

IEEE Standards Interpretations for IEEE Std C57.19.00™-2004 IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings

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Interpretation Request #1

Topic: DC bushings IEEE Std C57.19.03™-2005 limits the air side connection to 70°C ie 30°C above the maximum ambient temperature of 40°C

The question posed was: "Why does the DC bushings IEEE Std C57.19.03-2005 limit the air side connection to 70°C ie 30°C above the maximum ambient temperature of 40°C?"

Discussion: As a result of extensive discussion, it was realized that the neither the IEEE relevant standards nor the IEC ones adequately address the problem.

It was thought that the limit was set low so as not to add heat to the bushing and thus not impact its thermal performance. There had been a study done in the past about the high number of DC Bushing failures and the dielectric test values were recommended to be 115% of the transformer test value.

This is probably a typical struggle between the supplier who wants to get the maximum out of a bushing and the user who wants a more conservative number for longer life.

Agreement: There appears to be general agreement that the number of 70°C is too low.

Proposal: For the purpose of a reply, it is proposed that it be kept simple with more details entered into the revision of the standard. Wording proposed is as follows:

"After review, the IEEE DC Bushing IEEE Std C57.19.03-2005 concurs that the air side terminal is allowed to go to 90°C (including the conductor one metre away from the connection which shall not vary more that +/- 5°C) providing the hot spot temperature of

the bushing does not exceed 105°C for an Oil Impregnated Paper (OIP) DC Bushing, This area is under review in the standard and may change.”

It is advisable that your OEM DC bushings supplier be contacted who may be able to provide more specific details.

Interpretation Response

That clause did not change from the 1991 document and there were not any discussions on it during the Working Group meetings for the 2004 document. With that said, and not having been involved with the development of the 1991 document, the following is offered: Unlike the other equipment you listed, OIP (oil impregnated paper) bushings have the inboard end immersed in transformer oil with temperatures of 65°K rise over ambient or 95°C. The paper insulation system is limited to a temperature of 105°C. OIP bushings cannot use thermally upgraded Kraft paper because that paper does not allow stable power factors for the bushing. Above that temperature the paper will experience a loss of life. This is why the connection terminals are limited as stated in the document. Solid dielectric bushing (ERIP), do not use oil so they can handle higher temperatures, however, today, the vast majority of HV bushings are OIP.