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THE ROLE OF THE CALIBRATOR

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1. INTRODUCTION

Sound level meters and calibrators have been with us for many years. IEC Standards for both instruments are currently being updated. This is badly needed for the calibrators as the current Standard is virtually unusable due to extremely tight tolerances and lack of test procedures.

The official name, sound calibrator, is in reality, a device which applies a known sound pressure level to a microphone inserted into the cavity of the calibrator. Not, however, any microphone which will physically fit into the cavity, but to a specific type of microphone.

A calibrator does not apply a "free field" or "diffuse field", these values are derived from the response of the specific microphone and appropriate corrections are made to the sound pressure level of the calibrator or are given in the instructions manual.

It must be remembered that there is a difference between free field response of the microphone on its own and its response when it is mounted correctly on the body of a sound level meter.

In order to avoid mistakes in the use of calibrators with sound level meters, the draft IEC 1672, in para 5.3 places the responsibility for giving instructions for the correct use of specific calibrators with sound level meters on the manufacturers of sound level meters.

When a sound level meter is presented for pattern evaluation tests, it is to be supplied with a calibrator dedicated for use with it. This is to ensure

that the sensitivity of the sound level meter is adjusted with the correct calibrator prior to undergoing the full test procedure. This is done at reference environmental conditions. At this time, the reference conditions given in the draft proposals for sound level meters and calibrators are not identical, but this situation should be resolved soon.

Most calibrators in use today provide only one sound pressure level at one frequency, but there are some which offer several levels and frequencies, one of which is the reference level and frequency.

For periodic verification tests the sound level meter must also be accompanied by a calibrator assigned for use with it.

In normal use, the calibrator is applied to the microphone of the sound level meter to make sure that the sound level meter is working correctly. Small sensitivity adjustments are normal, but significant departures from norm may indicate a change in the sensitivity of the sound level meter, perhaps major changes in the frequency range not covered by the calibrator. It is also possible for the calibrator to develop a fault. This simply means that big deviations from norm indicate that something is not as it should be.

A frequently met problem is that of incorrect application of the calibrator; at an angle thus stressing the microphone, violent insertion into the cavity which may damage the diaphragm, not allowing the pressure in the calibrator and microphone to stabilise after insertion.

Temperature problems may arise if the equipment is left in direct sunlight, raising the temperature to levels much above the atmospheric temperature. At temperatures below, say 5 C, some batteries perform very poorly, which may cause deterioration of the calibrator performance.

A calibrator may look like a solid piece of engineering, metal and, or plastic, but it is likely to suffer damage when dropped or knocked hard and

may give incorrect pressure levels and frequencies even if it appears to be working.

The Standard currently in force was written many years ago. It contains requirements but not tests for verification of same.

The present IEC TC29 Working Group 17 was given the task of adding verification procedures, but when the group commenced its work it was found virtually impossible. The tolerances for sound pressure levels and frequencies were too small, especially as they applied not only at the reference environmental conditions but over a wide range of atmospheric pressure, temperature and humidity. It was also found that the uncertainties of measurement, even by top national laboratories were large, eating well into the tolerances.

So, WG 17 decided to apply the tolerances given in the current document to reference conditions only, to note the exact performance if within the given tolerances and then to apply numerically the same tolerances for performance changes within the full range of environmental conditions.

Recommendations for maximum uncertainties for the various tests were given.

Periodic verifications can be carried out at reference environmental conditions.

WG 17 also recommends the creation of several classes according to their performance over the range of environmental conditions. The calibrator may fully meet all the requirements over the full range or over a slightly reduced range, it may meet either of these with or without corrections which need to be applied.

The general idea is for sound level meters and calibrators placed on the market to undergo pattern evaluation tests. A pattern approval certificate

issued by an approved laboratory is proof that the calibrator conforms with the requirements of IEC 942. This is then reconfirmed by periodic verifications.