Motor-drive mechanism, type BUE 2
Technical guide
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Applications
The motor-drive mechanism is designed for outdoor operation of the on-load tap-changers UBB, UCG, VUCG, UCL, UCC and UCD.

Design
BUE contains all the necessary equipment for operation of the tap-changer. A large range of special equipment can also be supplied in order to fulfill all customers’ requests. Complete paralleling and voltage regulation systems can also be supplied to supplement the motor-drive and the tap-changer.

Cabinet
The cabinet is manufactured of welded sheet metal aluminium. Standard color RAL 7035 or Munsell 5.5B 5.5./1.25. Environmental class C4 according to ISO 12944-2. Other colors and environmental classification are available on request.

The door can be hinged on either the left or right hand side. Provision is made to fit padlocks. The door is sealed and the glued window is UV-protected.

The cabinet can be supplied with two different fixing devices, either with attachment lugs for screwing directly to the transformer side or with anti-vibration pads. The bottom has a flange opening for cable connection. On delivery the opening is covered with a 5 mm thick light-alloy cover.

The cabinet has two vents. Filters prevent insects from entering. The anti-condensation heater is permanently connected. The motor drive functions satisfactorily down to -40 °C (-40 °F). Cabinet lighting is automatically switched on when the door is opened.
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Locking device prepared for padlock</td>
</tr>
<tr>
<td>4</td>
<td>Air vent</td>
</tr>
<tr>
<td>7</td>
<td>Outgoing shaft</td>
</tr>
<tr>
<td>9</td>
<td>Lifting eye (under the roof)</td>
</tr>
<tr>
<td>10</td>
<td>Counter</td>
</tr>
<tr>
<td>11</td>
<td>Tap-change in progress indicator</td>
</tr>
<tr>
<td>12</td>
<td>Position indicator with draghands for max. and min. position</td>
</tr>
<tr>
<td>13</td>
<td>Shaft for hand crank</td>
</tr>
<tr>
<td>20</td>
<td>Hand crank</td>
</tr>
<tr>
<td>21</td>
<td>Descriptions and circuit diagram</td>
</tr>
</tbody>
</table>

**Fig. 1. Motor-drive mechanism, type BUE.**
Ambient air temperature
The ambient air temperature requirements for the motor-drive mechanism are shown in Fig. 2. The normal operating range is between –40 °C and +60 °C.

The motor-drive mechanism has been type tested at ambient air temperatures of –40 °C and +70 °C.

Connection of motor-drive mechanism to tap-changers
The connection between the tap-changer and the mechanism is made by an outgoing shaft through the top of the mechanism cabinet.

The motor-drive mechanism must be shaded from sun radiation by screens. It must be specially equipped if the ambient temperature exceeds +70 °C.

Normal operating range. (50 W heater shall operate). The temperature inside the cabinet should not exceed +75 °C.

Extra 100 W heater is required.
Extra 100 W heater and anti-condensation coverage are required.
ABB should be consulted.

Rating plate
The rating plate shows data for both the tap-changer and motor-drive mechanism and is placed on the front door of the motor-drive mechanism.

Extra 100 W heater is required.
Extra 100 W heater and anti-condensation coverage are required.
ABB should be consulted.

Fig. 2. Motor-drive mechanism ambient air temperature.

Fig. 3. Example of rating plate.
Principles of operation

Local control
Control selector switch (S1) in position LOCAL. Raise impulse is given by control switch (S2). Contactor (K2) is thereby energized and will be kept so via starting contact (S11:1-2) and its own holding contact. The motor (M1) starts running and soon the maintaining contact (S12:3-4) closes and takes over the control of the motor contactor (K2). At the end of the operation, the contact (S12:3-4) opens, and after a period long enough to secure an opening of the contactor (K2) the starting contact (S11:1-2) closes again. A brake, operated by the arm for the maintaining contact, makes the drive stop in the normal service position.

The lowering operation is carried out in a similar manner.

Remote control
Control selector switch (S1) in position REMOTE. The control supply for the remote push buttons is then received from a terminal in the motor-drive cabinet and incoming control circuits for raise and lower impulses are to be connected to other terminals as shown in the diagram. Local operation is not possible when switch (S1) is in position REMOTE and remote operation is not possible in position LOCAL.

Step-by-step operation
Step-by-step relay (K1) connected so that only one tap change operation is obtained each time the raise/lower switch is operated.

Protection against running-through
A relay (K6) stopping the motor-drive mechanism in case of a failure of the step-by-step control circuit, which would cause a running-through of the motor-drive mechanism. The relay energizes the trip coil in the protective motor switch (Q1).

Contact timing
The contact timing diagram shows contact operating sequences for one change of the tap position, which is equal to 25 turns of the hand crank.

Through positions
(dead switching steps)

The connection of (S15) to auxiliary contacts on (K2) means that the drive in the event of a control supply failure in a through position will always move to a lower normal service position.
Fig. 4. Circuit diagram.
Fig. 5. Contact timing diagram.
E1  Anti-condensation heater
E3  Cabinet light
K1  Contactor, step-by-step operation
K2  Contactor, Raise
K3  Contactor, Lower
K6  Time relay, running-through protection
M1  Motor
Q1  Protective motor switch
S1  Control selector switch Local-0-Remote
S2  Control switch Raise-0-Lower
S5  Interlocking switch, open when hand crank is fitted
S6  Cam switch (Limit switch)
    S6.1: Lower tap position
    S6.2: Upper tap position
S8  Push button, Emergency stop
S9  Switch, door operated
S11 Cam switch
    1-2 Starting contact
S12 Cam switch
    1-2, 3-4 Maintaining contact
    5-6, 7-8 Interlocking contact
    9-10, 11-12 Auxiliary contact
    13-14, 15-16 Auxiliary contact
S14 Position transmitter, potentiometer
S15 Continuation contact

Remote control
Local control
Protective earth
Raise operation
Lower operation
Crank
Control
- Control selector switch, Local-0-Remote.
- Control switch, Raise-0-Lower.
- Hand crank for manual operation.

Protection
- Protective switch for the motor with thermal overload release and magnetic overcurrent release.
- Limit switches – in both control and motor circuits.
- Mechanical end stops.
- Interlocking contact in the control circuit to prevent electrical operation during manual operation.
- Interlocking contacts in raise and lower control circuits to prevent operation in wrong direction of rotation (with wrong phase sequence).
- Motor contactors are electrically interlocked.
- Protection against running-through in case of a failure of the step-by-step control circuit.
- Emergency stop push button.

Indication
- Mechanical position indicator.
- Drag hands for max. and min. position indication.
- Tap-change in progress indicating red flag.
- Operation counter.

(The above four items are visible through the window in the door).
- Position transmitter (potentiometer) for remote position indication.

Wiring
The wiring is of grey polyvinylchloride insulated, stranded wire. Type and data see Technical data. Every wire is marked with figures corresponding to terminal numbers. All external connections are made of thermo-setting resin. Type and data see Technical data.

Short circuit protection (fuses) for motor control and heater supplies, if required, should be installed in the control cabinet or other separate compartment.

Maintenance
The motor-drive mechanism should be inspected regularly, at the same time as the tap-changer is overhauled. For further information see the overhaul instructions. The inspection consists only of checking a few points and if necessary lubricating and greasing.

Optional accessories

Anti-condensation coverage
The motor-drive cabinet inside can be supplied with an anti-condensation coverage.

Outlet
Socket outlet according to DIN or ANSI. Prepared for socket outlet, i.e. holes are cut out in the panel and cables are wired to the panel for the outlet.

Extra heater
Extra heater, 100 W, with thermostat and switch for e.g. use in arctic climate.

Hygrostat
For tropical climate the heater can be controlled by a hygrostat.

Tropical version
The motor-drive mechanism can be equipped to meet the requirements for humid tropical climates and desert conditions.

Extra multi-position switches
Maximum 10 extra contact rows can be accommodated.

<table>
<thead>
<tr>
<th>Extra position transmitter</th>
<th>Auxiliary contact Break-before-make</th>
<th>Make-before-break</th>
<th>Voltage transformer switch (Furnace)</th>
<th>Step switch for parallel control</th>
<th>Follower switch for parallel control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of contact rows

1 1 1 1 2 2

Note: Master switch for parallel control is a break-before-make auxiliary contact.
## Technical data

<table>
<thead>
<tr>
<th></th>
<th>Standard version</th>
<th>Alternative versions</th>
<th>Special versions at an additional price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motor-voltage, 3-phase</strong></td>
<td>220-240/380-420 V, 50 Hz</td>
<td>208 V, 60 Hz</td>
<td>120/240 V, 1-phase, 60 Hz</td>
</tr>
<tr>
<td></td>
<td>220-240 V, 60 Hz</td>
<td>220-240 V, 60 Hz</td>
<td>230 V, 1-phase, 50 Hz</td>
</tr>
<tr>
<td></td>
<td>110/220 V DC</td>
<td>110/220 V DC</td>
<td>110-127/220 V DC</td>
</tr>
<tr>
<td><strong>Current</strong></td>
<td>1.9/1.1 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rated output</strong></td>
<td>0.37 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>1380 rev/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Voltage for control circuit</strong></td>
<td>110/120 V, 50-60 Hz</td>
<td>110 V, 220 V DC</td>
<td>110 V, 125 V, 220 V DC</td>
</tr>
<tr>
<td></td>
<td>220-230 V, 50 Hz</td>
<td>220-240 V, 60 Hz</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>240 V, 50 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Voltage for heater</strong></td>
<td>208-240 V</td>
<td>110-127 V</td>
<td>Optional</td>
</tr>
<tr>
<td><strong>Mechanical position indicator</strong></td>
<td>Lowest position marked 1</td>
<td>Middle position marked N (normal position)</td>
<td>Optional</td>
</tr>
<tr>
<td><strong>Terminal blocks in BUE 2</strong></td>
<td>33 - Phönix UK 5N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>41 A, 800 V, AC acc. to IEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cross section: 0.2-4 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. number that can be accommodated</strong></td>
<td>270 - Phönix UK 5N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 - Phönix URTK/S Ben</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 - Phönix URTK/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>150 - Phönix OTTA 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>150 - Klippon RSF1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cabling</strong></td>
<td>Type H07V2-K, 1.5 mm², 750 V, 90° C</td>
<td></td>
<td>Optional</td>
</tr>
<tr>
<td><strong>Test voltage on control circuits</strong></td>
<td>2 kV (50 Hz, 1 min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Anti-condensation heater</strong></td>
<td>50 W</td>
<td></td>
<td>Additional 100 W</td>
</tr>
<tr>
<td></td>
<td>(Functions without extra heater down to -40° C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Approx. operating time</strong></td>
<td>6 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of revolutions per operation of</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the outgoing driving shaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the hand crank</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. torque on the outgoing shaft</strong></td>
<td>60 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. number of positions</strong></td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Degree of protection of cabinet</strong></td>
<td>IEC 60529 IP 55</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Environmental class according to ISO DIS 12 944-2</strong></td>
<td>C4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dimensions
BUE 2 with attachment lugs

Fig. 6. Dimensions.

Mass: ~155 kg
BUE 2 with anti-vibration pads

Fig. 7. Dimensions.

Mass: ~155 kg