reclosing relay, the mechanism permits the autoreclose cycle "Open-Close-Open", as well as the normal "Close-Open" cycle.

The spring can be charged either manually or with a motor 2400.

Fig. 3: Front view of the operating mechanism of a breaker SBS 12.08.20 V
The spring operating mechanism comprises the following assemblies:

- Interlock 2200
- Spring frame 2300
- Motor drive 2400
- Hand crank assembly 2450
- Auxiliary switch 2500
- Intermediate shaft 2550
- Drive shaft 2600
- Lock 2700
- Control unit assembly 2800
- Tripping device 2900

Fig. 4: Basic diagram of spring operating mechanism
4. Principle

A breaker pole 5000 can be seen in the “Closed position” in Fig. 2 (page 6). The whole live part of the pole is under oil. On opening, the contact rod 5430 is withdrawn very quickly from the contact holder 5100. An arc forms between the moving and fixed contacts, and vaporizes some of the oil. Dividing the interrupting chamber 5200 into cells ensures that the gas bubbles cannot expand and that the area of vaporization is kept very close to the arc. The formation of gas and a vigorous flow of oil cool the arc abruptly and extinguish it quickly. The energy produced on opening is absorbed by the buffer on the contact rod 5430 at the end of the opening movement.

4.1 Switching operation

Energy for actuating the breaker 1000 is provided by the spring operating mechanism 2000 (Fig. 3 and 4). The spring capacity is sufficient for reclosure, for the cycle “Open-Close-Open”. During the switching process, the springs 2306/2307, acting via the chain 2690 and the camdisc 2620, exert an almost constant force on pinion 2623, which meshes with two bevel gears 2610/2651. Bevel gear 2610 is mounted on the end of the shaft and can be turned only when charging the springs 2306/2307 with motor 2401 or crank 1040. Bevel gear 2651 transmits the torque to the drive shaft 2653, which is blocked by cam 2655. The breaker is opened or closed by rotation of the actuating shaft 1150/1550/1650 through about 50° when the cam 2655 on the drive shaft 2653 is released by the holding device (lock 2700). The mechanical linkage to the contact rod 5430 (Fig. 2) is through the cam disc 2660, actuating shaft 1150/1550/1650 and the actuating rods 1103/1503/1603.

4.1.1 Closing

A command to close, by means of the pushbutton 2802 or the solenoid on the control unit 2800, acts on the ratchet bar 2811 (Fig. 4) and releases the pawl 2812 on the control unit spring assembly. This consists of the knuckle joint 2813 and 2814 and the intermediate springs 2815, which cause the lever 2816 to move downwards. The trip rod 2907 disengages the lock 2700. The springs 2306/2307 of the operating mechanism 2000 cause the actuating shaft 1150/1550/1650 to turn by way of drive shaft 2653 and cam disc 2660. The contact rod 5430 (Fig. 2) is thus moved rapidly via a linkage into the “Closed” position. The breaker is closed.

4.1.2 Opening

The closing operation follows the same sequence, starting from the “Open” side “O” of the control unit.
4.2 Control of operating mechanism

4.2.1 Manual charging of spring mechanism

In order to fully charge the spring by hand, the crank handle 1040 (Fig. 4, page 8) has to be turned approx. 75 times.

4.2.2 Motor-driven charging of spring mechanism (see Fig. 4, page 8)

The charging motor 2401 is controlled automatically. It is started by a motor limit switch 2404 as soon as the fully tensioned spring 2305/2307 begins to discharge, and stops again when the spring is once more fully charged.

4.2.3 "Discharged/charged" indicator (see Fig. 4, page 8)

The indication "charged" on plate 2322 appears only when the springs 2305/2307 are charged to the maximum. The indication "discharged" means that the springs can be at a value between maximum tension and fully discharged. It is dangerous to interfere with the operating mechanism or the contacts while the springs are tensioned. First make sure that the springs really are fully discharged. (Procedure for discharging the springs, see Section C Maintenance, para. 1.1.1 General, page 20).

4.2.4 Closing interlock (see Fig. 4, page 8)

The control unit 2800 transmits closing commands only if the springs 2305/2307 are tensioned sufficiently, i.e. the breaker can open again immediately after closing. Closure when the springs are not adequately tensioned is prevented by the interlock device 2200. This acting through linkages, disengages the ratchet bar 2811. Tripping of the closing operation can be blocked voluntarily, for control purposes, by means of the control solenoid 2806 (Fig. 5e, page 11), in which case the ratchet pawl 2811 is disengaged while the coil has no voltage.

4.2.5 Electrical controls (Fig. 5, page 11)

- Closing solenoid DC (Fig. 5a)
- Closing solenoid AC (Fig. 5b)
- Opening solenoid DC and AC (Fig. 5c)
- Second opening solenoid DC and AC (Fig. 5d)
  (or current transf. trip)
- Locking solenoid for closing interlock DC and AC (Fig. 5e)
- Closed-circuit trip DC and AC (Fig. 5f)
4.2.6 Electrical tripping

The tripping devices can be arranged in a variety of ways (see Part A description, para. 1.3 Breaker solenoids, page 3). The solenoid configurations (Fig. 5a, 5b, 5c or 5d) are tripped by current pulses from an auxiliary power source.

The closed-circuit trip (Fig. 5f) responds when the coil has no voltage.

The arrangement of Fig. 5e prevents arbitrary remote operation.

Fig. 5a

Fig. 5b

Fig. 5c

Fig. 5d

Fig. 5e

Fig. 5f

Fig. 5: Coils in control unit
5. Dimension diagrams

5.1 Dimension diagram:

Circuit-breaker type SBS 12,08,20 L
  type SBS 24,08,12 L

with or without
relay linkage assembly

Fig. 6: Three-pole minimum-oil circuit-breaker type SBS
(with relay linkage assembly)
5.2 Dimension diagram:

Circuit-breaker type SBS 12.06.20 V
with truck interlock

Circuit-breaker type SBS 24.06.12 V

Fig. 7: Three-pole minimum-oil circuit-breaker type SBS
(truck-mounted)
Fig. 8: Connection diagrams for three-pole minimum-oil circuit-breakers type SBS

Note: A definitive circuit diagram is supplied with each breaker shipment.
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B  ERECTION AND STARTING OPERATION

1.  Erection

1.1  Installation

The breaker is dispatched in the "Open" position and without oil.

1.1.1  Fixing the breaker

The dimensions of the fixing holes Db (8 holes, approx. dia. .33") are shown in Fig. 6 (page 12)

1.1.2  Electrical connections

1.1.2.1  Power leads

- Breakers without primary relays
  Connect to top terminal bracket 5305 and bottom terminal bracket 5301

- Breakers with primary relays
  Connect to primary-relay terminal stud and bottom terminal bracket 5301

1.1.2.2  Control lines

- Connect to terminal block according to circuit diagram supplied

1.1.2.3  Earthing the breaker

- For circuit-breakers
  type SBS 12.08.20 L
  SBS 24.08.12 L
  Connect to yellow earthing screw 1036 at rear on operating mechanism assembly

- For circuit-breakers
  type SBS 12.08.20 V
  SBS 24.08.12 V
  The breaker is earthed through the sliding contact Ge 1 located on the truck (see Fig. 7, page 13)

Fig. 9: Earthing screw on circuit-breaker (type L)
2. Starting operation

2.1 Filling with oil

For reasons of transport the breakers are supplied without oil. The oil can either be supplied separately or obtained by the customer himself.

**WARNING:** Do not operate the breaker without oil, as there is then no vapourization of oil and the breaker can suffer mechanical damage on opening.

- Before starting operation, fill all three breaker poles with oil.
- Fill at cap 5002 after removing screw plug 5001.
- Slowly fill oil up to the middle of the oil sightglass 5021 (with oil temperature approx. 20° C = approx. 68° F). The oil level must be lower at low temperatures, and higher at high temperatures.

**Correction:** approx. 1 mm per 2° C (approx. .04" per 35,6°F)

**Quantity of oil:** approx. 1.75 lt per interrupting chamber (approx. .06 cuft)

**Oil specification:** see "Part C Maintenance, para. 3.2 Insulating oil", page 31

2.2 Function checks

- Check operation in response to electrical tripping command
- Closing solenoid 2803/2804
- Opening solenoids 2805/2807
- Closed-circuit trip 2806
- Execute CLOSE-OPEN (CO) cycle
  OPEN-CLOSE-OPEN (O-CO) cycle (if required)
- Operate motor drive to ensure correct functioning (tensioning springs 2306/2307)

- Operate breaker mechanically (by means of pushbuttons 2801/2802 on control unit 2800)
- Execute CLOSE-OPEN (CO) cycle
  OPEN-CLOSE-OPEN (O-CO) cycle (if required)

- Check any primary relays for correct setting according to instructions. The breaker can be taken into operation if all switching operations can be carried out faultlessly.
C MAINTENANCE

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1. Maintenance instructions

1.1 Regular maintenance

1.1.1 General

Maintenance must not be carried out unless the breaker is dead and the springs 2306/2307 are discharged. The motor drive 2400 must therefore be disconnected to make sure the springs are not automatically tensioned enough to operate the contact rod 3 times. This is done by disconnecting the control circuit, or better by removing the control lines from terminal 1.

By pressing the pushbuttons "Open" and "Close", discharge the springs by 2 contact rod movements so that the remaining movement will open the breaker.

The spring position is then as shown in Fig. 10. Place a piece of wood with approximate dimensions of 70 x 70 x 250 mm (approx. 2.75" x 2.75" x 9.84") on the spring plate of the spring frame.

Fig. 10

Then execute the last "Open" operation. The spring plate must bear on the inserted block of wood so that the springs are not discharged completely (see Fig. 11).

Fig. 11
1.1.2 Six-monthly checks

- Check oil level.
  The oil level can be checked through the sightglass 5021 on each breaker pole.
  If the level has fallen, oil must be added (see Part B Erection and starting operation, para. 2.1 Filling with oil, page 17) until the level comes up to the specified mark.

  **Note**
  Very dirty oil, or oil which no longer attains a breakdown strength of \( \leq 15 \text{ kV}_{\text{rms}} \) in the test arrangement according to IEC Publication 156 (electrode diameter 12.5 - 13.0 mm, (approx. .49\" - .51\") electrode gap 2.5 mm = approx. .10\"), must be changed.

- Check the arcing contacts
  - Arcing finger assembly 5110
  - Contact rod 5430
  arcing contacts
  Erosion of the arcing contacts depends mainly on the breaking capacity and frequency of operation.

  **Recommended values**
  - mechanical operations approx. 10 000
  - operations at rated current approx. 1 000
  - short-circuit operations approx. 5
  Heavily fouled oil which does not reach the value stated above (\( \leq 15 \text{ kV}_{\text{rms}} \)) must be changed.
<table>
<thead>
<tr>
<th>Contact rod 5430</th>
<th>Arcing finger 5110</th>
</tr>
</thead>
</table>

![Diagram showing contact rod and arcing finger](image)

Fig. 13: Guidance values for maximum permissible erosion of arcing contacts

- **Check interrupting chamber.**
  
The interrupting chamber 5200 must be changed if erosion of the bore exceeds 2 mm = approx. .08" (symmetrical or eccentric erosion).

1.1.3 **Dismantling procedure for checking arcing contacts and interrupting chamber**
(see Fig. 15, page 35 and Fig. 25, page 47)
- Discharge the operating mechanism (see para 1.1.1 General, page 20).
- Unscrew drain plugs 5401 from the 3 poles 5000, and drain off oil.
- Undo 4 screws 5005 and take off cap 5002.
- Set breaker poles 5000 to the "Closed" position so that the contact rods are accessible. To do this, disconnect the actuating rods 1103/1503/1603.

**WARNING**  
The settings of the actuating rods 1103/1503/1603 must not be altered. Secure the hexagon adjusting bushes 1057 at either end of the actuating rods with adhesive tape to stop them falling out.

The arcing contacts and the interrupting chamber can then be inspected.
Changing the contact parts and the interrupting chamber:

If the parts of the contacts have to be replaced, the procedure is as follows:

- Remove housing assembly 5400 (undo 4 screws 5000)

The following parts must be changed:
- Contact rod 5430
- Interrupting chamber assembly 5200
- Anvil finger assembly 5110
- Compression spring 5105 if necessary
- Bracket 5121 if necessary
- Contact finger 5103 if necessary
- Spring 5102 if necessary
- Roller contact ass. 5440 if necessary
- Ring seal 78.97 mm x 3.53 mm G 75 (top)
- Ring seal 78.97 mm x 3.53 mm G 75 (bottom)

- Before cleaning the cap 5002 with cleaning agent, unscrew the oil level sightglass, and screw back after cleaning.

- After the parts have been changed, screw on cap 5002 and housing assembly 5400, and reconnect actuating rods 1103/1503/1603.

Check travel

- After assembling, check the contact rod gap with the tool 0100 supplied.

- To do this, plug 5001 must be removed

- The gap of contact rod 5430 is correct when the "red marker groove" is flush with the top edge of cap 5002.
1.2 Parts subject to wear

Parts subject to wear are those components which need to be replaced periodically, depending on the mechanical and electrical stresses (switching operations at rated current or on short circuits).

<table>
<thead>
<tr>
<th>Part no</th>
<th>Parts subject to wear</th>
<th>No./breaker</th>
<th>Remarks</th>
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<tr>
<td>5430</td>
<td>Contact rod</td>
<td>3</td>
<td>Replace if eroded electrically or worn mechanically</td>
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<td>5200</td>
<td>Interrupting chamber ass.</td>
<td>3</td>
<td></td>
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<td>5110</td>
<td>Arcing finger assembly</td>
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<td>5105</td>
<td>Compression spring</td>
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<td>Bracket</td>
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<td>5103</td>
<td>Contact finger</td>
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<td>5102</td>
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<td>15</td>
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<td>5440</td>
<td>Roller contact assembly</td>
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<td>5003</td>
<td>Ring seal 78,97 mm x 3,53 mm G 75 (top)</td>
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<td>Renew each time removed</td>
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<td>5008</td>
<td>Ring seal 78,97 mm x 3,53 mm G 75 (bottom)</td>
<td>3</td>
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1.3 Overhauls (Summary)

1.3.1 General

Overhauls are required only at long intervals. The time between overhauls depends on the frequency of operation and regular maintenance.

1.3.2 Recommended times between overhauls

**Overhaul A**
- After 5 short-circuit operations
- Procedure as para. 1.4.1

**Overhaul B**
- After each thousand operations at rated current
- Procedure as para.1.4.1

24
Overhaul C
- After each 10,000 operations (mechanical)
- Procedure as para. 1.4.1
- General check of - breaker pole
  - operating mechanism
  - screwed joints
  - electrical connections
    (power leads and control lines)

Note: In the case of mixed loadings (elect. and mach.) the times between overhauls should be shortened accordingly.

1.4 Overhaul procedures

1.4.1 Overhaul procedures on breaker pole

Replacement of:
- Arcing contacts and interrupting chamber

Procedure:
- Discharge the operating mechanism (see Part C. Maintenance, para. 1.1.1 General, page 20).
- In addition to cap 5002, remove also housing assembly 5400 (undo the 4 screws 5005 on each pole) and renew ring seals 5003/5008 afterwards.

The following parts must be changed:
- Contact finger 5103
- Spring 5102
- Arcing finger ass. 5110
- Compression spring 5105
- Bracket 5121
- Contact rod 5430
- Interrupting chamber ass. 5200
- Roller contact ass. 5440
- Ring seal 78.97 mm x 3.53 mm G 75 (top) 5003
- Ring seal 78.97 mm x 3.53 mm G 75 (bottom) 5008

Set breaker poles to the "Closed" position so that the contact rods are accessible.
To do this, disconnect the actuating rods 1103/1503/1603.

WARNING: The settings of the actuating rods 1103/1503/1603 must not be altered. Secure the hexagon adjusting bushes 1057 at either end of the actuating rods with adhesive tape to stop them falling out.
After the parts have been changed, screw on cap 5002 and housing assembly 5400, and reconnect actuating rods 1103/1503/1603.

1.4.2 Adjusting travel of contact rod

Adjustment procedure

- Set the breaker 1000 to the "Closed" position.
- Remove plug 5001 and insert tool 0100 into oil filler hole.
- To correct the contact rod travel (the red ring on the shaft of the tool 0100 denotes the tolerance), adjust the actuating rod 1103/1503/1603 by turning the adjusting bush 1057 on the arm linking the pole and the actuating shaft. The gap of contact rod 5430 is correct when the "red marker groove" is flush with the top edge of cap 5002.
- Adjust contact rod travel on all three breaker poles.
- Take out tool 0100 and screw back plug 5001.
## 1.5 Parts for renewal on overhaul

The parts stated in the following list must be changed when overhauls are carried out. Some parts have to be replaced simply in order to ensure reliable operation until the next overhaul.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Parts for replacement</th>
<th>no. per breaker</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5430</td>
<td>Contact rod</td>
<td>3</td>
<td>Overhaul A or B</td>
</tr>
<tr>
<td>5200</td>
<td>Interrupting chamber ass.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5110</td>
<td>Arcing finger assembly</td>
<td>3</td>
<td>Replace if eroded electrically or worn</td>
</tr>
<tr>
<td>5105</td>
<td>Compression spring</td>
<td>3</td>
<td>mechanically</td>
</tr>
<tr>
<td>5121</td>
<td>Bracket</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5103</td>
<td>Contact finger</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5102</td>
<td>Spring</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5440</td>
<td>Roller contact assembly</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5003</td>
<td>Ring seal 78.97 mm x 3.53 mm G 75 (top)</td>
<td>3</td>
<td>Renew each time removed</td>
</tr>
<tr>
<td>5008</td>
<td>Ring seal 78.97 mm x 3.53 mm G 75 (bottom)</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### On breaker pole.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Parts for replacement</th>
<th>no. per breaker</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5430</td>
<td>Contact rod</td>
<td>3</td>
<td>Overhaul C</td>
</tr>
<tr>
<td>5200</td>
<td>Interrupting chamber</td>
<td>3</td>
<td>Replace if eroded electrically or worn</td>
</tr>
<tr>
<td>5110</td>
<td>Arcing finger assembly</td>
<td>3</td>
<td>mechanically</td>
</tr>
<tr>
<td>5105</td>
<td>Compression spring</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5121</td>
<td>Bracket</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5103</td>
<td>Contact finger</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5102</td>
<td>Spring</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5440</td>
<td>Roller contact</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5003</td>
<td>Ring seal 78.97 mm x 3.53 mm G 75 (top)</td>
<td>3</td>
<td>Renew each time removed</td>
</tr>
<tr>
<td>5008</td>
<td>Ring seal 78.97 mm x 3.53 mm G 75 (bottom)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5464</td>
<td>Roller</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5465</td>
<td>Spiral locking pin 2 x 20 mm</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>5465</td>
<td>Washer</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>5440</td>
<td>Wiper assembly</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
1.6 List of reserve parts

Reserve parts are components which are not necessary for ordinary regular maintenance, but should be kept available in case of unforeseen events. We recommend that these parts should be acquired.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Reserve parts</th>
<th>No. per breaker</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1103</td>
<td>Contact rod for SBS 12, 08, 20 p = 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1503</td>
<td>Contact rod for SBS 24, 08, 12 p = 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1603</td>
<td>Contact rod for SBS 24, 08, 12 p = 275</td>
<td>3 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>For operating mechanism</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Bevel gear assembly</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2706</td>
<td>Tension spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2570</td>
<td>Intermediate shaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2559</td>
<td>Coil tension spring</td>
<td>2</td>
<td>with 1 to 20 breakers</td>
</tr>
<tr>
<td>2559</td>
<td>Buffer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2400</td>
<td>Motor drive</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2401 *</td>
<td>Motor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2402 *</td>
<td>Pinion</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2403 *</td>
<td>Locking pin CS 2.5 x 14 mm</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Trip coils:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2803</td>
<td>Closing solenoid (DC)</td>
<td>1</td>
<td>Specify rated voltage</td>
</tr>
<tr>
<td>2804</td>
<td>Closing solenoid (AC)</td>
<td>1</td>
<td>when ordering</td>
</tr>
<tr>
<td>2805</td>
<td>Opening solenoid (DC and AC)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2807</td>
<td>2nd opening solenoid (DC and AC)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2808</td>
<td>Closed-cir. current trip (DC and AC)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2806</td>
<td>Locking solenoid (DC and AC)</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

* Components installed together
2. Function checks

2.1 Mechanical tests

- Operate breaker by electrical control signal
  - Closing solenoid
  - Opening solenoid
  - Closed-circuit current trip
  - Perform switching cycle: CLOSE - OPEN - (CO)
  - OPEN CLOSE - OPEN (O-CO)
    (if required)

- Operate breaker mechanically (with pushbuttons on control unit)
  - Perform switching cycle: CLOSE - OPEN - (CO)
  - OPEN - CLOSE - OPEN (O - CO)
    (if required)

- Check any primary relays for correct setting according to instructions. The breaker can be taken into service if all switching operations can be carried out faultlessly.

3. Lubrication

Once a year or after 1000 switching operations, the operating mechanism of the breaker must be lubricated with oil "Schmieröl spez. 2" or Mo 52 - Paste 1. The mechanism in the interrupting chamber assembly 5000 need not be lubricated, as the whole mechanism is under oil. All oil holes marked red (on the control unit), linkages, roller bearings, ball bearings and gear wheels must be lubricated with the oil stated above, in accordance with the lubrication diagram in Fig. 14 (page 32).

3.1 Lubricants

Lubricating oil "Schmieröl spez. 2"
Brown Boveri designation: Schmieröl spez. 2 to NBT 402604 P1

Molykote Paste Rapid
Brown Boveri designation: Mo 52 - Paste 1 to NBT 402450 P1

Remarks
Former designations for oil Schmieröl spez. 2:
- Graphite oil: BBC 909
- Graphite oil: LM 2 g

Oil "spez. 2" is a mixture of oil "spez. 4" (suspension of graphite in oil) and oil S 15/1.
Oil "spec. 4" is a dispersion of 10% colloidal graphite in oil. The platelet-shaped particles of the colloidal graphite are smaller than 1 μm.

**Acceptable branded product:** Oildag colloidal graphite in oil
**Supplier:** Acheson Colloids Ltd., Prince Rock,

Oil S 15/1 is ordinary mineral oil with no special additives. Resistance to oxidation is low.

**Acceptable branded product:**
1) Carnea 21
2) Energol SR 24
**Supplier:**
1) Shell
2) BP

**Instructions for preparing oil "spec. 2"**

**Mixing ratio:**
- 5% oil "spec. 4" and
- 95% oil S 15/1

Put the mineral oil in an open container. Shake the "Oildag" well before use and then add it slowly to the mineral oil in a thin stream, stirring all the time. Stir the mixture thoroughly for 5 minutes, and then pour at once into smallish bottles. Fill the bottles only two-thirds full so that the dispersion mixes well when shaken.

**THE SPECIAL LUBRICATING PROPERTIES OF THIS OIL MIXTURE ARE OBTAINED ONLY IF THESE INSTRUCTIONS ARE FOLLOWED EXACTLY**
3.2 Insulating oil

General
The insulating oils used for the breaker poles must be clean, new mineral-based oils. They must not contain any free water or any non-oil additives except for an oxidation inhibitor. The only oxidation inhibitor permitted is di-tertiary-butyl-paracresol (DBPC) in a maximum concentration of 0.3% by weight.

The oil is required to have the properties listed below:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Unit</th>
<th>Test Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at 20°C (approx. 68°F)</td>
<td>.890(.03)</td>
<td>g/cm³ (lbs/cubic inch)</td>
<td>SNV 81109/ASTM 1298-55</td>
</tr>
<tr>
<td>Flash point (Pensky-Martens)</td>
<td>130 (266)</td>
<td>°C (°F)</td>
<td>closed cup, test as per SNV 81110/ASTM D 93</td>
</tr>
<tr>
<td>Pour point</td>
<td>-30 (-22)</td>
<td>°C (°F)</td>
<td>SNV 81107/ASTM D 97-57</td>
</tr>
<tr>
<td>Viscosity at 20°C (approx. 68°F)</td>
<td>35 (.0004)</td>
<td>cSt (sft/sec)</td>
<td>SNV 81057/ASTM D 445-61</td>
</tr>
<tr>
<td>Acidity</td>
<td>.03 (.00031)</td>
<td>mg KOH/g</td>
<td>SNV 81103/ASTM D 974-58T or ASTM D 864-58</td>
</tr>
<tr>
<td>Test for corrosive sulphur</td>
<td>negative</td>
<td></td>
<td>SEV Publication 0124.1960/ASTM D 1275-58</td>
</tr>
<tr>
<td>Breakdown strength</td>
<td>50*</td>
<td>kV/2.5 mm</td>
<td>IEC Publ. 156</td>
</tr>
</tbody>
</table>

* If the oil does not reach this value in its condition on delivery, it must be filtered and, if necessary, dried.

Valid conditions
The values above apply only to oils for breakers for an ambient temperature of -15 to +40°C (approx. 5°F to 104°F). Special guidelines apply for higher or lower temperatures.
## D PARTS LISTS

### Contents

<table>
<thead>
<tr>
<th>Sub-assembly code numbers</th>
<th>Page</th>
</tr>
</thead>
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<td>34</td>
</tr>
<tr>
<td>1100 Breaker (complete) type SBS 12,08,20 with p = 200</td>
<td>34</td>
</tr>
<tr>
<td>1500 Breaker (complete) type SBS 24,08,12 with p = 200</td>
<td>34</td>
</tr>
<tr>
<td>1600 Breaker (complete) type SBS 24,08,12 with p = 275</td>
<td>34</td>
</tr>
<tr>
<td>0000 Special tools</td>
<td>37</td>
</tr>
<tr>
<td>0100 Measuring tool</td>
<td>37</td>
</tr>
<tr>
<td>2000 Operating mechanism and control unit</td>
<td>38</td>
</tr>
<tr>
<td>2200 Interlock</td>
<td>38</td>
</tr>
<tr>
<td>2300 Spring frame</td>
<td>39</td>
</tr>
<tr>
<td>2400 Motor drive</td>
<td>40</td>
</tr>
<tr>
<td>2450 Hand crank assembly</td>
<td>40</td>
</tr>
<tr>
<td>2500 Auxiliary switch</td>
<td>41</td>
</tr>
<tr>
<td>2550 Intermediate shaft assembly</td>
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<tr>
<td>2600 Drive shaft</td>
<td>42</td>
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<tr>
<td>2700 Lock</td>
<td>44</td>
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<tr>
<td>2800 Control unit assembly</td>
<td>45</td>
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<tr>
<td>2900 Tripping device</td>
<td>45</td>
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<tr>
<td>5000 Breaker pole complete</td>
<td>45</td>
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<tr>
<td>5100 Contact holder assembly</td>
<td>46</td>
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<tr>
<td>5200 Interrupting chamber assembly</td>
<td>46</td>
</tr>
<tr>
<td>5300 Insulating tube assembly</td>
<td>46</td>
</tr>
<tr>
<td>5400 Housing assembly</td>
<td>46</td>
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<tr>
<td>9000 Breaker accessories</td>
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<td>9100 Relay holder</td>
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<td>9200 Relay linkage assembly</td>
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<td>9500 Interlock unit</td>
<td>52</td>
</tr>
<tr>
<td>9600 Interlock actuating mechanism</td>
<td>55</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>Socket-head screw M8 x 20 mm steel 8.8</td>
<td>1040</td>
<td>Crank handle</td>
</tr>
<tr>
<td>1002</td>
<td>Hex lock nut M8 steel 6 cold gal.</td>
<td>1041</td>
<td>Spring washer 6.12 mm spring st. black</td>
</tr>
<tr>
<td>1003</td>
<td>Lock washer 9/18 mm spring st. black</td>
<td>1042</td>
<td>Indicator rod</td>
</tr>
<tr>
<td>1005</td>
<td>Washer T large 17/39 mm st. cold gal.</td>
<td>1051</td>
<td>Bearing bush</td>
</tr>
<tr>
<td>1006</td>
<td>Lock washer 17/34 mm spring st. black</td>
<td>1052</td>
<td>Washer</td>
</tr>
<tr>
<td>1007</td>
<td>Socket-head screw M6 x 20 st. 6.8</td>
<td>1053</td>
<td>Circlip A 12 mm spring st.</td>
</tr>
<tr>
<td>1008</td>
<td>Hex lock nut M8 st. cold gal.</td>
<td>1054</td>
<td>Bracket</td>
</tr>
<tr>
<td>1009</td>
<td>Lock washer 9/18 mm spring st. black</td>
<td>1055</td>
<td>Spring washer 6 mm wire spring st. nickeled</td>
</tr>
<tr>
<td>1011</td>
<td>Washer Z 10.5/18 mm st. cold gal.</td>
<td>1056</td>
<td>Washer T large 10.5/26 mm st. hot gal.</td>
</tr>
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<td>1012</td>
<td>Spilt pin A 3 x 25 mm st.</td>
<td>1057</td>
<td>Adjusting bush</td>
</tr>
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<td>Tension spring with eye</td>
<td></td>
<td></td>
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<tr>
<td>1014</td>
<td>Socket-head screw M8 x 20 mm st. 8.8</td>
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<td></td>
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<tr>
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<td>Hex lock nut M8 st. cold gal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1016</td>
<td>Lock washer 9/18 mm spring st. black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1017</td>
<td>Nyloc nut M6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1018</td>
<td>Hex screw M6 x 20 mm st. cold gal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1019</td>
<td>Lock washer 6.4/14 mm spring st. black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1021</td>
<td>Bearing bracket</td>
<td>1101</td>
<td>Support insulator P 12/750</td>
</tr>
<tr>
<td>1022</td>
<td>Spring washer 3.5 mm wire spring st. nickeled</td>
<td>1102</td>
<td>Frame</td>
</tr>
<tr>
<td>1023</td>
<td>Nyloc nut M6</td>
<td>1103</td>
<td>Actuating rod</td>
</tr>
<tr>
<td>1024</td>
<td>Hex screw M6 x 20 mm st. cold gal.</td>
<td>1104</td>
<td>Socket head screw M16 x 40 mm</td>
</tr>
<tr>
<td>1025</td>
<td>Lock washer 6.4/14 mm spring st. black</td>
<td>1150</td>
<td>Actuating shaft p 200</td>
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<tr>
<td>1026</td>
<td>Orifice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1027</td>
<td>Strap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1031</td>
<td>Hex screw M26 x 45 mm st. cold gal.</td>
<td>1550</td>
<td>Actuating shaft p 200</td>
</tr>
<tr>
<td>1032</td>
<td>Lock washer 17/34 mm spring st. black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1033</td>
<td>Washer semi-bright 17/34 mm st. cold gal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1034</td>
<td>Hex nut 0.8 d M16 st. cold gal.</td>
<td>1601</td>
<td>Supp</td>
</tr>
<tr>
<td>1035</td>
<td>Stud M12 x 40/18/30 mm</td>
<td>1601</td>
<td>Support insulator P 24/750</td>
</tr>
<tr>
<td>1036</td>
<td>Hex nut 0.8 d M12 st. cold gal.</td>
<td>1602</td>
<td>Frame</td>
</tr>
<tr>
<td>1037</td>
<td>Lock washer 14/28 mm spring st. black</td>
<td>1603</td>
<td>Actuating rod</td>
</tr>
<tr>
<td>1038</td>
<td>Hex screw M12 x 35 mm st. cold gal.</td>
<td>1604</td>
<td>Socket-head screw M16 x 90 mm</td>
</tr>
<tr>
<td>1039</td>
<td>Washer semi-bright 13/24 mm st. cold gal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td>Breaker (complete) type SBS 24.08.12 with p = 275</td>
<td>1650</td>
<td>Actuating shaft p 275</td>
</tr>
</tbody>
</table>
1150/1550  Actuating shaft p 200
1151/1551  Bush assembly
1152/1552  Radial grooved ball bearing 6006 zz st.
1153/1553  Circlip A 30 mm spring st.
1154/1554  Locking pin CS 8 x 60 mm spring st.
1155/1555  Locking pin CS 5 x 40 mm spring st.
1156/1556  Locking pin CS 8 x 40 mm spring st.
1160/1560  Shaft assembly p 200

1650  Actuating shaft p 275
1651  Bush assembly
1652  Radial grooved ball bearing 6006 zz st.
1653  Circlip A 30 mm spring st.
1654  Locking pin CS 8 x 60 mm spring st.
1655  Locking pin CS 5 x 40 mm spring st.
1656  Locking pin CS 8 x 40 mm spring st.
1660  Shaft assembly p 275

1150,1550,1650

Fig. 16
0000 Special tools

0100 Measuring tool

0101 Rod dia. 4.5 x 450 mm
0102 Retaining screw
0103 Spring ring 3.1 mm st. wire hard

0110 Tube complete

Fig. 17
2200 Interlock

- 2201 Spring washer 3.5 mm spring st. wire nickeled
- 2202 Indicator rod
- 2210 Interlock shaft assembly
- 2221 Lock washer BE 7 mm
- 2222 Lock washer BE 7 mm
- 2223 Spring washer 10 mm spring st. wire nickeled
- 2224 Spring washer 3.5 mm spring st. wire nickeled
- 2225 Lock washer 5.3/12 mm

- 2226 Hex nut 0.8 d M5
- 2227 Nyloc nut M5
- 2228 Blocking rod
- 2229 Spring washer 3.5 mm spring st. wire nickeled
- 2231 Spring washer 10 mm spring st. wire nickeled
- 2232 Interlock rod
- 2233 Nyloc nut M5
- 2234 Lock washer 5.3/12 mm
- 2235 Guide

Fig. 18
Spring frame

2301 Top plate
2302 Hex nut 0.8 d M6 st. cold gal.
2303 Lock washer 9/18 mm spring st. black
2304 Chain holder
2305 Dish spring
2306 Cyl. compression spring
2307 Cyl. compression spring
2308 Indicator plate (I/O)
2309 Circlip A 10 mm spring st.
2311 Pin
2312 Spring frame

2313 Guide wheel
2314 Circlip A 10 mm spring st
2315 Hex nut 0.8 d M6
2316 Lock washer 6.4/14 mm spring st. black
2317 Hex screw M6 x 16 mm
2318 Hex nut 0.5 d M8
2319 Lock washer 8.4/18 mm spring st. black
2321 Hex screw M8 x 16 mm
2322 Indicator plate (charged/ discharged)

Fig. 10
2400 Motor drive

2401 Motor
2402 Pinion

2403 Locking pin CS 2.5 x 14 mm
2404 Motor limit switch

2450 Hand crank assembly

2451 Circlip A 18 mm spring st.
2452 Split pin A 2 x 10 mm
2453 Washer semibright 5.3/12 mm st.
cold gal.
2454 Spring washer
2455 Bush assembly
2456 Cyl. compression spring
2457 Stop
2458 Shaft
2459 Circlip A 12 mm spring st.
2460 Bevel gear assembly
2461 Locking pin 4 x 20 mm spring st., block
2485 Angle strap assembly
2462 Locking pin 2.5 x 20 mm spring st.
block
2491 Bush
2463 Bush
2492 Circlip A 16 mm spring st.

Fig. 20
2500 Auxiliary switch

2510 Auxiliary switch, 4-pole
2520 Auxiliary switch, 8-pole

2550 Intermediate shaft assembly

2551 Bevel pinion
2552 Adjusting ring
2553 Key
2554 Bearing bush assembly
2555 Nyloc nut M5
2556 Lock washer 5.3/12 mm
2557 Stud
2558 Cyl. Tension spring
2559 Buffer dia. 4 x 50 mm
2561 Grub screw pointed M 3 x 5 mm
2562 Bearing bush assembly

2570 Intermediate shaft
2571 Shaft
2572 Pawl assembly
2573 Pawl assembly
2574 Circlip A 15 mm spring st.
2575 Gearwheel

Fig. 21
<table>
<thead>
<tr>
<th>Code</th>
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<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>2601</td>
<td>Castle nut 0.8 d 1/2&quot; st. cold gal.</td>
<td>2671</td>
<td>Circlip A 25 mm spring st.</td>
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<tr>
<td>2602</td>
<td>Washer semibright 13.5/28 mm st. cold gal.</td>
<td>2681</td>
<td>Split pin A 1.5 x 10 mm</td>
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<tr>
<td>2603</td>
<td>Spacer ring</td>
<td>2682</td>
<td>Washer semibright 5.3/10 mm</td>
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<tr>
<td>2604</td>
<td>Grooved ball bearing 6004 dusttight st.</td>
<td>2683</td>
<td>Charging rod</td>
</tr>
<tr>
<td>2605</td>
<td>Bush</td>
<td>2690</td>
<td>Roller chain</td>
</tr>
<tr>
<td>2610</td>
<td>Bevel gear assembly</td>
<td>2691</td>
<td>Roller chain 1/4&quot; x 1/4 x 7.75</td>
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<td>2611</td>
<td>Bevel gear</td>
<td>2692</td>
<td>Connecting link with spring clip</td>
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<td>2612</td>
<td>Grooved ball bearing 6004 zgg st.</td>
<td>2695</td>
<td>Hex nut 0.8 d M6</td>
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<td>Circlip I 42 mm spring st.</td>
<td>2696</td>
<td>Lock washer 6.4/14 mm spring st. black</td>
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<td>2620</td>
<td>Chain cam disc assembly</td>
<td>2697</td>
<td>Strap</td>
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<td>2621</td>
<td>Chain cam disc</td>
<td>2698</td>
<td>Hex screw M 6 x 16 mm</td>
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<td>2622</td>
<td>Segment</td>
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<td>Bevel pinion</td>
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<td>2624</td>
<td>Pin</td>
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<td>2625</td>
<td>Disc</td>
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<td>2626</td>
<td>Needle bearing 20/32 x 16 mm st.</td>
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<tr>
<td>2627</td>
<td>Washer Z 10.5/18 mm st. cold gal.</td>
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<td>2628</td>
<td>Hex screw M 5 x 30 mm st. cold gal.</td>
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<td>2629</td>
<td>Locking spin CS 4 x 18 mm spring st. black</td>
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<td>Washer semibright 5.3/12 mm st. cold gal.</td>
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<td>2632</td>
<td>Nyloc nut M 5</td>
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<td>2651</td>
<td>Bevel gear</td>
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<tr>
<td>2652</td>
<td>Split pin A 3 x 25 mm</td>
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<td>2653</td>
<td>Drive shaft</td>
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<td>2654</td>
<td>Key</td>
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<td>2655</td>
<td>Cam</td>
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<td>2656</td>
<td>Grooved ball bearing 6205 dusttight st.</td>
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<td>2660</td>
<td>Cam disc assembly</td>
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<td>2661</td>
<td>Bush</td>
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<tr>
<td>2662</td>
<td>Cam disc assembly &quot;Close&quot;</td>
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<td>Cam disc assembly &quot;Open&quot;</td>
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2700 Lock

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<td>2702</td>
<td>Stop</td>
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<td>2703</td>
<td>Strap right</td>
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<tr>
<td>2704</td>
<td>Spacer sleeve</td>
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<tr>
<td>2705</td>
<td>Circlip A 15 mm spring st.</td>
</tr>
<tr>
<td>2706</td>
<td>Cyl. tension spring</td>
</tr>
<tr>
<td>2707</td>
<td>Strap</td>
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<tr>
<td>2708</td>
<td>Circlip A 12 mm spring st.</td>
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<tr>
<td>2709</td>
<td>Circlip A 15 mm spring st.</td>
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<td>2711</td>
<td>Spacer ring</td>
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<tr>
<td>2712</td>
<td>Lever</td>
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<tr>
<td>2713</td>
<td>Circlip A 12 mm</td>
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<td>2714</td>
<td>Washer HF 13/21 mm st. cold gal.</td>
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<td>2715</td>
<td>Spacer sleeve</td>
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<td>2716</td>
<td>Pin</td>
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<td>2717</td>
<td>Pin</td>
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<td>2720</td>
<td>Roller assembly</td>
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<td>2721</td>
<td>Pin</td>
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<tr>
<td>2722</td>
<td>Pin</td>
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</tbody>
</table>

![Diagram of Lock Parts](image_url)

Fig. 23
2800 Control unit assembly

2801 Pushbutton "Open"
2802 Pushbutton "Close"
2803 Closing solenoid (DC)
2804 Closing solenoid (AC)
2805 Opening solenoid (DC and AC)
2806 Locking solenoid (DC and AC)
2807 2nd opening solenoid (DC and AC)
2808 Closed-circuit current trip (DC and AC)
2811 Ratchet bar
2812 Pawl
2813 Knuckle joint
2814 Knuckle joint
2815 Spring
2816 Lever
2821 Armature
2822 Armature with short-circuiting ring
2823 Solenoid armature
2824 Tension spring
2825 Solenoid armature
2826 Tension spring

2900 Tripping device

2901 Sleeve
2902 Actuating link left
2903 Pin
2904 Split pin A 2.5 x 22 mm
2905 Hex nut 0.8 d M6
2906 Nyloc nut M6
2907 Trip rod
2908 Lock washer 5.4/14 mm spring bronze nickel
2909 Washer semibright 5.4/14 mm
2911 Pin right
2912 Spring washer 3.5 spring st. wire nickel

Fig. 24
5000 Breaker pole complete

5001 Screw plug M20 x 1.5 mm
5002 Cap
5003 Ring seal 78.97x3.53mm G75 (top)
5004 Lock washer 510mm spring st., phosph.
5005 Socket-head screw M10x40 mm 26-8.8
5006 Socket-head screw M10x40 mm 26-8.8
5007 Lock washer 510 mm spring st., phosph.
5008 Ring seal 78.97x3.53mm G75(bottom)
5021 Oil level sightglass
5022 Ring seal BS - C33 steel + G 85 cast ir.
- 5030 Oil separator assembly
  5031 Membrane
  5032 Bush
  5033 Oil separator
  5034 Valve
  5035 Cyl. compression spring
  5036 Centre stud
- 5304 Insulating tube
  5305 Flange (top)

5400 Housing assembly

5401 Oil drain plug
5402 Ring seal BS - C20, st. + G 85 cast ir.
5403 Housing
5404 Screw plug
5405 Split taper sleeve 5x16 mm sping st.
5406 Spiral locking pin 5 x 26 mm
5407 Guide pin
- 5410 Wiper assembly
  5421 Lock washer 5.6 spring st., phosph.
  5422 Socket-head screw M 6 x 25/18 mm cold gal.
  5430 Contact rod
  5431 Tip
  5432 Rod
  5440 Roller contact assembly
  5441 Serpess lock nut M 5
  5442 Spacer ring
  5443 Compression spring
  5444 Washer 5.2/15 x 1 mm
  5445 Contact roller
  5446 Endplate
  5447 Socket-head screw M 5 x 45/16 mm
  5451 Spiral locking pin 2 x 20 mm
  5452 Pin
  5453 Washer
  5460 Lever assembly
  5461 Strap
  5462 Rivet
  5463 Lever brazed
  5464 Roller
  5465 Washer
  5466 Spiral locking pin 2 x 20 mm
  5467 Pin

5100 Contact holder assembly

5101 Contact holder
5102 Spring
5103 Contact finger
5104 Spacer tube
5105 Compression spring
- 5110 Arcing finger assembly
  5111 Arcing finger
  5112 Washer 3.2/9 x 0.8 mm
  5113 Half-round rivet 3 x 10 mm
  5114 Joint
  5121 Pin
  5122 Lock washer 55 mm spring st., phosph.
  5123 Socket-head screw M5x12 mm

5200 Interrupting chamber assembly

5201 Interrupting chamber
5202 Ring seal
- 5470 Crank assembly
  5471 Pin
  5472 Level
  5473 Shaft assembly
  5481 Spiral locking pin 5 x 36 mm
  5482 Ring seal 17.86 x 2.62 mm G 75
  5483 Shim 18/30 x 0.5 mm spring st.
  5484 Circlip A 17 mm spring st.

5300 Insulating tube assembly

5301 Flange (bottom)
5302 Ring seal 71.12 x 2.62 mm G 75
5303 Set screw with tapered top M5x6 mm st. cold gal.
9000 Breaker accessories

9100 Relay holder

9160 Relay holder for M 16 fixing
9170 Relay holder for M 20 fixing
9180 Relay holder for M 24 fixing

9101 Relay

9110 Lever assembly
9121 Pin
9122 Spring washer 2 mm st. nickeled
9123 Bearing bracket

9130 Trip rod assembly

9141 Hex screw M 6 x 18 mm st. cold gal.
9142 Lock washer E 6.4/11 mm st. nickeled
9143 Spacer sleeve
9144 Pin
9145 Shaft
9146 Spring washer 6 mm st. nickeled
9147 Locking pin CS 3 x 16 mm st.

9151 Hex screw M 16 x 60 mm st. cold gal.
9152 Lock washer 17/34 mm st. block
9153 Washer 17/30 mm st. cold gal.
9154 Hex nut 0.8 d M 16 st. 8 cold gal., yellow

9161 Relay holder (M 16)

9162 Hex screw M 16 x 40 mm st. cold gal.
9163 Washer 17/30 mm st. cold gal.
9164 Lock washer 17/34 mm st. block

9171 Relay holder (M 20)

9172 Hex screw M 20 x 40 mm st. cold gal.
9173 Washer 21/37 mm st. cold gal.
9174 Lock washer 21/40 mm st. black
<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>9280</td>
<td>Relay linkage assembly, pole spacing 200 (SBS 12.08.20 L)</td>
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<tr>
<td>9290</td>
<td>Relay linkage assembly, pole spacing 275 (SBS 24.08.12 L)</td>
</tr>
<tr>
<td>9201</td>
<td>Lever</td>
</tr>
<tr>
<td>9202</td>
<td>Pin</td>
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<tr>
<td>9203</td>
<td>Spring washer</td>
</tr>
<tr>
<td>9210</td>
<td>Charging rod assembly</td>
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<tr>
<td>9221</td>
<td>Socket-head screw M6x12 mm st. 8.8</td>
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<td>9222</td>
<td>Spring washer double 6.5 mm spring st. black</td>
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<tr>
<td>9223</td>
<td>Alarm contact (self-resetting)</td>
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<tr>
<td>9224</td>
<td>Alarm contact (with button)</td>
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<td>9231</td>
<td>Hex screw M5x12 mm st. cold gal.</td>
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<tr>
<td>9232</td>
<td>Hex nut 0.8 d M 5 st. 8 cold gal. yellow</td>
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<tr>
<td>9233</td>
<td>Lock washer 5.3/12 mm spring st. black</td>
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<tr>
<td>9234</td>
<td>Locking pin CS 4 x 8 mm st.</td>
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<tr>
<td>9235</td>
<td>Bearing plate</td>
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<tr>
<td>9236</td>
<td>Circlip A 15 mm spring st.</td>
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<tr>
<td>9237</td>
<td>Bearing</td>
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<td>9238</td>
<td>Hex nut 0.5 d M 6 st. 04 cold gal. yellow</td>
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<tr>
<td>9239</td>
<td>Circlip A 10 mm spring st.</td>
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<td>9241</td>
<td>Cyl. compression spring</td>
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<td>Circlip A 6 mm spring st.</td>
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<td>Hex screw M5x12 mm st. cold gal.</td>
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<td>Hex nut 0.8 d M 5 st. 8 cold gal. yellow</td>
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<td>9246</td>
<td>Lock washer 5.3/12 mm spring st. black</td>
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<tr>
<td>9247</td>
<td>Locking pin CS 4 x 8 mm st.</td>
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<td>Bush assembly</td>
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<td>9250</td>
<td>Bearing plate assembly</td>
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<td>9261</td>
<td>Guide pin</td>
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<td>9262</td>
<td>Bearing</td>
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<td>9263</td>
<td>Circlip A 15 mm spring st.</td>
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</table>
9500 Interlock unit

9510 Interlock unit SBS p = 200 (SBS 12.08.20 V)

9511 Shaft 711 mm long
9515 Hex shaft assembly

9520 Interlock unit SBS p = 275 (SBS 24.08.12 V)

9521 Shaft 911 mm long
9525 Hex shaft assembly

9531 Bearing plate
9532 Hex screw M5 x 12 mm st. cold gal.
9533 Hex nut 0.8 d M5 st. cold gal.
9534 Lock washer 5.3/12 mm spring st. black
9535 Rod
9537 Lever 65 mm long
9538 Shackle
9539 Shackle pin 82 mm long

9561 Lock washer 5.3/12 mm spring st. black
9562 Hex screw M5 x 20 mm st. cold gal.
9563 Lock washer 5.5 mm spring st. phosph.
9564 Spiral locking pin 8 x 50 mm
9555 Lever
9556 Socket-head screw M8x20 mm st. cold gal.
9557 Lock washer 9/18 mm spring st. black
9568 Lever
9559 Spiral locking pin 8 x 50 mm

9541 Washer 13/24 mm st. cold gal.
9542 Split pin A 4 x 25 mm st. cold gal.
9543 Hex nut 0.8 d M10 st. cold gal.
9544 Hex nut 2 d M 10 st. cold gal.
9545 Lock washer 5.3/12 mm spring st. black
9546 Washer 5.3/10 mm st. cold gal.
9547 Angle joint A 8 mm left
9548 Hex nut 0.8 d M5 L st. cold gal.
9549 Lock washer 35 mm spring st. phosph.

9551 Hex nut 0.8 d M5 st. cold gal.
9552 Lock washer 5.5 mm spring st. phosph.
9553 Angle joint A 8 mm
Interlock unit

- Grooved ball bearing 627
- Push bracket
- Nyloc nut M 5
- Lock washer 5.3/12 mm spring st. black
- Hex nut 0.8 d M 5 st. cold gal.
- Threaded rod
- Compression spring
- Hex screw M 6x12 mm st. cold gal.
- Lock washer 6.4/14 mm spring st. black

Washer 13/24 mm st. cold gal.
Bearing bracket
Spiral locking pin 3 x 20 mm
Disc dia. 60 mm
### Interlock actuating mechanism

- **9601** Locking pin CS 6 x 40 mm st.
- **9602** Lever 89 mm long
- **9603** Spacer sleeve
- **9604** Split pin A 3 x 20 mm st. cold gal.
- **9605** Washer 10.5/21 mm st. cold gal.
- **9606** Adjusting ring
- **9607** Shaft 222 mm long
- **9608** Sleeve 40 mm long
- **9609** Latching shaft
- **9610** Lever assembly
- **9620** Bearing plate assembly
- **9630** Interlock rod
- **9641** Cyl. compression spring
- **9642** Hex screw M 8x20 mm st. cold gal.
- **9643** Hex nut 0.8 d M 8 st. cold gal.
- **9644** Lock washer 9/18 mm spring st. black
- **9645** Lock washer BE 4 mm spring st.

![Diagram](image-url)
APPENDIX

Note 1

Experience shows that our products attain maximum reliability if the recommendations contained in these instructions are adhered to.

Note 2

A set of instructions cannot cover every eventuality arising from the use of technical equipment. In the event of any incident therefore, we request that you consult us or our appointed representative.

Note 3

We specifically disclaim all responsibility for all direct damages resulting from incorrect maintenance or operation of our equipment, even when the instructions contain no specific indications in this respect.

Note 4

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