

10.4 Bushing replacement

Bushing replacement is a common practice, taking place thousands of times every year. The most critical item to remember when replacing existing bushings is that you do not change the electrical geometry inside the transformer. Any change to the electrical clearances or insulation structure inside the transformer may lead to a transformer failure.

When replacing an existing bushing a number of key items need to be addressed before a replacement bushing is selected. The following is a list of items to be considered:

- Bushing mounting flange configuration; bolt circle diameter and number of bolt holes
- Bushing length below the flange, this is normally noted on the nameplate as the "L" dimension
- How is the bushing connected to the transformer winding? Via draw lead cable or conductor or connected to the bottom of the bushing
- Bottom terminal; threaded stud, two-hole spade or bottom plate
- Height of bushing above the mounting flange
- Bushing current rating

10.4.1 Replacing Bottom Connected Bushings

If the replacement bottom connected bushing meets all the dimensional requirements below the mounting flange as the existing bushing the only other item to consider is the shielding. Additional shielding is used on bushings rated 46 kV and above. (At 46 and 69 kV only a few designs utilized bottom plates that required additional shielding) The key item to confirm is the thickness and diameter of the bottom plate, it must not be thicker than the existing bushing's bottom plate nor larger in diameter.

If all the dimensions of the replacement bushing bottom plate are the same as the existing bushing and there is no damage to the original shield and terminal, it is recommended to utilize the original shield and terminal. This will avoid any changes to the original electrical design inside the transformer. If the original shield has been damaged you should consult with the original transformer manufacturer or industry recognized consultant on the replacement of the shield.

10.4.2 Replacing Draw Lead Connected Bushings

Replacing existing draw lead connected bushings presents several items that must be considered. The most critical item to consider is the height above the flange of the existing bushing versus the replacement bushing. If these dimensions are the same there are no concerns about changing the electrical geometry inside the transformer. However, if this dimension is not the same (+/- 25 mm) it would be advisable to use one of two options to insure that the original electrical geometry is maintained.

Option one, draw lead adapter is used when the replacement bushing's height above the mounting flange is longer than the existing bushing. A draw lead adapter that threads onto the existing draw lead stud is the quickest and easiest device to correct for the difference in height. Other types of draw lead adapters may be considered. The draw lead adapter makes up the height difference will insure that the electrical geometry inside the transformer does not change.

Option two, replacing the existing draw lead stud when the replacement bushing's height above the mounting flange is shorter than the existing bushing. This is a more complicated procedure requiring that the original draw lead stud be cut off at a specific point on the draw lead cable and either crimping or brazing on a new draw lead stud. Once this procedure has been completed it will insure that the electrical geometry inside the transformer does not change.

Another issue that may come up is different types of draw lead studs. Historically the draw lead stud was a threaded stud which transferred the load current to the top terminal of the bushing. In recent years new draw lead stud designs have been introduced into the marketplace. These new designs do not use threads to transfer current but rather multi-spring contacts. When you need to replace a bushing with this new design with a bushing that requires a threaded stud, option two above must be used during the replacement of the bushing.

For more details regarding draw lead bushing replacement refer to the instructions provided by the replacement bushing manufacturer.