Low-Oil-Volume Circuit-Breaker

Typ SBK 36 mc 1000
SBK 36 n 1500

Publication No. AG 90242 E

Instructions for erection and operation

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   b) Operating mechanism
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Notice 1

Based on our own experience, you will obtain the best possible operational reliability from our equipment by following the recommendations given in these Instructions. The data contained herein purports solely to describe the product and is not a warranty of performance or characteristics. It is with the best interests of our customers in mind that we constantly strive to improve our products and keep them abreast of advances in technology. This may, however, lead to discrepancies between a product and this Instruction.

Notice 2

Within the scope of these Instructions, it is impossible to take into account every possible eventuality which may arise with technical equipment in service. Please consult our local agents in the event of any irregularities, especially if not referred to herein.

Notice 3

We expressly decline liability for any damages resulting from any incorrect operation or wrong handling of our equipment, even if these Instructions contain no specific indication in this respect. We lay particular stress on the fact that only genuine spare parts should be used for replacements.

Notice 4

Without our written consent it is not permissible to disclose, reprint, copy or reproduce any part of these Instructions.
Instructions for Erection and Operation

Low-Oil-Volume Circuit-Breakers
with Spring Operating Mechanism

Type SBK 36 mc 1000
Type SBK 36 n 1500

Contents:

1. General
2. Technical Data
3. Construction
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6. Maintenance
7. Spare Parts

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Low - Oil - Volume Circuit-Breakers
with Spring Operating Mechanism

Type SBK 36 mc 1000
Type SBK 36 n 1500

1. General

The type SBK low-oil-volume circuit-breaker with spring operating mechanism is simple, reliable and quick-acting. It is used for on-load circuit-breaking in high voltage installations.

It is intended for indoor operation and is available for a rated voltages of 36 kV at a rated current of 1250 A, and a breaking capacity of 1000 MVA.

Models available

Type SBK is for fixed installation in an open cell.

Type SBKJ is intended for installation in metalclad switch-gear units. It is removable and fitted with plug-in contacts.
<table>
<thead>
<tr>
<th>Breaker Type</th>
<th>SBK 36 mc 1000</th>
<th>SBK 36 n 1500</th>
</tr>
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<tbody>
<tr>
<td>Rated Voltage</td>
<td>kV</td>
<td>30/36</td>
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<tr>
<td>Rated breaking capacity</td>
<td>MVA</td>
<td>1000</td>
</tr>
<tr>
<td>Rated current</td>
<td>A</td>
<td>1250</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>c/s</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated breaking current</td>
<td>$k_A^{RMS}$</td>
<td>19,2/16</td>
</tr>
<tr>
<td>Rated making current</td>
<td>$k_A^{PEAK}$</td>
<td>49/41</td>
</tr>
<tr>
<td>Short-time current (1 s)</td>
<td>kA</td>
<td>19,2</td>
</tr>
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<table>
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<th></th>
<th>SBK 36 mc 1000</th>
<th>SBK 36 n 1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulse test Voltage 1,2/50 us</td>
<td>$kV^{PEAK}$</td>
<td>170</td>
</tr>
<tr>
<td>Power frequency test Voltage (50 c/s, 1 min)</td>
<td>kV</td>
<td>75</td>
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</table>
3. Construction

a) **Breaker Pole**

Each breaker has its own interrupter chamber. All three poles of a triple-pole breaker are arranged vertically and are mounted on supports 48a and 48b (Fig. 2).

The interrupter chamber cylinder 12 (Fig. 2 and 7) carries the breaker pole and is made of glassfibre-reinforced epoxy resin. It also carries the connecting flanges 12n and 12l (Fig. 2) which, on the one hand, connect the current flow path from the pole to the busbars and, on the other, permit assembly of the breaker pole to the operating mechanism through the moulded resin rod insulators 11. The operating mechanism housing 19 is fixed to the lower connecting flange 12l (Fig. 2). This houses the parts required for operating the switch rod, the switch rod itself 18 (Fig. 7d), the roller contact 17g (Fig. 7b) and the guide tube 20. The switch rod has a replacable tip at the upper end 18a (Fig. 7d). It is somewhat tapered at the lower end and is damped by the oil-filled guide tube 20 as the circuit is broken. The guide tube 20 also serves as oil drain plug. The roller contact 17g is a following, low-friction type contact which guarantees a constant current flow from the lower connecting flange 12l through the mechanism housing 19 to the switch rod 18 (Fig. 7d). The contact retainer 13 is situated on the upper connecting flange 12n (Fig. 2 and 7). It carries the static contact which consists of several fingers 14c in the shape of a tulip. The upper connection forms the pressure equalising chamber 15 (Fig. 2 and 7d), which is fitted with an oil level inspection window 15c (Fig. 2, 3 and 7d) and an oil separator 16.
The breaker can be fitted with three primary relays as shown in Fig. 3. The construction is such that all necessary inspections and maintenance of the interrupter chamber can be carried out without removing the relays.

b) Operating Mechanism

The circuit-breaker is fitted with a spring operating mechanism which, apart from the normal open-close cycle, also allows for open-close-open auto-reclosing cycles when used in conjunction with a reclosing relay. The operating mechanism can be preloaded either by hand or with a motor. It consists of the following sub-assemblies:

The control unit 31 (Fig. 9) with mechanical and electrical trip mechanism; interlock 24 (Fig. 9) and tensioning device; spring operator 27d-g (Fig. 6 and 8) for opening and closing the circuit; the hand and motor-driven preloading mechanism 25 / 30 (Fig. 6) with ratchet and pawl; differential gearing and chain for loading the energy store 2ln (Fig. 6 and 8); drive shaft with cams 2ld; auxiliary switch 29 (Fig. 6); indicator and terminal strip 52 (Fig. 6); additional "On" spring 28u, 28v (Fig. 9)(only for the type 36 n 1500).

4. Principle

Fig. 7d shows a breaker pole in the open position. The active part of the pole is submerged in oil. When the circuit is opened, the switch rod 18 (Fig. 7d) is withdrawn very rapidly from the quenching chamber. Arcing occurs between the moving contact and the tulip shaped fixed contact 14c (Fig. 7) which evaporates some of the oil. The quenching chamber 12 is divided into cells which ensure that the gas bubbles cannot expand and that the evaporation surface is confined to the immediate vicinity of the arc. The arc is rapidly cooled
and extinguished by the generation of gas and the intensive oil flow. The energy generated in opening the circuit is absorbed by the damping effect of the oil-filled sleeve 20 at the end of the travel.

Important! The breaker must not be operated unless there is sufficient oil in the interrupter chamber as otherwise the quenching system can not function properly and the breaker could suffer damage on opening the circuit.

(See instruction plate on the side of the breaker which states: Do not operate without oil!)

a) Switching operation

The necessary energy for opening the breaker is provided by the spring operating mechanism 27d-g (Fig. 6 and 9). As previously stated, the energy in the springs is sufficient for an autoreclosing cycle (open-clos-open). The springs 27 d-g exert a constant pressure upon the pinion 2lz (Fig. 8) during the switching operation through the chain 2ln and cam 2lh shown (Fig. 6 and 8). The pinion is in mesh with two bevel gears. The right-hand gear 21i (Fig. 6) is mounted on the shaft by a roller bearing and its sole purpose is for loading the springs 27 d-g by means of the motor 30 or the crank handle 25g. The left-hand bevel gear 21 g transmits the torque to the drive shaft 2la (Fig. 6, 8 and 9), and the potential energy is stored by the cam 21c (Fig. 9). The breaker is opened or closed by rotating the switch shaft 28 through approximately 50° which releases the cam 21c on the drive shaft 21 (Fig. 6, 8 and 9) from the locking device, allowing it to engage with the operator 22. The power for the switch rod 18 (Fig. 7) is transmitted through the cam 21d to the switch shaft 28 and the switch rods 28h through the linkage to the switch rod 18 (Fig. 7).
b) A closing signal, given through the push-button 31b or the magnet 32 in the control unit 31, actuates the release pawl 31a (Fig. 6 and 9) which in turn releases the retaining pawl 31h at the control unit power source (Fig. 9). This consists of a toggle joint 31d and 31e and the intermediate springs 31f which throws the lever 31g downwards. The operator 22 (toggle joint) is released by the release rod 26 (Fig. 9).

The switch shaft 28 is rotated by the action of the springs 27d-g (Fig. 8) through the main shaft 21 and the cam 21d. The switch rod 18 (Fig. 7) is moved into the "on" position with force through the lever system by this process. The breaker is now closed.

c) For switching off

The same process is repeated from the "off" button of the control unit 31.

d) Preloading the springs by hand with the cranking handle 25g (fig. 6 and 9) requires approximately 75 turns, until the energy accumulator springs are fully loaded.

e) Preloading the springs 27d-g with the aid of the motor.

The electric motor is controlled automatically. It is switched on by the limit switch 49 (Fig. 6) as soon as the load on the springs dips below maximum and switched off again as soon as maximum load is reached again.

f) "Charge - Discharge" indicator

The indicator plate 27m (Fig. 8) only shows "charge" when the springs 27d-g are loaded to the maximum. When it shows "discharged" it indicates that the spring tension is somewhere between maximum and minimum. It is dangerous to manipulate the mechanism or the contacts when the springs are under tension. Always ensure that springs are completely free from tension!
g) Anti-closing interlock

The control unit 31 (Fig. 9) only transmits closing signals when the springs 27d-g are adequately loaded i.e. it can cut out the signal immediately after it has been given. Closure is prevented at insufficient spring tension by the blocking device 24 (Fig. 6 and 9). This disengages the release cam 31a through a linkage. Deliberate blockage of closure for specific control purposes can be effected by the control magnets (Fig. 10e) which hold the release cam 31a out of engagement when the coil voltage fails.

h) Available models (to suit customers' requirements)

Electrical Control Components

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Closing magnet</td>
<td>d.c. (Fig.10a)</td>
</tr>
<tr>
<td>b) Closing magnet</td>
<td>a.c. (Fig.10b)</td>
</tr>
<tr>
<td>c) Tripping magnet</td>
<td>d.c./a.c. (Fig.10c)</td>
</tr>
<tr>
<td>(or current-transformer release)</td>
<td></td>
</tr>
<tr>
<td>d) Second tripping magnet or current-transformer release with second release magnet</td>
<td>(Fig.10d)</td>
</tr>
<tr>
<td>e) Blocking magnet to prevent closure</td>
<td>(Fig.10e)</td>
</tr>
<tr>
<td>f) No-voltage release</td>
<td>(Fig.10f)</td>
</tr>
</tbody>
</table>

i) Electrical releases

These are available in various forms (see electrical control components above). The magnetic arrangements Fig. 10a, b,c, or d release through an electrical signal from an auxiliary supply.

The current-transformer trip Fig. 10c or 10d is fed by the main and auxiliary transformer, which renders auxiliary supply unnecessary.

The no-voltage trip Fig. 10f also known as closed-current trip, operates if the voltage at the coil fails.

Arbitrary remote control is blocked as shown in Fig. 10e.
5. Assembly and Operation

The breaker frame 48a/b (Fig. 1 and 2) is a bolted construction for supporting the interrupter chambers and also for fixing the complete unit (see attachment holes 47 in Fig. 3) in its various forms for outdoor installation. The power supply should be connected to the relay terminal bolts 41 (Fig. 3) or, in models without relays, to the upper terminal screws 12e (Fig. 2) and to the lower connecting screws 12m.

The wiring should be connected up in accordance with the wiring diagram packed with the breaker.

The earthing connection, which is painted yellow and (not visible in the illustrations) should be suitably earthed in accordance with the regulations in force.

Breakers are delivered in the switched-off condition.

a) Filling with oil

Before use, all three interrupter chambers must be filled with pure transformer oil of good quality and free from water, after loosening the oil separator housing bolts 16 (Fig. 1, 2 and 7). The oil should be poured in slowly until the level reaches the red spot on the inspection window 15c (Fig. 1 and 7). Each interrupter chamber requires approximately 7 litres of oil. The breaker should be tested for correct functioning under operating conditions. Several opening and closing operations should be carried out and all parts inspected for positive engagement. If the results of these tests are satisfactory, the breaker may be connected to the supply and put into operation.
6. Maintenance

All mechanical parts operate with complete reliability and are affected by dust or temperature changes under normal conditions.

Maintenance can be limited to a periodic cleaning and lubrication of the individual components, which is quite sufficient to prevent premature wear. Servicing must be carried out with the breaker in the open condition.

We recommend that the following checks and servicing be carried out:

a) Half-yearly checks
The oil level should be checked at the inspection window 15c (Fig. 1 and 7) and the oil topped up as necessary to the marked level. For filling instructions see paragraph 5a.

b) Changing the arcing contacts
The deterioration of the arcing contacts and the pollution of the oil depend to a great extent on the demands made on the breaker with respect to the breaking power and the number of switching cycles. The contacts can survive one thousand switching cycles at normal operating power (rated current). The contact life expectancy is reduced correspondingly when overloads are interrupted. It is essential to inspect the contacts for damage after four or five short-circuit interruptions. This should be carried out as follows:

1. Drain the oil from the three interrupter chambers into a clean receptacle by removing the oil drain plug 20 (Fig. 2 and 7d).

2. After loosening the four screws 12c (Fig. 7d), lift out the complete pressure equalising chamber 15 (Fig. 2 and 7d) and the interrupter chamber 13 (Fig. 7d).
3. The replaceable contact fingers 14c (Fig. 7a) are easily accessible after removing the interrupter chamber 13 and can, if necessary, be replaced.

4. It is recommended that the individual poles of the breaker be brought into the "closed" position which gives better accessibility to the contact tip 18a (Fig. 7d). The switch rods 28h (Fig. 2 and 6) must also be loosened. Under no circumstances may these be brought out of adjustment. Make sure, when reassembling, that they are in exactly the same position as before.

5. The unserviceable tip 18a can be removed with an Allen key and replaced by a new one.

c) General overhaul

After draining the oil from the interrupter chambers, and apart from the work described under 6b, the four screws 12d (Fig. 2 and 7d) must also be loosened. This permits withdrawal of the active part of the pole, together with the switch rod 18, which can then be disassembled into its various component parts as shown in Fig. 7b, c and d. The reverse procedure is adopted for reassembly.

The quenching oil should also be checked, the more frequently the more often the breaker operates, and if it is found to be very polluted it should be changed. The insulating capacity of the oil is best tested in an oil testing apparatus.

The oil sample is allowed to stand for about half an hour before being subjected to the test voltage. It at a distance of 5 mm with 12.5 mm diameter spheres the oil breaks down below 10 to 15 kV, then it should be changed. The breakdown voltage of the fresh oil must be at least 40 kV.

d) Lubrication

The switching mechanism should be lubricated once a year,
or after every 1000 switching cycles, with graphite lubricating oil type BBC LM 2g or Molycote Paste Rapid. The operating mechanism in the interrupter chamber needs no lubrication as it is constantly submerged in oil. All lubricating holes marked red (on the control unit 31), as well as all joints, shaft bearings, ball bearings and gear wheels should be lubricated with the previously mentioned lubricant according to lubrication chart Fig. 11.

The graphite lubricating oil BBC 909 2g is a mineral oil with the following characteristics:

Viscosity at 20°C 30-60 centistokes
Neutralization number 0.2
Flash-point (Marcusson) 140° C
Ash content (incombustible material) 0.01 %

This oil must be carefully mixed with 5% by weight of colloidal graphite.

7. Spare Parts

We recommend that adequate supplies of the following spare parts be carried in stock as they are subject to wear and tear or could conceivably become damaged. Considerable delays can be avoided by carrying this small stock of spares. Spare parts should be ordered from our appointed agents quoting the following details:

1. Equipment for which the spare parts are required
2. Its type designation and
3. Works serial number
   The data should be carefully noted from the identification plate.

4. Quantity required
   Description
   Item numbers of the desired spare parts (if quoted in this set of instructions)

Note:
The information required under 1, 2 and 3 must be quoted even if the order is accompanied by a sample, otherwise it is not possible to establish the exact type of apparatus. We further request that the type designation and works serial number be quoted in any correspondence associated with spare parts.

<table>
<thead>
<tr>
<th>a) For the breaker pole</th>
<th>Item</th>
<th>Piece</th>
<th>Fig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arcing finger</td>
<td>14c2</td>
<td>8</td>
<td>7a</td>
</tr>
<tr>
<td>Arcing finger spring</td>
<td>14b</td>
<td>8</td>
<td>7a</td>
</tr>
<tr>
<td>Contact tip</td>
<td>18a</td>
<td>1</td>
<td>7d</td>
</tr>
<tr>
<td>Switch rod complete</td>
<td>16</td>
<td>1</td>
<td>7d</td>
</tr>
<tr>
<td>Roller cage complete</td>
<td>17</td>
<td>1</td>
<td>7b</td>
</tr>
<tr>
<td>Convектор chamber complete</td>
<td>12</td>
<td>1</td>
<td>7d</td>
</tr>
<tr>
<td>Sealing ring</td>
<td>19k</td>
<td>1</td>
<td>7c</td>
</tr>
<tr>
<td>&quot;</td>
<td>15b</td>
<td>1</td>
<td>7a</td>
</tr>
<tr>
<td>&quot;</td>
<td>14a</td>
<td>1</td>
<td>7a</td>
</tr>
<tr>
<td>&quot;</td>
<td>13a</td>
<td>3</td>
<td>7a</td>
</tr>
<tr>
<td>Seal</td>
<td>20a</td>
<td>1</td>
<td>7a</td>
</tr>
<tr>
<td>&quot;</td>
<td>16a</td>
<td>1</td>
<td>7a</td>
</tr>
<tr>
<td>&quot;</td>
<td>19h</td>
<td>1</td>
<td>7c</td>
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<th>b) For spring operating mechanism</th>
<th>Item</th>
<th>Piece</th>
<th>Fig.</th>
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</thead>
<tbody>
<tr>
<td>Magnet coil &quot;ON&quot;</td>
<td>32</td>
<td>1</td>
<td>10a/b</td>
</tr>
<tr>
<td>Magnet coil &quot;OFF&quot;</td>
<td>32</td>
<td>1</td>
<td>10c</td>
</tr>
<tr>
<td>Tension spring</td>
<td>23f</td>
<td>2</td>
<td>8/23</td>
</tr>
<tr>
<td>Motor</td>
<td>30</td>
<td>1</td>
<td>9</td>
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</table>
Captions to Illustrations

Fig. 1 Low-oil-volume circuit-breaker type SBK 36 mc 1000 with spring operating mechanism, viewed from the mechanism side.

Fig. 2 Low-oil-volume circuit-breaker type SBK 36 mc 1000 with spring operating mechanism, viewed from the interrupter chamber side.

Fig. 3 Type SBK 36 mc 1000, fitted with three primary relays, type HB and HT, viewed from the mechanism side.

Fig. 4 Low-oil-volume circuit-breaker, type SBKJ 36 mc 1000 mounted on a trolley for metalclad installation, viewed from the quenching chamber side. (Quenching chambers hidden by insulating covers).

Fig. 5 Type SBKJ 36 mc 1000 circuit-breaker on a trolley for metalclad installation, viewed from the mechanism side.

Fig. 6 Spring operating mechanism for low-oil-volume circuit-breaker, type SBK 36 mc 1000.

Fig. 7a, b, c & d Assembly diagrams of interrupter chamber of one pole of a type SBK 36 mc 1000 circuit-breaker.

Fig. 8 Spring operating mechanism, taken apart into its main components.

Fig. 9 Diagrammatic view of spring operating mechanism. Springs under tension. (Breaker in "OFF" position.)
Fig. 10  Coils in control unit
Fig. 10a Closing magnet (d.c.)
Fig. 10b Closing magnet (a.c.)
Fig. 10c Tripping magnet (a.c./d.c.)
(or current-transformer trip)
Fig. 10d Second tripping magnet or
current-transformer trip with second trip magnet.
Fig. 10e Blocking magnet for switch interlocking.
Fig. 10f No-voltage trip
Fig. 11 Lubrication chart.
Component Parts

10 Trolley
11 Supporting insulator
12 Quenching chamber insulator assembled
12a Washer
12b Spring washer
12c Screw
12d Screw
12e Connection bolt
12f Washer
12g Spring washer
12h Threaded plate
12i Nut
12k Screw
13 Retainer for contact fingers
13a Sealing ring
13b Retaining ring
13c Steel ball
13d Screw
13e Spring washer
13f Washer
14 Finger holder complete
14a Sealing ring
14b Springs
14c Replaceable contact finger
15 Pressure equalizing chamber, complete
15a Retaining ring
15b Sealing ring
15c Inspection window (oil level gauge)
15d Ring
15e Oil level graduations
16 Oil separator complete (oil filler plug)
16a Seal
17 Roller cage complete
17a Conducting stud
17b Plate
17c Plate
17d Washer
17e Nut
17f Nut
17g Roller complete
17h Plate
17i Screw
18 Switch rod complete
18a Contact tip
18b Pressure spring
18c Switch rod
18d Screwed ring
18e Pin
18f  Guide
19  Mechanism housing complete
19a  Switch lever
19b  Split pin
19c  Friction disc
19d  Washer
19e  Fulcrum pin
19f  Locking key
19g  Retaining ring
19h  Seal
19i  Threaded bush
19k  Sealing ring
19 l  mechanism lever
19m  Retaining ring
19n  Spring ring
20  Guide tube complete (oil drain screw)
20a  Seal
21  Drive shaft complete
21a  Drive shaft
21b  Key
21c  Cam
21d  Cam disc complete
21e  Split pin
21f  Loading shaft
21g  Bevel gear
21h  Sprocket complete
21i  Bevel gear complete
2lk  Bush
21l  Shim
21m  Clip
2ln  Roller chain
2lo  Split link
2lp  Roller bearing
21q  Roller bearing
21r  Screw
21s  Nut
21t  Spring washer
21u  Retaining ring
21v  Washer
21w  Bevel pinion
21x  Split pin
21y  Washer
22  Lock complete
22a  Link left
22b  Link right
22c  Link
22d  Lever
22e  Pin
22f  Pin
22g  Pin
22h  Pin
22i  Roller
22k  Spacer tube
22l  Spacer tube
22m  Spacer ring
22n  Stop
22p  Washer
22q  Retaining ring
22r  Retaining ring
23  Gear complete
23a  Gear shaft
23b  Bevel pinion
23c  Bearing bush
23d  Screwed stud
23e  Peg
23f  Tension spring
23g  Nut
23h  Spring washer
23i  Locking pin
23k  Retaining ring
23l  Damper
24  Interlock complete
24a  Interlock shaft
24b  Spring washer
24c  Indicator rod
24d  Blocking rod
24e  Interlocking rod
24f  Guide
24g  Nut
24h  Spring ring
24i  Retaining ring
24n  Spring ring
25   Hand crank complete
25a  Bearing bracket
25b  Shaft
25c  Bush
25d  Bush
25e  Angle bracket
25f  Stop
25g  Crank handle
25h  Sleeve
25i  Angle
25k  Locking pin
25l  Locking pin
25m  Pressure spring
25n  Bevel gear wheel
25p  Pressure spring
25q  Bush
25r  Retaining ring
25s  Retaining ring
25t  Retaining ring
25u  Retaining ring
25v  Washer
25w  Split pin
25x  Nut
26 Release mechanism complete
26a Release rod
26b Release lever
26c Shaft
26d Sleeve
26e Shaft
26f Washer
26g Split pin
27 Spring frame, complete (with energy accumulator)
27a Spring frame
27b Pulley
27c Shaft
27d Compression spring
27e Compression spring
27f Compression spring
27g Compression spring
27h Spring plate
27i Chain retainer
27k Shaft
27l Top plate
27m Indicator plate (Charged - Discharged)
27n Indicator plate (I - O)
27o Indicator rod
27p Screw
27q Nut
27r Nut
27s Spring washer
27t Retaining ring
28  Switch rod complete
28a Switch rod
28b Bush
28c Bearing bush
28d Washer
28e Shaft
28f Cam
28g Diaphragm
28h Switch rod
28i Adjusting bush
28k Washer
28l Ball bearing
28m Cheese-head screw
28n Peg
28o Retaining ring
28q Spring washer
28r Spring washer
28s Spring ring
28t Spring ring
28u Tension spring with eye
28v Pull-rod
28w Washer
28x Split pin

29  Auxiliary switch

30  Motor
31 Control unit complete
31a Release pawl
31b Push-button "ON"
31c Push-button "OFF"
31d Toggle joint
31e Toggle joint
31f Compression spring in the control unit
31g Lever
31h Retaining pawl
32 Coil on/off
33 Coil
34 Armature
34a Armature with short-circuit ring
35 Magnet armature
35a Tension spring
36 Magnet armature
36a Tension spring
38 Loading cam in the control unit
39 Relay loading cam
40 Cam for actuating the under-voltage trip magnet
41 Main power connection for use with primary relays
42 Primary relays, series relays, type HB
43 Primary relays, thermal relays, type HT
44 Relay - release rod
45  Relay - release rodding
46  Relay release shaft
47  Fixing holes
48a Upper support
48b Lower support
49  Limit switch
50  Inspection cover
51  Alarm contact re-set
52  Terminal strip
53  Pole isolating housing
54  Front housing
55  Roller
56  Tulip contact
57  Push-button for illumination of oil-level indicator
Lubricating chart for SBK

Red marked places in control unit

Spring guiding rods

Lubricate on erection and revision

Lubricate annually or after 1000 operations

Link chain

Guide roll

Bearings of the indicating rods

Ball and roller bearing

Bearing of the locking device and the changing rod

Cam bearing

Graphite Lubricating oil BBC 909

Molybdenum Paste Rapid

Bearing of the auxiliary switch actuator

Slide bearing of the hand and motor rewinder

All bearings and gear wheels

Slide bearing of the interlocking shaft and the pinion

Fig.11