Product Information

Pole Wall Bushing GOFL 1050
Cable Pole Bushing GOFL 1300

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The bushing shall be de-energized and grounded when any kind of works is carried out on the bushing
Description

The design principle is shown in figure 1.

The conductor is an aluminium tube. The condenser body is wound on a separate tube, concentrically mounted on the conductor tube. The condenser body is clamped to the mounting flange.

A set of concentric tubes, inside the conductor tube, is pre-stressed and serve as a spring that holds the main bushing components together and provides adequate pressure on the gaskets at all expected temperature and load conditions.

The mounting flange on the bushing is a welded steel construction. It has a square inclined mounting plate for bolting the bushing to the wall structure.

The insulators are brown (grey on the Cable Pole Bus). The insulators are cemented to the fixing flange and bolted to the mounting flange. The indoor insulator is also cemented to a ring at the top that is bolted to the cover. See figure 1, item 22. In case of damage to the outdoor insulator, the indoor side is still sealed and no oil will leak into the valve hall.

The outdoor chamber is made of aluminium and has expansion space for the oil, sufficient for the expected temperature variations. The chamber is equipped with an oil level indicator of magnetic type. At the top of the chamber, there are oil filling plugs to be used for oil level adjustments. See maintenance instructions below.

The indoor cover is an aluminium alloy casting. The cover is equipped with an oil drain plug.

The mounting flange, the outdoor chamber and the indoor cover are protected by a two component paint.

The Pole bus bushing is designed to be mounted from the outside of the wall and with an angle between the bushing centre line and the horizontal of 22.5°. See figure 5. The Cable bus bushing is designed to be mounted vertically.

Voltage tap

The mounting flange is equipped with a voltage tap from the outer layer of the condenser body and a voltage limiting device as shown in figure 3. This device must not be disconnected and the voltage tap circuit left open in service.

The voltage tap must always be earthed or connected to an impedance.

Dimensions

The dimensions of the Pole bus bushing is shown on outline drawing 2756 040E-66. The dimensions of the Cable Pole bus bushing is shown on outline drawing 2756 040E-65.

Terminals

The outdoor and indoor terminal studs are shown in figure 2.
1. Terminal stud
2. End nut
3. Sealing plug M8 ABB Part No. 2522 731-A
4. Flexible connection
5. Outdoor chamber
6. Oil level indicator, magnetic type ABB Part No. 2744 322-DV
7. Spring device
8. Pre-stressed tubes
9. Transformer oil
10. Outdoor insulator
11. Condenser body clamping
12. Condenser body
13. Voltage tap
14. Voltage limiting device
15. Rating plate
16. Bushing mounting flange
17. Indoor insulator
18. Conductor tube
19. Indoor cover
20. Sealing plug M16 ABB Part No. 2522 731-B
21. ¾" valve
22. Bolting of indoor cover
23. Flexible flange (Pole Bushing)
24. Transducer (Roof Bushing)
25. Transducer supports

Figure 1. Bushing design
Mounting instruction

Packing
The bushings are delivered from ABB Components in wood cases with the bushing supported by cellular plastic blocks and fibre boards. The case is marked with Top End. On receiving, the bushing shall be inspected with regard to shipping damages.

Storing
Spare bushings, GOFL 1050, shall be stored leaned with the outdoor terminal at least 2500 mm above the indoor terminal. It shall be pointed out that the oil level indicators not will work correctly in this position. Spare bushings, GOFL 1300, shall be stored leaned with the outdoor terminal at least 4800 mm above the indoor terminal.
It is recommended to check for visible oil leakage regularly.

Lifting
When lifting the bushing out from the case, two lifting points have to be used on the bushing. A main lifting wire applied in the lifting holes of the mounting flange, carrying the whole mass of the bushing. A second sling shall be applied to the end of the bushing according to figure 4 to prevent the bushing from tipping. This sling is not allowed to be applied around the sheds because of the risk to damage the sheds. The required force is given in connection with the figure.

Place the bushing on the ground supported under the same places as in the case using the same blocks.

Mounting
Pole bus bushing
The flexible flange shall be mounted on the bushing while the bushing is placed on the ground. When mounting the bushing in the wall, the lifting tool according to figure 5 shall be used. The lifting hook is then applied to the lifting tool. When lifting, the bushing automatically will be leaned 22.5° from the horizontal. To let the air enter the expansion space in the outdoor chamber, the bushing must be kept at an angle larger than 30°, see figure 5, for at least 2 minutes. After that, the angle must be kept not lower than 15° to keep the air cushion in the top chamber.

Cable bus bushing
When mounting the bushing onto the roof, two lifting points have to be used on the bushing. Two main lifting slings applied in the lifting holes on the mounting flange carrying the whole mass of the bushing lifted by one crane. Another sling shall be applied to the top end of the bushing according to figure 6. The last sling shall be lifted by another crane.

The sheds shall be protected by boards tied around the indoor insulator during mounting the bushing through the wall / roof.
Tightening torque
Tightening torque for bolts M20 to mount the bushing in the wall is 420 Nm and 190 Nm for the M16 bolts that holds the flexible flange. The threads shall be oiled before assembly.

Connection of external conductors
The terminal studs are made of aluminium. Before connection of conductor clamps, the aluminium studs must be carefully wire brushed and greased with a proper contact compound.

Service and maintenance

Maintenance
The outdoor porcelain surface shall be kept hydrophobic. The method to be used is determined by the environment. Upon request, ABB Components will assist to work out a proper maintenance program. Units exposed to salt spray must be cleaned regularly.

The flexible flange on the Pole Bus bushing has certain parts made of steel that is not painted. At delivery, these parts have been protected by Tectyl. It is recommended to do an anti corrosion protection at normal maintainence of the equipment. See instruction in connection with figure 7!

In case of damage to the bushing, it must be sent back to ABB Components for repair end re-testing.

Control of the oil level
The oil level indicator, magnetic type, indicates a too low oil level by pointing on the red field on the dial. The oil level indicator shall always indicate on the green field.

Oil quality
For topping up of the bushing, dry and clean transformer oil according to IEC 296 shall be used. The plugs in top of the bushing shall be removed and the holes used when adjusting the oil level. See figure 1, item 3 and 20 and instructions below.

Opening and sealing of the bushing
The weather shall be dry if the sealing plugs in top of the bushing shall be opened. It is of utmost importance that the bushing always is properly sealed. Otherwise inleakage of water in the bushing may cause a catastrophic electrical failure. To ensure proper sealing when the bushing has been opened, the old gaskets of the sealing plugs shall always be replaced by new ones.

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The bushing is designed to work in a specific pressure interval and the internal pressure in the shall be 1 bar sometime when the mean bushing temperature rises from 0°C to 30°C. This means that if the bushing is unsealed (opened) below 0°C or above 30°C, it has to be opened next time the bushing means temperature is between 0°C and 30°C to reach ambient pressure (1 bar). After that, the bushing is sealed again.

**Oil sampling for gas in oil analysis**

It is not recommended to take oil samples regularly. However, if it is deemed necessary (i.e., after flashovers) oil sample can be taken.

- **Note 1:** The bushing shall be de-energized and grounded when oil samples are taken.

- **Note 2:** Oil samples shall not be taken when the mean bushing temperature is above 30°C or below 0°C.

Oil sample is taken through the ¾” valve on the bushing flange. *The plug shall be mounted in the valve after this operation.*

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**Figure 2. Assembly of terminal stud**

1. Terminal stud
2. Hexagon screw M8x40
3. Hexagon screw M10x60
4. Conical spring washer 8.4x18x1 (Belleville)
5. Washer 10.5x22x2
6. Gasket (O-ring) 99.1x5.7
7. Retainer ring for gasket

**Mounting of outer terminal**

The outer terminals are mounted at the factory. However, if the terminals for some reason are disassembled, assembly of the terminals shall be carried out according to the instructions below.

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The inner contact surfaces of aluminium, both on the bushing tube and on the terminal stud, are tin plated. Therefore no wire brushing or contact grease is needed. The surfaces shall be cleaned carefully before assembly. The gasket retainer ring, the gasket itself, and the outer terminal stud is assembled according to figure 2. The bolts that press the stud against the bushing tube must be tightened first. When this is done, the screws that hold the retainer ring is inserted and tightened in order to press the gasket into place. **It is extremely important in both cases to tighten evenly.** The bolts shall thus be tightened in steps, alternating on both sides.

**Figure 3. Voltage tap**

1. Tap  
   ABB Part No. 27 69 517-3
2. Grounding spring  
   ABB Part No. 9580 148-1
3. Cover  
   ABB Part No. 2749 515-2
4. Gasket (O-ring) 64.5x3  
   ABB Part No. 2522 731-A
5. Sealing plug M8 (complete)  
   ABB Part No. 2769 516-A
6. Bushing  
   ABB Part No. 2129 713-3
7. Pressing screw  
8. Disc spring  
9. Gasket (O-ring) 24.2x3  
10. Cable  
11. Layer of condenser body

The voltage limiting device is replaced according to the following instructions.

- Remove the cover, item 3
- Loosen the cables marked P and earth in the terminal box as well as the cable gland
- Replace the device and assembly according to above

**The test tap (2769 523-B) shall always be replaced by ABB employees.**
Figure 4. Lifting of bushing out of case

Note: If the bushing shall be packed in the case, the cellular blocks and fibre boards shall be placed in the same way as first delivered from ABB Components. Wood boards is not allowed to be placed under the bushing in the case. These shall be used to fix the bushing in axial direction in the case. 

\[ F = 2.5 \text{ kN for Pole Wall bus and } F = 6 \text{ kN for Cable Pole bus.} \]

Figure 5. Lifting of bushing at mounting

Keep the angle \( \alpha \geq 30^\circ \) before mounting of the bushing for a period of 2 minutes to let the air enter the top of the bushing.

After this procedure the angle must be kept \( \geq 15^\circ \).

Lifting tool ABB Part No 9778 751-A
Figure 6. Mounting of bushing into the roof

Note! Due to earth quake requirements, a spacer washer T=5 shall be placed between the bushing mounting flange and the roof flange. A seal will be necessary to avoid inleak of water.
Fig 7 Flexible flange for Pole Wall Bushing GOFL 1050

Certain parts of the flexible flange are made of steel that are not painted. It is recommended to do an additional anti corrosion protection at regularly maintenance. Suitable protection is TECTYL 506.

The surfaces to be protected are

1. Both ends of the shaft
2. The inside surfaces of the cardan ring and its supporting fork in the area close to the shaft
3. Guiding sleeves and disc nuts
4. Fastening details for the spring assembly (both ends) including washers on both ends of the bracket, nuts and ends of the bolts