Technical Note 1302

Measurement Microphones

The Uses of Measurement Microphones

The uses of measurement microphones are falling into two catalogues. One is the legal required measurements， and the other is the non-legal required measurements

Legal Required Measurements:

(1) Factory Noise: For measuring the noise level in the workplace for hearing protections. It is legal requirements for accurate and repeatable measurements.

(2) Environmental Noise: For measuring the noise level in the neighborhood from traffic, industries and open space performances

(3) Products Noise: For measuring noise emitting from industrial products..

For the legal measurements, the microphones or systems have to be calibrated annually by the Accredable Labs. The microphones used in this catalog have to meet Class 1 or Class 2 requirements according to IEC61672 standards. The microphones have to be stable to meet the annual calibration requirements. There are only a few companies manufacturing such microphones..

1) Non-legal Required Measurements

(1) Most of audio measurements are not regulated by legal documents. For example, the measurements of room responses, measurements of PA system, measurements of loudspeakers.

(2) Most of the customers are only interested in frequency responses in the data sheets.

The customers can only access the data provided by the manufacturers and will not recalibrated annually. The manufacturers' data may look very good at the factory release, but how above

the change of specifications during the normal uses? The sensitivity may drop 3 dB in one year time for some the measurement microphones.

There are many companies making measurement microphones for non-legal required measurements.

Measurement Microphone Standards

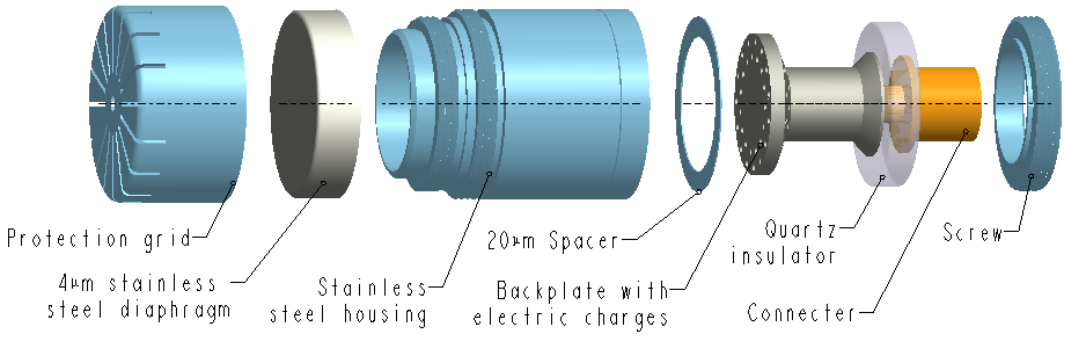
Those two standards are followed closely by legal required measurement microphones. IEC61094-4 specified the size and dimensions of the microphones. There are only three diameter sizes of the microphones, namely 1", 1/2" and 1/4" defined in the IEC61094. The microphone capsules are interchangeable for different manufacturers, i.e. a 1/2" microphones from B&K, Gras or BSWA (MicW) are precisely the same dimensions. The microphones can be calibrated by using Sound level Calibrators.

What is a good measurement microphone in for acoustical measurements? The IEC 61094 standards, entitled "Measurement Microphones" specified the requirements for the good measurement microphones. Besides the frequency responses, sensitivity, omnidirectional and dynamic range, there are a number of requirements for good measurement microphones.

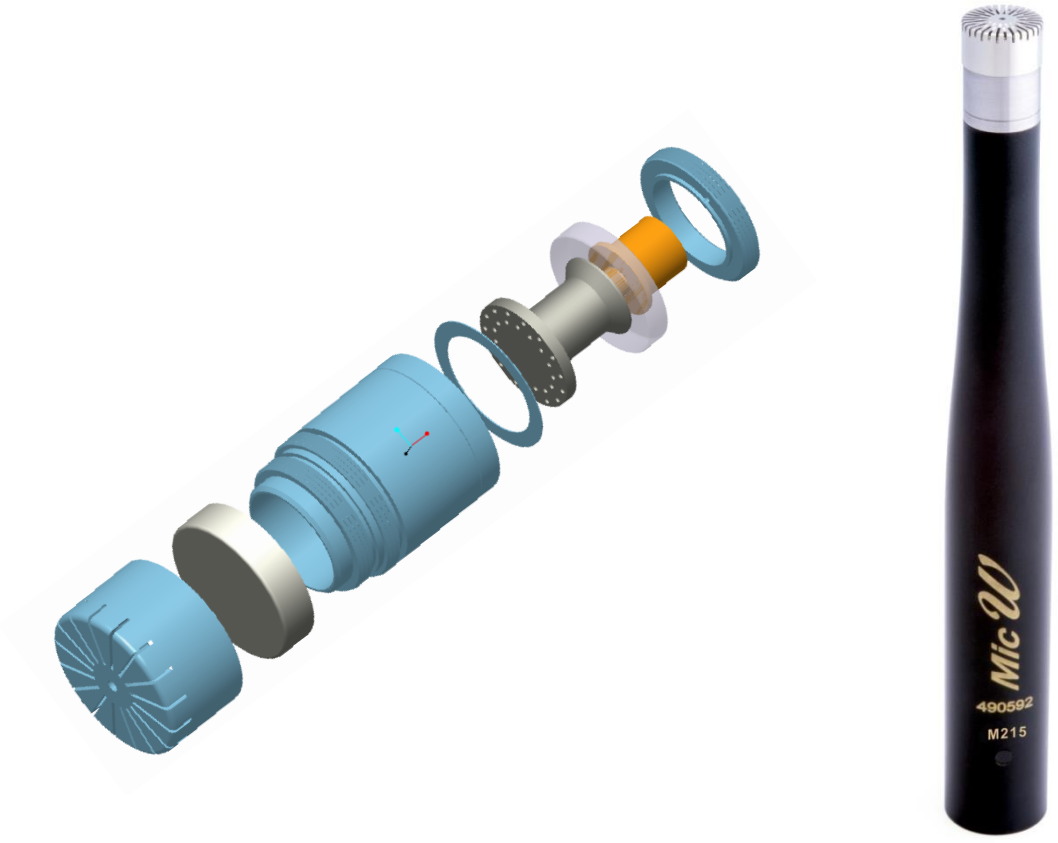
1) Calibrations: The microphone capable of being calibrated by the at least one of (a) a method specified in IEC 61094-2 or IEC 61094-3; (b) by comparison with a calibrated laboratory standard microphone; (c) by a sound calibrator as specified in IEC 60942. The majority of themicrophones on the market will face the calibration problems due to their structures or diameters.
2) Sensitivity stability with environments. The standards specified the sensitivity changes with temperature, humidity and static pressure shall be within; ±0.03 dB/C; ±0.001 dB/%; and ±0.03 dB/kPa for Class 1 microphones. The most of measurement microphones on the market do not have such specifications or not tested for environmental conditions.

Structure of M215 Capsule

It is easy to make flat response microphones at certain environmental conditions. But it is not easy to make microphones stable in changing the environments. When the temperature increases, the diaphragm will be expanded. It will result increase the sensitivity and dropping in high frequency responses. If the diaphragm is made of polymer with plastic insulator, the thermal expansion will significantly change the performance of microphones. The material used in M215 capsule is carefully selected to minimize the thermal expansions.



Mechanical Structure of M215 capsule



References

[1] IEC 61094-1: 1991, Measurement microphones - Part 1: Specifications for laboratory standard microphones
[2] IEC 61094-4: 1995, Measurement microphones - Part 4: Specifications for working standard microphones
[3] IEC 61094-6: 2004, Measurement microphones - Part 6: Electrostatic actuators for determination of frequency response
[4] IEC 61672-1 2002, Electroacoustics- Sound Level Meters