

Checklists for Abnormal Power Factor Test Results in the Field

PCORE Engineering

All PCORE bushings are routine tested in the factory and the power factor results are put on the bushing nameplates. It is not uncommon to see the power factor test results in the field are slightly different from the nameplate values. It is mainly caused by the differences in the test sets and the testing environment.

However, a significant difference may indicate some testing issues in the field. The users may see significantly higher or lower values of either C_1 or C_2 power factors than the bushing nameplate values. Below are the checklists we recommend for the users to eliminate any testing issues:

1. Always check:
 - Make sure the test set works fine;
 - Make sure the test set-up is correct;
 - Make sure all groundings are proper;
 - Make sure there are no sharp wire strands sticking up in the energized test circuit that could cause corona;
 - Do not test a bushing in the crate.

2. If you have significantly **higher C_1 power factor** values during C_1 UST test:
If the bushing under test is H1, and the test is performed with the bushing in the transformer,
 - Connect all HV bushings (H1, H2, H3) together to the voltage source of the test set;
 - If neutral H0 exists, unground H0 and connect it to H1 as well as H2 and H3;
 - Connect all LV bushings (X1, X2, X3, and X0 if exists) together to the ground;
 - All voltage/test tap covers should be closed except for H1;
 - H1 bushing flange must be directly grounded through the “Guard” or ground lead. Remove painting or rust at connecting point on the flange if necessary;
 - Make sure the transformer oil is clean.
 - Clean & dry the bushing porcelain surface.

3. If you have significantly **lower or negative C_1 power factor** values during C_1 UST test:
 - Make sure the transformer oil is clean, if tested in transformer;
 - Clean & dry the bushing porcelain surface.

The following points (4 and 5) for C_2 tests are applicable ONLY to the bushings rated 115 kV and above which are equipped with voltage taps per IEEE standard.

4. If you have significantly **higher C_2 power factor** values during C_2 GST test:
 - If the bushing is tested in the transformer, try to isolate the bushing flange from transformer tank;
 - Make sure the transformer oil is clean, if tested in transformer;
 - Clean & dry the bushing voltage tap area;
 - Clean & dry the bushing porcelain surface;

5. If you have significantly **lower or negative C_2 power factor** values during C_2 GST test:
 - Clean & dry the bushing porcelain surface;
 - Make sure the transformer oil is clean.

For more information, check PCORE website and the following paper,

S. Zhang, “Analysis of some measurement issues in bushing power factor tests in the field,” *IEEE Transactions on Power Delivery*, vol. 21, no. 3, pp. 1350-1356, July 2006.