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MICROPHONES FOR SOUND LEVEL METERS

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1. INTRODUCTION

The accuracy of acoustic measurements plays an increasing role, if legislation, prediction, and noise control shall be taken seriously. If the trafic intensity is doubled by year 2000, we should expect 3dB higher noise level, unless we reduce the emitted sound power from each vehicle with 3dB.

This calls for better and more accurate measurements. We need better monitoring equipment, better source location and source ranking equipment. Outdoor monitoring has undergone a development to more rugged, stable and accurately calibrated systems.

2. PERFORMANCE SPECIFICATIONS

The first edition of IEC 1672 describes performance specifications for sound measuring instrumentation. In general it is the aim to obtain comparable data within well defined accuracy limits for sound level measurements. The scope of the standard is to cover the measurement of sounds in the range of human hearing.

The present standard IEC 651:1979 and IEC 804:1985 have been used extensively and have in recent years been met by complete systems including windscreen and rain protection devices. It seems therefore inappropriate if IEC 1672 shall replace IEC 651 and 804 to exclude windscreens as specifically described in 5.1.16. The scope and title does not indicate that the standard is only valid for Sound Level Meters for indoor use. The application of Sound Level measuring instrumentation for outdoor use and under influence of airflow is extensive and should be included in this standard.

5.1.16.: A windscreen may be provided for the microphone. The specifications in this Internatinal Standard do not include the effect of windscreens on directional response, nor on the frequency response of a microphone enclosed within a windscreen, see also 7.2. should be deleted and replaced by:
5.1.16.: A windscreen alone or a windscreen and rain protection may be part of the microphone assembly. The specifications in this International Standard include the effect of such devices on the directional response and on the frequency response. The devices should not be removed unless the specification is maintained both with and without the devices ridgid mounted.

3. REGARDING POINT 5.2

Accuracy of indication at 1kHz under reference conditions. 1kHz is a practical reference frequency for electrical test purposes. It is not a practical reference frequency for acoustical testing.

IEC 651 gave a choice between 200 and 1kHz. If any particular frequency for reference in acoustical measurements should be preferred, it would be 250Hz, which is equally far from the errors introduced by difraction etc. at 1000Hz and above and from low frequency errors below 30Hz like acoustic leaks - adiabatic/isothermic conditions, low frequency impedance problems in amplifiers etc.

The use of 250Hz for testing of devices with only A-weighting may be more reliable using a -8.6dB correction related to 1kHz than making 1kHz mandatory. 1kHz calibrators are usually no more reliable than the sound level meters being tested.

4. 5.2.2.

5.2.2. should either be deleted or refer to a more serious calibration, whenever disagreement exists between the check device and the sound level meter.

5. A.6.2 ACCURACY OF INDICATION AT 1KHZ UNDER REFERENCE CONDITIONS

It is recommended to change the reference frequency to 250Hz or a suitable frequency between 200Hz and 1000Hz, which should be reported by the manufacturer.

5.GENERAL COMMENTS

The condenser microphones are generally very stable and rugged. Improved materials and manufacturing techniques have been introduced. The external polarized condenser microphones give very few problems. The sound level meters are equally improved, but have also grown in complexity and sophistication, keeping the reliability at a constant level for the total sound level instrumentation. (Fig1).

The use of prepolarized microphones has become more common. The prepolarized microphones contain an electrostatic charged layer of electret foil either as diaphragm material or as a layer placed on the back plate. The use of the prepolarized electret microphones of the electret diaphragm foil type should be discouraged for sound level meters except for inexpensive survey types outside the scope of this standard.

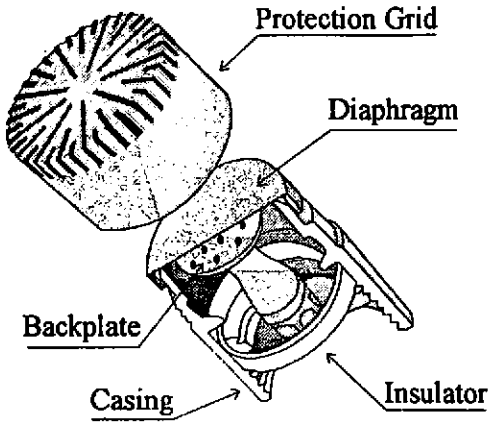
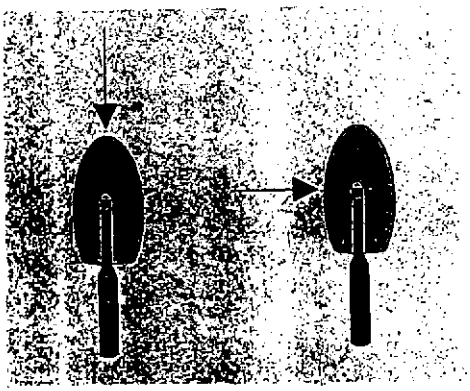


Fig.1. Basic elements of measurement microphone

The prepolarized microphones with the electret layer placed on the back plate may have the same quality using the same diaphragm material, insulator and housing as the external polarized microphones. However, the electret material cannot be as stable as an external polarization source. Furthermore changes due to excess pressure may cause local discharge and partly blocking of the diaphragm. This may occur in time intervals e.g. during calibration procedures, when a calibrator is placed over the microphone and disappear, when it is removed. This type of microphone may even be used for control of the sound pressure level of the calibrator, doubling the chance of introducing inaccurate calibration checks.The use of such techniques should be limited to Type 2 Sound Level Meters and Type 2 Calibrators.

Much effort is devoted to outdoor measurements (Fig.2), Aircraft fly-over and certification, Vehicle drive-by, Community noise etc. It is important that a new standard address the problems encountered in the use of the old standard and add improvements over the old standard. IEC 651 has served well. Improvements are needed for the many special applications, where experience has been gained.

The issue of e.g. IEC 1094 part 4 involving 1" - ½" and ¼" microphones (Fig.3) enable improvement in the sound level measurements regarding very low noise levels using 1" microphones. General noise level measurements using ½" microphones and high level short duration pulses using ¼" microphones. The IEC 1672 is written around ½" microphones. This should be made clear for the user.



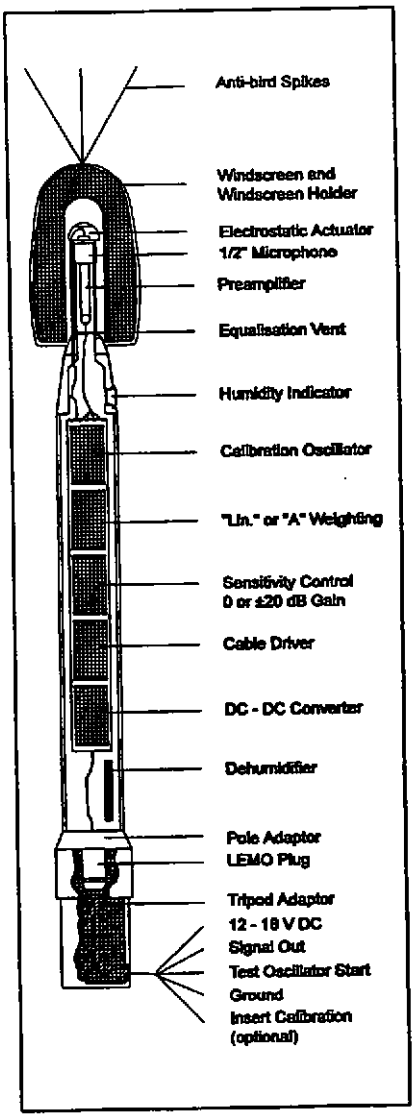


Fig.2. Outdoor Microphone Type 41AM and 41CM, built to IEC 651 system requirements

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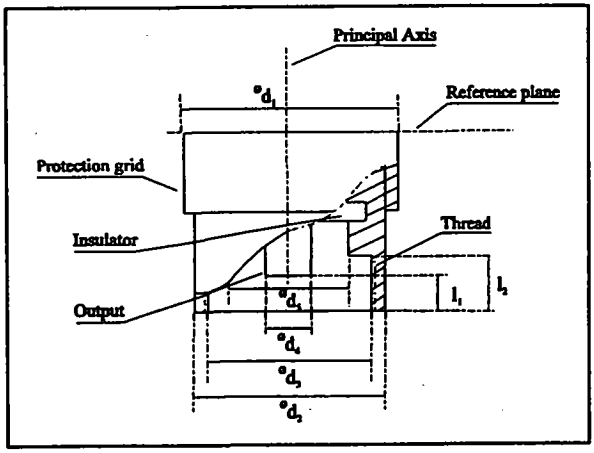

Dimension Symbol	Type WS1P/F/D	Type WS2P/F/D	Type WS3P/F/D
$^*d_1$	$23{,}77\ ^{+0{,}05}_{-0{,}1}$	$13{,}2\ ^{+0{,}05}_{-0{,}1}$	$7{,}0\ ^{+0{,}03}_{-0{,}05}$
$^*d_2$	23,77 ± 0,1	12,7 ± 0,1	6,35 ± 0,05
$^*d_3$	23,11	11,7	5,70
$^*d_4$	4 - 6	3 - 5	2 - 3
$^*d_5$	> 12,2	> 7,8	> 3,5
l_1	3 - 4	3,6 - 4,6	1 - 2
Length of thread l_2	> 2,7	> 2,2	> 1,6
Thread $^*d_3$	60 UNS-2B	60 UNS-2B	60 UNS-2B

Fig.3. Standardized dimensions for measurement microphones, IEC 1094 Part 4