



1ZSE 5492-156 en, Rev. 4

On-load tap-changers, type UBB

User's manual

Original instruction

The information provided in this document is intended to be general and does not cover all possible applications. Any specific application not covered should be referred directly to ABB or its authorized representative.

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Manufacturer's declaration

The manufacturer **ABB AB**
Components
SE-771 80 LUDVIKA
Sweden

Hereby declares that

The products On-load tap-changers, type **UB**
with motor-drive mechanisms, types **BUE and BUL**

comply with the following requirements:

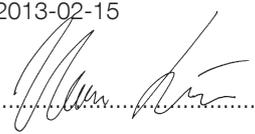
By design, the machine, considered as a component of a mineral oil filled power transformer, complies with the requirements of

- Machinery Directive 89/392/EEC (amended 91/368/EEC and 93/44/EEC) and 93/68/EEC (marking) provided that the installation and the electrical connection are correctly realized by the manufacturer of the transformer (e.g. in compliance with our Installation Instructions) and
- EMC Directive 89/336/EEC regarding the intrinsic characteristics to emission and immunity levels and
- Low Voltage Directive 73/23/EEC (modified by Directive 93/68/EEC) concerning the built-in motor and apparatus in the control circuits.

Certificate of Incorporation:

The machines above must not be put into service until the machinery into which they have been incorporated has been declared in conformity with the Machinery Directive.

Date 2013-02-15

Signed by 

Hans Linder

Title Manager Tap-Changers, Local Product Group Unit Components

Introduction

The UB range of on-load tap-changers manufactured by ABB has been developed over many years to provide maximum reliability. The simple and rugged design gives a service life equal to the service life of the transformer. Minimum maintenance is required for trouble-free operation. The only parts requiring maintenance are contacts that might need replacement during the service life, the insulating oil and the motor-drive mechanism.

The design allows ready access to all parts, making inspection and maintenance quick and simple.

The on-load tap-changers, type UB, is housed in the transformer tank. The motor-drive mechanism, type BUE or BUL, is attached to the transformer tank and connected to the tap-changer by means of drive-shafts and a bevel gear.

Safety warnings

The following warnings and notes are used in the manual:



WARNING

WARNING indicates an imminently hazardous situation, which if not avoided will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING also indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.



CAUTION

CAUTION indicates a potentially hazardous situation, which if not avoided may result in minor or moderate injury. It may also be used to alert of unsafe practices.

CAUTION may also indicate property-damage-only hazards.

Safety precautions

WARNING



Personnel operating and inspecting the tap-changer must have good knowledge of the apparatus and must be aware of the risks pointed out in this manual.

Personnel making electrical connections in the motor-drive mechanism have to be certified.

WARNING



Small amounts of explosive gases might come out from the breathing devices (dehydrating breather or one-way breather). Make sure that no open fire, hot surfaces or sparks occur in the immediate surroundings of the breathing devices.

CAUTION



After a trip from a supervisory device, an inspection must be made by a specialist. The diverter switch housing must be drained and the diverter switch lifted and carefully investigated before the transformer is reenergized.

Operation



WARNING

The handcrank must not be inserted during electrical operation.



WARNING

If the tap-changer is not in the exact position and the handcrank is pulled out, the motor-drive mechanism will start and go to the exact position if the power supply is on.



WARNING

If a failure in power supply occurs during operation, the operation will be completed when the power returns.

- The position indicator shows the actual tap-position.
- The draghands show the max. and min. tap-position between which the tap-changer has been working since last resetting.
- **For BUE:** The tap-change in progress indicator shows POSITION in service position, RAISE when operating in a raise operation and LOWER when operating in a lower operation.
- **For BUL:** The tap-change in progress indicator shows RED during operation and WHITE when the tap-changer is in service position.
- For resetting of the emergency stop turn the knob clockwise.
- The LOCAL/REMOTE switch. In position LOCAL the tap-changer can be operated by the RAISE/LOWER switch. In position LOCAL remote operation is rendered impossible. In position REMOTE the tap-changer is operated from the control room or by a voltage regulator. Local operation is not possible in remote position.
- In case of a failure in power supply for the motor-drive mechanism, it is possible to handcrank the tap-changer. Put the handcrank on the shaft. Make sure it has entered the slot in the shaft. Crank in the desired direction as per the information plate above the shaft. The number of turns

for one step is also shown on the rating plate. When the handcrank is inserted all electrical operations are rendered impossible. Continue cranking until the tap-changer in progress indicator shows POSITION for BUE or white colour for BUL.

- Thermostat for extra heater (option). We recommend a setting at +5 °C.
- Hygrostat for extra heater (option). We recommend a setting at approximately 60 %.
- Outlet (option) with earth fault protector.

Normally the tap-changer is controlled by a voltage regulator and no manual operation of the tap-changer and the motor-drive mechanism is needed.

Maintenance schedule



CAUTION

To maintain the high reliability of the tap-changer it is important that the inspections and the overhauls be carried out at the interval stated on the rating plate.



CAUTION

If the frequency of operations is very low and the tap-changer is filled with degassed oil after commissioning or overhaul, the gas cushion should be restored one month after filling. The absence of a gas cushion means a risk for a false trip of the pressure relay. See Restoring the gas cushion.

Maintenance of the tap-changer consists of three major steps:

- Inspection to be carried out by site personnel once a year (see below)
- Overhaul to be carried out by a specialist at intervals stated on the rating plate
- Contact replacement to be carried out by a specialist. The possible need for replacement is decided during overhaul.

A specialist is a service engineer from ABB or an authorized person trained by ABB for maintenance work on UB tap-changers.

Inspection



CAUTION

Approval should be given by the site engineer in charge for inspection as well as for operating the tap-changer.

It is recommended to inspect the tap-changer once a year. This principally concerns the motor-drive mechanism and refers to a visual inspection inside the BUE/BUL cabinet to check that nothing is loose, and that the heater is functioning.

In the motor-drive mechanism a counter registers every tap-change operation. During inspection the counter is read and noted. If possible, motor and counter are to be tested by operating one step and then back.

If the tap-changer has its own oil conservator, the breather and the oil level indicator on the oil conservator are to be checked according to the instructions from the transformer manufacturer.

The inspection is to be carried out while the transformer is in service.

On the conservator the following are to be checked:

- Oil level
- Breather

In the motor-drive mechanism the following items are to be checked:

- Motor and counter
- Emergency stop
- Heater
- Earth fault protector for the outlet (option)

If the tap-changer is equipped with an oil filter unit, the pressure drop over the filter is to be checked.

Required tools

The following equipment is required for the inspection:

- Set of screwdrivers
- Pen and note pad

Procedure



WARNING

Checking of the breather and the oil level must be carried out from ground level since the transformer is energized.

1. Checking of the breather



WARNING

The breathers and the tube from the conservator might contain explosive gases. No open fire, hot surfaces or sparks may be present when removing the breather.

Check the breather according to the instructions for the transformer.

If more than half of the drying agent has changed colour, it must be dried or replaced.

The drying agent usually starts to change colour from the bottom of the breather. If it changes colour at the top of the breather, there is a leakage in the connections to the conservator. Locate the leakage and seal it.

2. Checking of the oil level in the conservator

The oil level in the conservator should be according to the instructions in the transformer documentation.

3. Checking of the motor and the counter

Open the motor-drive cabinet door and turn the selector-switch to the LOCAL position. Then turn the control switch to the RAISE (LOWER) position.

Check that the motor works properly, the position indicator increases (decreases) one step, and the counter advances one step for each operation. Record the counter's value. The counter shows the number of operations run by the tap-changer (the overhaul schedule can be determined with the help of this information).

Turn the control switch to the LOWER (RAISE) position. Check that the motor also works properly in that direction, the position indicator decreases (increases) one step and the counter advances one step more.

Reset the draghands.

4. Checking of the emergency stop

Give a RAISE or LOWER impulse and after about one second press the emergency stop. The operation should be interrupted. Reset the emergency stop by turning the knob clockwise and set the protective motorswitch to ON. The started operation should now be completed. Operate back to service position.

5. Checking of the earth fault protector (option)

If the motor-drive mechanism is equipped with an outlet, the earth fault protector should be tested by pressing the test knob on the outlet on BUE or on the separate earth fault protector on BUL.

6. Checking of the heater



WARNING

Before starting any work inside the motor-drive mechanism the auxiliary power must be switched off.

N. B. The motor, contactors and heating element may be energized from separate sources.

Disconnect the incoming auxiliary power.

Open the control panel (BUE only).

Check by feeling with a finger on the protection plate that the heater has been functioning.

Close the control panel (BUE only). Reconnect the incoming auxiliary power.

Complete the inspection by turning the selector-switch to the REMOTE position and closing the cabinet door.

7. Checking of the oil filter unit (option)

If the tap-changer is equipped with an oil filter unit from ABB:

- Read the pressure gauge.
- Note the reading so the change from year to year can be seen.

If the pressure is 2.0 bar or more, or close to 2.0 bar, the filter insert should be replaced.

If moisture is suspected to have come into the tap-changer compartment, the filter insert should be replaced.

If a filter insert replacement is needed, call a specialist.

Also check for leakages. All leakages should be repaired!

Restoring the gas cushion

In case the tap changer has an oil filter unit from ABB that is installed according to our instructions, no outage of the transformer is necessary. See the manual for oil filter unit.

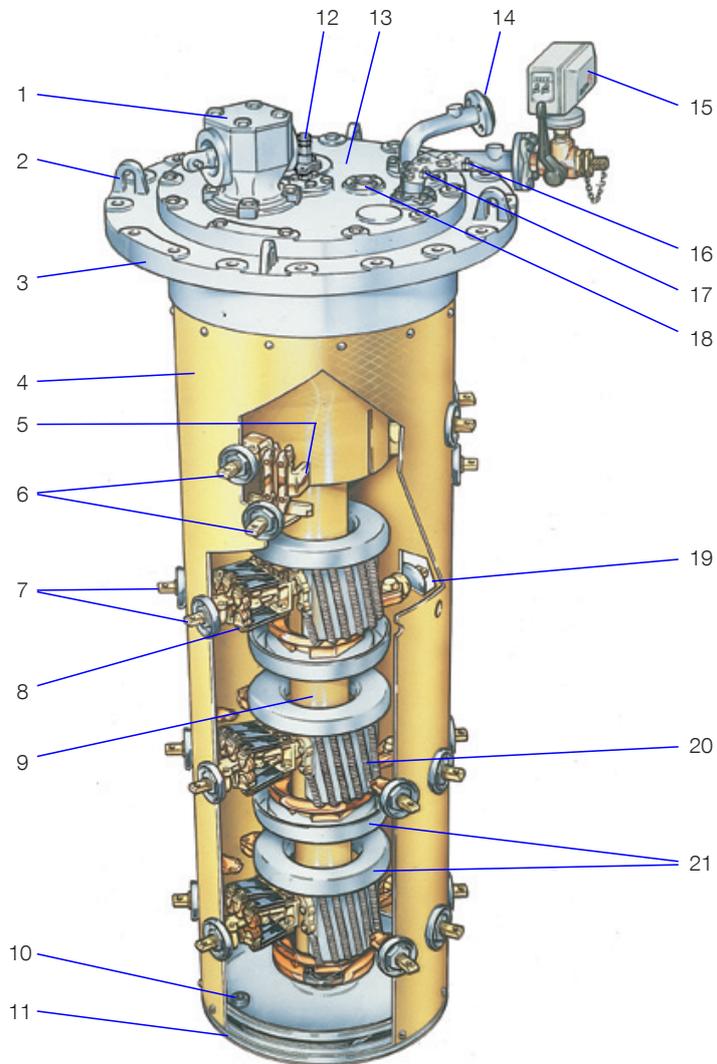


WARNING

Before any work is carried out on the tap-changer: Make sure that the transformer is disconnected and that earthing is properly carried out. Obtain a signed certificate from the engineer in charge.

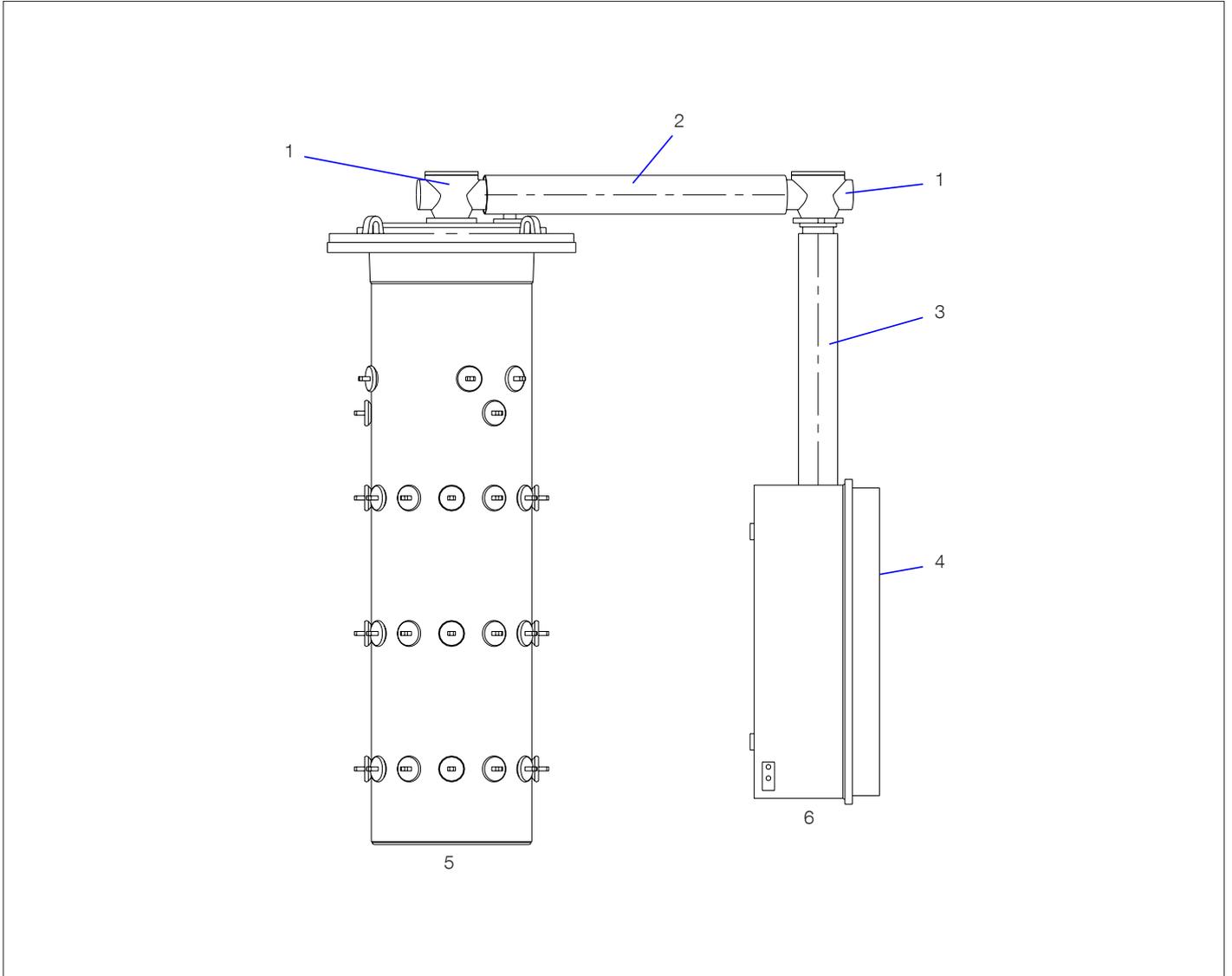
Proceed as follows:

1. Shut the conservator valve.
2. Connect a hand pump to the oil valve and start to suck out oil. Open the air release valve to the tap-changer and let air in. Stop pumping after about 2 litres of oil have been sucked out from the tap-changer.
3. Shut the air release valve and the oil valve and disconnect the pump.
4. Open the conservator valve and an appropriate gas cushion will be formed.



Layout of on-load tap-changer, type UBB.

- | | |
|---|---|
| 1. Bevel gear | 12. Valve R $\frac{1}{2}$ " for filling and draining of oil |
| 2. Lifting eye | 13. Top cover |
| 3. Flange | 14. Connection to conservator |
| 4. Cylinder | 15. Pressure relay |
| 5. Change-over selector moving contacts | 16. Air release valve to transformer tank |
| 6. Change-over selector fixed contacts | 17. Air release valve for tap-changer |
| 7. Selector switch fixed contacts | 18. Position indicator window |
| 8. Selector switch moving contacts | 19. Current collector terminal |
| 9. Selector switch shaft | 20. Transition resistor |
| 10. Bottom drain screw | 21. Shielding rings |
| 11. Bottom | |



Layout of on-load tap-changer system.

1. Bevel gear
2. Horizontal shaft with protection cover
3. Vertical shaft with protection cover
4. Rating plate
5. On-load tap-changer
6. Motor-drive mechanism



Cabinet layout of motor-drive mechanism, type BUE.

- | | |
|--|---|
| 1. Locking device prepared for padlock | 10. Tap-change in progress indicator |
| 2. Emergency stop | 11. Position indicator with drag hands for max. and min. position |
| 3. Air vent | 12. Shaft for hand crank |
| 4. LOCAL/REMOTE switch | 13. Protective motor switch |
| 5. RAISE/LOWER switch | 14. Door-operated switch for lamp |
| 6. Outgoing shaft | 15. Hand crank |
| 7. Lamp (40 W socket E27) | 16. Descriptions and circuit diagram |
| 8. Lifting eye | |
| 9. Counter | |



Cabinet layout of motor-drive mechanism, type BUL2.

- | | |
|--|--------------------------------------|
| 1. Position indicator with drag hands for max. and min. position | 8. Emergency stop |
| 2. Tap-change in progress indicator (Red: in progress, White: in position) | 9. RAISE/LOWER switch |
| 3. Counter | 10. LOCAL/REMOTE switch |
| 4. Outgoing shaft with multi-hole coupling half | 11. Protective motor switch |
| 5. Shaft for hand crank | 12. Air vent |
| 6. Locking device prepared for padlock | 13. Door-operated switch for lamp |
| 7. (Option) Outlet | 14. Lamp |
| | 15. Descriptions and circuit diagram |
| | 16. Hand crank |

Contact us

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