Instruction for Erection and Operation

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

Type SBK 7,2 mc 350, Type SBK 7.2 n 350
Type SBK 12 mc 500, Type SBK 12 n 500
Type SBK 12 mc 750, Type SBK 12 n 750
Type SBK 24 mc 1000, Type SBK 24 n 1000

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I.1973

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

Type SBK 7.2 mc 350,  Type SBK 7.2 n 350
Type SBK 12 mc 500,  Type SBK 12 n 500
Type SBK 12 mc 750,  Type SBK 12 n 750
Type SBK 24 mc 1000,  Type SBK 24 mc 1000

1. General

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

It is intended for indoor operation and is available for rated voltages of 7.2, 12 and 24 kV at rated currents of 1250 A and 1600 A and breaking capacities of 350, 500, 750 and 1000 MVA.

Models available

Type SBK is for fixed installation in an open cell.

Type SBKJ is intended for installation in metal clad switch-gear units. It is removable and fitted with plug-in contacts.

Type SBKL is designed for open cell installation, is removable and fitted with plug-in connections.
## Technical Data

<table>
<thead>
<tr>
<th>Breaker Type</th>
<th>SBK 7,2 mc 350</th>
<th>SBK 7,2 n 350</th>
<th>SBK 12 mc 500</th>
<th>SBK 12 n 500</th>
<th>SBK 12 mc 750</th>
<th>SBK 12 n 750</th>
<th>SBK 24 mc1000</th>
<th>SBK 24 n 1000</th>
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</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV</td>
<td>6/7,2</td>
<td>6/7,2</td>
<td>10/12</td>
<td>10/12</td>
<td>10/12</td>
<td>10/12</td>
<td>20/24</td>
</tr>
<tr>
<td>Rated breaking capacity</td>
<td>MVA</td>
<td>350</td>
<td>350</td>
<td>500</td>
<td>500</td>
<td>750</td>
<td>750</td>
<td>1000</td>
</tr>
<tr>
<td>Rated current</td>
<td>A</td>
<td>1250</td>
<td>1600</td>
<td>1250</td>
<td>1600</td>
<td>1250</td>
<td>1600</td>
<td>1250</td>
</tr>
<tr>
<td>Rated making current</td>
<td>kApeak</td>
<td>86/71</td>
<td>86/71</td>
<td>74/61</td>
<td>74/61</td>
<td>110/92</td>
<td>110/92</td>
<td>74/61</td>
</tr>
<tr>
<td>Short-time current (1 s)</td>
<td>kA</td>
<td>33,7</td>
<td>33,7</td>
<td>29</td>
<td>29</td>
<td>43</td>
<td>43</td>
<td>29</td>
</tr>
<tr>
<td>Impulse test voltage 1,2/50 us</td>
<td>kVpeak</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>125</td>
<td>125</td>
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<tr>
<td>Power frequency test voltage 50 c/s 1 min</td>
<td>kV</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>55</td>
</tr>
</tbody>
</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 in Fig. 1.

The interrupter chamber cylinder 12 (Fig. 1 and 7) carries the breaker pole and is made of glassfiber-reinforced epoxy resin. It also carries the connecting flanges 12 n and 12 l (Fig. 1) 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 12 l (Fig. 1). 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 replaceable 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 also serves as oil drain plug. The roller contact 17g is following, low-friction type contact which guarantees a constant current flow from the lower connecting flange 12 l through the mechanism housing 19 to the switch rod 18 (Fig. 7d). The contact retainer 13 is situated on the upper connecting flange 12 n (Fig. 1). It carries the static contact which consists of several fingers in the shape of a tulip 14c. The upper connection forms the pressure equalising chamber 15 (Fig. 1 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 3t (Fig. 9) with mechanical and electrical trip mechanism; interlock 24 (Fig. 9) and tensioning device; spring operator 27 d-g (Fig. 6 and 8) for opening and closing the circuit; the hand and motor-driven preloading mechanism 25 / 30 (Fig. 6) with ratchet an pawl; differential gearing and chain 21n (Fig. 6 and 8) for loading the energy store; drive shaft with cams 21d; auxiliary switch 29 (Fig. 6); indicator and terminal strip 52 (Fig.6); additional "On" spring 28u, 28v (Fig.9).

4. Principle

Fig. 7d shows a breaker pole in the open operation. 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 14e (Fig. 7) which evaporates some of the oil. The quenching chamber 12 and 19 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 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 27 d-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 21s (Fig. 8) during the switching operation through the chain 21n and cam 21h (Fig. 6 and 8). The pinion is in mesh with the two bevel gears. The right-hand gear 21l (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 21g transmits the torque to the drive shaft 21a (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 3lb 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 through 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 27 d-g (Fig. 8) through the main shaft 2l and the cam 2ld. 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 27 d-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) **"Charged-Discharge" indicator**

The indicator plate 27m (Fig. 8) only shows "charge" when the springs 27 d-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 the springs are completely free from tension!

g) Anti-closing interlock

The control unit 3l (Fig. 9) only transmits closing signals when springs 27 d-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 3la through a linkage. Deliberate blockage of closure for specific control purpose can be effected by the control magnets Fig. 10e which hold the release cam 3la out of engagement when the coil voltage fails.

h) Available models (to suit customers' requirements)

**Electrical Control Components**

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

Arbitrary remote control is blocked as shown in Fig. 10e.

5. Assembly and Operation

The breaker frame 48a/ b (Fig. 1 and 2) is bolted construction for supporting the interrupter chambers and also for fixing the complete unit (see attachment holes 47 in Fig. 1) 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. 1) 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 located in the driving mechanism (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. 2, 3 and 7). Each interrupter chamber requires approximately 15.6 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 not 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. 2 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. 1 and 7d).

2. After loosening the four screws 12c (Fig. 7d), lift out the complete pressure equalising chamber 15 (Fig. 1 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. 1 and 6) must be loosened. Under no circumstances may 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. 1 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. If, 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 909 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 LM 2g is a mineral oil with the following characteristics:

Viscosity at 20° C
Neutralization number
Flash-point (Marcusson)
Ash content (incombustible material)

30 - 60 centistokes
0.2
140° C
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 the prevent instruction)

Note:

The information required under 1, 2 and 3 must be quoted even if the order is accompanied by a sample, as 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.
### For the breaker pole

<table>
<thead>
<tr>
<th>Item</th>
<th>Piece</th>
<th>Fig.</th>
<th>Item</th>
<th>Piece</th>
<th>Fig.</th>
</tr>
</thead>
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<tr>
<td>Arcing finger</td>
<td>14c1</td>
<td>8</td>
<td>7a</td>
<td>14c2</td>
<td>8</td>
</tr>
<tr>
<td>Arcing finger spring</td>
<td>14b</td>
<td>8</td>
<td>7a</td>
<td>14b</td>
<td>8</td>
</tr>
<tr>
<td>Contact tip</td>
<td>18a</td>
<td>1</td>
<td>7d</td>
<td>18a</td>
<td>1</td>
</tr>
<tr>
<td>Switch rod complete</td>
<td>18</td>
<td>1</td>
<td>7d</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Roller contact complete</td>
<td>17</td>
<td>1</td>
<td>7b</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Interrupter chamber complete</td>
<td>12</td>
<td>1</td>
<td>7d</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Sealing ring</td>
<td>19k</td>
<td>1</td>
<td>7c</td>
<td>19k</td>
<td>1</td>
</tr>
<tr>
<td>Seal</td>
<td>15b</td>
<td>1</td>
<td>7a</td>
<td>15b</td>
<td>1</td>
</tr>
<tr>
<td>Seal</td>
<td>14a</td>
<td>1</td>
<td>7a</td>
<td>14a</td>
<td>1</td>
</tr>
<tr>
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<td>13a</td>
<td>3</td>
<td>7a</td>
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<td>3</td>
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<td>7a</td>
<td>20a</td>
<td>1</td>
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<tr>
<td>Seal</td>
<td>16a</td>
<td>1</td>
<td>7a</td>
<td>16a</td>
<td>1</td>
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<tr>
<td>Seal</td>
<td>19h</td>
<td>1</td>
<td>7c</td>
<td>19h</td>
<td>1</td>
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### For spring operating mechanism

<table>
<thead>
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<th>10a/b</th>
<th>10a/b</th>
</tr>
</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</td>
</tr>
<tr>
<td>Motor</td>
<td>30</td>
<td>1</td>
<td>9</td>
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Captions to Illustrations

**Fig. 1** Low-oil-volume circuit-breaker type SBK 12 mc 500 with spring operating mechanism, viewed from the interrupter chamber side.

**Fig. 2** Low-oil-volume circuit-breaker type SBK 12 mc 500 with spring operating mechanism, viewed from the mechanism side.
Fig. 3 Type SBK 12 mc 500, fitted with three primary relays type HB, viewed from the mechanism side.

Fig. 4 Low-oil-volume circuit breaker type SBKJ 12 mc 500 mounted on a trolley for metalclad installation, viewed from the interruptor chamber side.

Fig. 5 Type SBKJ 12 mc 500 circuit-breaker, viewed from the mechanism side.

Fig. 6 Spring operating mechanism for low-oil-volume circuit-breaker type SBK 12 mc.

Fig. 7a,b,c & d Assembly diagrams of interrupter chamber of one pole of a type SBK 12 mc 500 circuit-breaker.

Fig. 8 Dismantled main parts of the spring actuating mechanism.

Fig. 9 Diagrammatic view of spring operating mechanism, spring 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**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>10</td>
<td>Trolley</td>
</tr>
<tr>
<td>11</td>
<td>Supporting insulator</td>
</tr>
<tr>
<td>12</td>
<td>Quenching chamber, complete</td>
</tr>
<tr>
<td>12a</td>
<td>Washer</td>
</tr>
<tr>
<td>12b</td>
<td>Spring washer</td>
</tr>
<tr>
<td>12c</td>
<td>Screw</td>
</tr>
<tr>
<td>12d</td>
<td>Screw</td>
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<tr>
<td>12e</td>
<td>Upper Connection screw</td>
</tr>
<tr>
<td>12f</td>
<td>Washer</td>
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<tr>
<td>12g</td>
<td>Spring washer</td>
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<tr>
<td>12h</td>
<td>Clamping plate</td>
</tr>
<tr>
<td>12i</td>
<td>Screw</td>
</tr>
<tr>
<td>12k</td>
<td>Screw</td>
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<tr>
<td>12l</td>
<td>Lower connecting flange</td>
</tr>
<tr>
<td>12m</td>
<td>Lower connection bolt</td>
</tr>
<tr>
<td>12n</td>
<td>Upper connection flange</td>
</tr>
<tr>
<td>13</td>
<td>Contact holder complete</td>
</tr>
<tr>
<td>13a</td>
<td>Sealing ring</td>
</tr>
<tr>
<td>13b</td>
<td>Retaining ring</td>
</tr>
</tbody>
</table>
13c  Steel ball
13d  Screw
13e  Spring washer
13f  Washer

14  Retainer for contact fingers complete
14a  Sealing ring
14b  Spring
14c  Replaceable contact fingers  14c/1 for 1250 A
     14c/2 for 1600 A

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
16a  Seal

17  Roller contact complete
17a  Conducting stud
17b  Plate
17c  Plate
17d  Washer
17e  Nut
17f  Nut
17g  Roller complete
17h  Angle piece
17i  Screw
18 Switch rod complete
18/1 for 1250 A
18/2 for 1600 A

18a Contact tip
18b Pressure ring
18c Switch rod with guide

19 Mechanism housing complete
19a Switch lever complete
19b Split pin
19c Pin
19d Washer
19e Fulcrum pin
19f Locking key
19g Retaining ring
19h Seal
19i Threaded bush
19k Sealing ring
19l Lever complete
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
2lf Loading shaft
2lg Bevel gear
2lh Sprocket complete
2li Bevel gear complete
2lk Bush
2ll Spring ring
2lm Clip
2ln Roller chain
2lo Split link
2lp Ball bearing
2lq Ball bearing
2lr Screw
2ls Nut
2lt Spring washer
2lu Retaining ring
2lv Washer
2lw Castle nut
2lx Split pin
2ly Washer
2lz Pinion

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
22o  Tension spring
22p  Washer
22q  Retaining ring
22r  Retaining ring
23  Gearing complete
23a  Gear shaft
23b  Bevel pinion
23c  Bush
23d  Spacer bolt
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  Interlock rod
24f  Guide
24g  Nut
24h  Spring ring
24i  Retaining ring
24n  Spring ring

25  Hand crank complete
25a  Bearing bracket complete
25b  Shaft
25c  Bush
25d  Bush
25e  Angle bracket
25f  Stop
25g  Crank handle
25h  Sleeve
25i  Angle bracket
25k  Locking pin
25l  Locking pin
25m  Cyl. pressure spring
25n  Bevel gear wheel
25p  Cyl. 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  Right pin
26d  Sleeve
26e  Shaft
26f  Washer
26g  Split pin
27   Spring frame (with power storage mechanism)
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
27a  Spring washer  
27t  Retaining ring  
28  Switch rod  
28a  Switch rod complete  
28b  Bush complete  
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  
28σ  Peg  
28p  Retaining ring  
28q  Washer  
28r  Spring washer  
28s  Spring ring  
28t  Washer  
28u  Additional "ON" spring  
28w  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 Tripping coil
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 no-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 rodding
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 Partition
54 Front housing
55 Roller
56 Tulip contact