L.V. CIRCUIT BREAKER
N250/320/400

SWITCH DISCONNECTOR
NS250/320/400

SWITCH
NSa250/320/400

INSTRUCTIONS FOR USE AND MAINTENANCE
12. ELECTRICAL DIAGRAM

Explanations:
P  front fitting
L  left fitting
D  right fitting
f  fixed circuit breaker
i  draw-out circuit breaker
KSm limit motor switch
M  motor operator
Q  circuit breaker
K1-K4 auxiliary switches
SK1-SK2 auxiliary switches for signalling on-trip-off
OI  shunt trip
OP  undervoltage release
KS  auxiliary switch of shunt-trip
O  off button
I  on button

Notes:
a) Contact for signalling on-trip-off are shown in the position when the circuit breaker is not tripped.
b) In the circuit breaker only parts from the order are fitted.
c) In the circuit-breaker can be fitted on the left side only one field 2, 3 or 4 and on the right side only one field 5, 6, 7 or 8.
d) Fittings signed with --- lines are not delivered with the circuit breaker.
9. SWITCH-DISCONNECTORS TYPES NS250, NS320, NS400 AND SWITCHES TYPES NSa250, NSa320, NSa400

Switch-disconnectors and switches are derived as special version from circuit breakers types N250, N320 or N400. They have the same overall dimensions as the circuit breakers from which they are derived.

10. MAINTENANCE

Before carrying out any servicing, open the circuit breaker and disconnect power to the circuit breaker (power circuit and auxiliary circuits)!

Under normal operating conditions perform the following operations once a year. Under more severe conditions repeat them every six months:

a) wipe off dirt and soot with a clean, dry rag
b) clean the arc chute
c) if necessary, clean the main contact surface with a fine file or emery cloth
d) check the surfaces of the isolating contacts; clean with solvent
e) check the condition of all connections; remove all traces of oxidation with fine emery cloth; clean with solvent; firmly tighten all screws and bolts

11. WEIGHTS (3p)

N250
Fixed circuit breaker/switch-disconnector/switch with front terminals: 3.7/3.5/3.6 kg
Fixed circuit breaker/switch-disconnector/switch with rear terminals: 4.4/4.2/4.3kg
Draw-out circuit breaker/switch-disconnector/switch with front/rear terminals: 7kg

N320/400
Fixed circuit breaker/switch-disconnector/switch with front terminals: 4.3/4.1/4.2kg
Fixed circuit breaker/switch-disconnector/switch with rear terminals: 5.3/5.1/5.2kg

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1. **INSPECTION ON RECEIPT**

Each circuit breaker is shipped in a carton containing also the fittings requested with the order. Contents are to be carefully examined on arrival. If damage has occurred, notify our factory within five days from the date of receipt.

2. **STORAGE**

A circuit breaker is to be kept in its carton in a dry room.

3. **INSTALLATION**

3.1 **Installation sites**

The open installation may be adopted only for dry non-dusty rooms and where the circuit breaker does not suffer blows. For dusty, moist, salty or corroding locations, enclosure or switchboard mounting is advised.

3.2 **Minimum distance [mm] (fig. 1)**

![Earthing Wall Diagram]

- Earthed wall
- Earthed wall protected by a 3mm thick isolated sheet

1. Remove the circuit breaker cover.
2. Fit the switches to proper seat on the right side of thermomagnetic release block.
3. Introduce cables into duct (1). Break the diaphragm on the right side of the circuit breaker cover and introduce the cable duct (1) (For fitting the auxiliary switches for circuit breaker tripped indication, remove diaphragm (2) on the circuit breaker cover).
4. Refit the circuit breaker cover.
5. Check the electrical performance of auxiliary switches with the circuit breaker open, closed and tripped. Should performance not be correct, bend suitably lever (3) for circuit breaker closed or open or lever (4) for circuit breaker tripped indications.

The same operations are to be done for mounting the auxiliary switches on the left side of the circuit breaker.

8.8 **Auxiliary switches for indications: breaker open, closed or tripped (fig. 20)**

![Auxiliary Switches Diagram]

1. Set transparent protection (2) on the circuit breaker (see fig. 21).
2. Pierce the self-adhesive label (1) through the two side holes. Secure the protection (2) on the cover with the insulating nails (3).

8.9 **Transparent protection (fig. 21)**

![Transparent Protection Diagram]
8.7 Auxiliary switches for indication: service position, isolated position
(Fig. 18 and 19)

1. Draw the circuit breaker out of the stationary portion.
2. To the stationary portion (1) secure the switches for indication "service position" (2) with screws (3) (Fig. 18), or seat switch for indication "isolated position" (6) (Fig. 19).
3. Lead the cables through slots 4.
4. Connect the circuit breaker to the stationary portion.
5. Check the electrical performance of switches with the circuit breaker connected and isolated.
   Should performance not be correct, bend properly levers (5) for indication "service position", that is lever (7) for indication "isolated position".

3.3 Installation position (Fig. 2)

4. EL. CONNECTIONS

4.1 General

The connections must be performed careful; the contacts surface of the connections must be flat and clean.
Any burrs, dents and traces can be the reason of remarkable partial warming.

Check the conditions of contact surfaces: burr, dents or oxidation traces are to be removed by a fine file or emery cloth, then clean carefully using a rag drenched with tricloroethylene.

- Copper conductor should be tin-plating, silver plating or nickel plating and coat with neutral grease (at least in the area of contact with the circuit breaker terminals).
- Aluminium conductor should be cleaned using a metallic brush and coat with neutral grease
- In the case of cable connections it is advisable to use cable lugs (except the circuit breakers with direct cable connection).
- Tighten the screws and nuts with prescriptive torques (see 4.2)

4.2 Cable sections and tightening torques

<table>
<thead>
<tr>
<th></th>
<th>N250</th>
<th>N320/400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>max. width mm</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>max. thickness mm</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>tightening torque Nm</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Cable front connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>min. diameter mm</td>
<td>Ø6</td>
<td>-</td>
</tr>
<tr>
<td>max. diameter mm</td>
<td>Ø16</td>
<td>-</td>
</tr>
<tr>
<td>tightening torque Nm</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Extended front connection</td>
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<td></td>
</tr>
<tr>
<td>diameter mm</td>
<td>20x5</td>
<td>25x5</td>
</tr>
<tr>
<td>tightening torque Nm</td>
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<tr>
<td>Rear threaded</td>
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<tr>
<td>diameter mm</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>tightening torque Nm</td>
<td>19</td>
<td>25</td>
</tr>
</tbody>
</table>
5. INSTALLATION

5.1 Fixed circuit breaker with front or cable terminals (fig. 3)

1. Drill the sheet steel and door to the template shown on the figure 3.
2. Remove the cover plates (see 5.3.1). Install the circuit breaker with the screws, washers and nuts supplied with the breaker itself. For breakers N320/400 and N250 with extended terminals is necessary to put extended terminals on the front terminals on the breaker (fig. 3). Refit the cover plates. On the door install the door flange with the supplied screws and nuts.

8.6 Undervoltage release (fig. 17)

1. Remove the circuit breaker cover.
2. Accommodate the undervoltage release on its seat at the left side of thermomagnetic release block.
3. Introduce cables (1) into duct (2).
4. Break the diaphragm on the left side of the circuit breaker cover and introduce the cable duct (2).
5. Refit the circuit breaker cover.

8.6.1 Check the undervoltage release performance (fig. 17)

It must be impossible to close the circuit breaker begin the release not energized. Begin the circuit breaker closed, if the release is deenergized, the circuit breaker must trip.

Should performance not be correct, bend suitably lever (4) (fig. 17)).
8.4 Terminal protections (fig. 15)

1. Fit the pieces (2) to their seats on the rear of the case in correspondence with securing screws.
2. Install the circuit breaker.
3. Fit the terminal protections (3) to the circuit breaker with sealing screws (4).
4. If fixing screws are to be sealed, thread into screws (4) the wire (5) and seal it.

8.5 Shunt trip release (fig. 16)

1. Remove the circuit breaker cover.
2. Accommodate the shunt trip release on its seat at the left side of thermomagnetic release block.
3. Introduce cables (1) into duct (2).
4. Break the diaphragm on the left side of the circuit breaker cover and introduce the cable duct (2).
5. Refit the circuit breaker cover.

8.5.1 Check the shunt trip release performance (fig. 16)

It must be possible to close the circuit breaker begin the shunt trip release not energized. When the shunt trip is energized, the circuit breaker must trip cutting the feeding circuit trough limit switch (3). Should performance not be correct, bend suitably lever (4) (fig. 16).

5.2 Fixed circuit breaker with rear terminals (fig. 4)

1. Drill the sheet steel and door to the template shown on the figure 4.
2. Install the rear terminals (see 5.3.2). When are removed the circuit breaker's cover plates, install the circuit breaker with the screws, washers and nuts supplied with the breaker itself. On the door install the door flange with the supplied screws and nuts.
5.3 Draw-out circuit breaker with front or rear terminals (fig. 5 and 6)

1. Drill the sheet steel (channel), lateral carrier sides and door, shown on the figure 5 or fig. 6.
2. Draw the circuit breaker out of the stationary portion (see 6.2.1).
3. Fasten the stationary portion with guides on the sheet steel or channel, lateral carrier sides with screws and washers supplied with the circuit breaker.
   On the door install the door flange with the supplied screws and nuts. (see 5.3.3).
4. Put the circuit breaker on guides (see 6.2.2).

**Draw-out circuit breaker with front terminals**

![Holes drilling plan (sheet steel)](image1)
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8.2.2 Motor operator – dimension drawing and holes drilling plan (fig. 14)

[Diagram of Motor operator with dimensions]

8.3 Sealing screws (fig. 15)

1. Replace the standard screws with the special ones (6).
2. Thread a wire (7) into the holes of screws as shown on the figure 15 and seal.
8.2 Motor operating mechanism
8.2.1 Operations (fig. 13)

a) Remote closing operation
   1) Circuit-breaker in open position
      Turn the handgrip to closing position (or press the closing push-button); the motor starts
      and closes the circuit breaker in less than one second
   2) Circuit-breaker in tripped position
      Turn the handgrip to opening position (or press the opening push-button); the motor
      starts and reloads in less than one second. If the circuit breaker is equipped with
      “tripped” indication, the reloading is shown by the disappearance of the indication itself.
      Then operate as instructed under point 1.
      Note: When tripping is due to thermal releases, wait some minutes before resetting.

b) Remote opening operation
   1) Motor controlled operation
      Turn the handgrip to opening position (or press the closing push-button); the motor starts
      and opens the circuit breaker in less than 0.5 seconds

c) Closing operation at site
   This operation is performed manually only in case of emergency such as energy failure, fault
   etc., by turning the shaft (1) with wrench (2) attached to the motor operating mechanism. The
   closing operation is shown by the white indicator to letter "I".

d) Opening operation at site may be performed in two ways:
   1) by rotating the shaft (1) in anticlockwise with wrench (2). Indicator to letter "0" shows the
      opening operation.
   2) by pressing the red push-button (4) marked "0". This operates the trip bar and the circuit
      breaker trips instantaneously. Yellow indicator (3) shows the opening operation.

---

**Fig. 13**

**Fig. 6**
5.3.1 Removal of cover plates (fig. 7)

1. Open the circuit breaker.
2. Screw out the four screws (2) to remove the cover plates (1) (fig. 7).

5.3.2 Mounting of rear terminals (fig. 8)

1. Open the circuit breaker.
2. Remove the cover plates (see 5.3.1).
3. Screw down the side (1) and centre (2) systems on the terminals that tighten nuts (3) means of a box wrench.
4. Fit on the systems the side and centre insulating tubes (4) i (5).
5. Tighten nuts (6) and washers (7) as shown on the figure 8.
6. Refit the cover plates.

8.1.2 Mounting the rotary handle mechanism on the door (fig. 11 and 12)

1. Install the circuit breaker in the panel or enclosure taking care that the clearance between the door and the circuit breaker is that indicated on figure 12.
2. Drill the door to template of figure 12.
3. Secure the transmission group (5) with gasket (6) to the door with screws (7) and split washers (8).
4. Fit the door flange (9) with screws (10).
5. Fit the handle (11) on the shaft (12) and fit with screw (13) and washer (14), then fit the screw plug (15).

When the circuit breaker is closed, the plate (16) enters the piece (2) slot and prevents the door from being opened.
7.2 Rated and setting currents for thermomagnetic releases

<table>
<thead>
<tr>
<th>Release</th>
<th>Range of thermal releases adjustment depending on ambient temperature I₁ (A)</th>
<th>El. mag. trip Iₑ(A)</th>
<th>Mag. release only Iₘ(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10°C</td>
<td>20°C</td>
<td>30°C</td>
</tr>
<tr>
<td>-</td>
<td>MIN</td>
<td>MAX</td>
<td>MIN</td>
</tr>
<tr>
<td>R</td>
<td>60</td>
<td>30</td>
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</tr>
<tr>
<td>B</td>
<td>60</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>R</td>
<td>100</td>
<td>110</td>
<td>140</td>
</tr>
<tr>
<td>B</td>
<td>100</td>
<td>110</td>
<td>140</td>
</tr>
</tbody>
</table>

1) L rated current of circuit breaker for pertinent type of release and temperature of environment.
2) Values valid for a.c. For d.c. multiply values by 1.5.

The tolerances of electromagnetic release’s are ±20% (IEC/EN 60947-2).

8. FITTINGS
8.1 Rotary handle mechanism
8.1.1 Mounting the parts of rotary handle on circuit breaker (fig. 11)
1. Remove the circuit breaker cover and replace the standard handle with the shorter one (1).
2. Refit the circuit breaker cover and screw up the screws.
3. Secure the piece (2) as shown on the figure 11, on the circuit breaker cover with screws (3) and washers (4).

Note: Above operations is not necessary if is ordered the circuit breaker with rotary handle (all parts mounted).

5.3.3 Door flange for draw-out circuit breaker (fig. 9)
1. Drill the door (1) to the template shown on the figure 5 or 6.
2. On the door secure the flange (2) and gasket (3) with screws (4) and nuts (5) (fig. 9).

6. MANIPULATION
6.1 Lever operating mechanism
The lever operating mechanism may be in three positions:
1. upwards: circuit breaker closed; indication "I"
2. downwards; circuit breaker open; indication "O"
3. intermediate; circuit breaker tripped

6.2 Draw-out insertion operations on a draw-out circuit breaker
Before operations "draw out" and "draw in" the circuit breaker must be in open position.
6.2.1 Isolation and draw-out operations (fig. 10)

1. Fit the proper lever (1) taking care that forks (2) engage the stationary portion pins (3) and that the lever pins (4) enter proper holes (5) in the moving portion.
2. Push upwards-locking levers (6).
3. Push downwards the lever (1) till the circuit breaker is isolated.
4. Take lever (1) off.
5. Push locking levers (6) downwards and draw the breaker to draw-out position.
6. Push locking levers (6) upwards and take the moving portion off.

6.2.2 Insertion operation (fig. 10)

1. Push locking levers (6) upwards.
2. Introduce the moving portion guides (7) into those of stationary portion and push the circuit breaker till the first locked position.
3. Fit the proper lever (1) taking care that forks (2) engage the stationary portion pins (3) and that the lever pins (4) enter proper holes (5) in the moving portion.
4. Push locking levers (6) downwards.
5. Push upwards the lever (1) till levers (6) plunge. The circuit breaker is then inserted.

7. OVERCURRENT THERMOMAGNETIC RELEASES

7.1 Time-current curves

- a) thermal release; cold state
- b) thermal release; hot state
- c) magnetic release; maximum setting value $I_2=10I_1$
- d) magnetic release; minimum setting value $I_2=5I_1$
- e) circuit breaker’s breaking time