Speaker substitute characteristics

We consider that the sound should be evaluated by ears finally, but then our subjectivity enters, and therefore, the substitute characteristics subject to measurement by measuring instrument is now thought. Hereafter, we introduce the important characteristics especially to maintain and control the speaker quality. (Related standards: JIS C5532)

- Min. resonance frequency (fo)
  Normally, it is called "f0", and in JIS it is specified as the lowest frequency of the frequencies that the absolute value of the voice coil electrical impedance becomes extremely large.
  This resonance frequency is raised by the speaker vibration-system mass and suspension compliance such as edge, damper or the like supporting it, and an important factor to decide the low-pass reproduction limit in the speaker.
  In addition, f0 is considerably changed by the temperature, humidity, input voltage, supporting method, etc. If the strict value is needed, it is necessary to apply the specified input voltage and take a measurement at 20 °C/65 % (R.H.) with no baffle.

- Impedance
  The electrical impedance characteristics of the speaker shows an impedance change of the voice-coil by frequency, and generally it is as shown in Fig-1. And, in normal case, sudden rising is done at f0, and then rising is done according to the voice coil inductance.

- Speaker input
  This item is specified in JIS as that in the case the voltage in voice coil terminals is applied to the just resistance of which value is equal to the rated impedance, it is an electric power to be consumed by that resistance value, and it means the electrical power to be calculated as follows:

  \[ P = \frac{V^2}{Z} \]

  Where, \( P \) = Speaker input (W), \( V \) = Voltage in voice coil terminal (V), \( Z \) = Rated impedance of speaker (Ω)

- Rated input
  This is to allow the speaker to operate adequately, and individually the voltage calculated from the specified input and rated impedance is applied to the voice coil terminal, and then it is required to meet the following tests.
  1. Operating test (Program source)
  2. Unusual noise test (Sine wave)
  3. Distortion factor test
  4. Continuous load test or Service life test

  (JIS NOISE: A specified noise as a programme test signal)
  In addition, the band-specified speaker uses the specified dividing network.
  For more details of these testing methods, see the Japanese Industrial Standard (JIS).
  If continuously used as rated input herein, the value is to endure the thermal destruction due to temperature rise of voice coil and mechanical fatigue of the support-system (edge, etc.) and flexible wire. But, if the operation is kept long exceeding the rated input, we cannot ensure the normal operation and service life. So, you must take care.

  Additionally, for use with a set having extremely large internal resistance, that is, if to be used under the condition that is near the constant current driving, the signal voltage to be applied to the speaker is so increased near f0, therefore, a danger such as bottom contact, baffle contact, etc. may be raised.

  Therefore, although there is an allowance to some extent, you are required to use within the specified voltage over the entire frequency band.
  As for ambient temperature for operation, setting is done with 40 °C at high temperature side and –20 °C at low temperature side as a standard, but if it is different from for general, such as for car mounting and outdoor, it should be subject to other specifications, and contact us.

- Max. input
  The maximum input power which the loudspeaker drive-unit or system can handle without causing permanent damage, for a period of 1 min when the signal is a noise signal simulating normal programme material shall be specified. The test shall be repeated 10 times with intervals of 2 min. The maximum input power is specified separately, confirming the bottom of voice coil no hitting and no other mechanical damages. In addition, the band-specified speaker uses the dividing network specified individually. For acoustic load, unless otherwise specified, the enclosure specified in our standard is to be used.

---

Panasonic

Mar. 2005
Sound pressure frequency characteristics
It is a representative one of the speaker substitute characteristics, and the constant voltage (or constant current in rare case) is to be applied to the speaker to determine the relationship between the frequency and sound pressure level. Thus, it is a guide for the speaker reproducing band, conversion efficiency, flatness, etc. and also considered as a most general guide in judging the speaker tone quality. The sound pressure frequency characteristics is measured and shown pursuant to the Japanese Industrial Standard (JIS), but because it is in the commonly-called JIS standard enclosure, if placed in the actual set, it receives an influence, thereby coming to a different characteristics, by various conditions such as set cabinet size, internal capacity, construction of speaker mounting part, grill opening rate and shape, extent of rear air vent, etc. Therefore, in order to obtain a good tone quality, it is necessary to have a total sound-making including the speaker, cabinet, amplifier characteristics or the like.

Output sound pressure level
It is a value of showing the speaker efficiency, that is, if the input of 1 W is applied to the speaker, the sound pressure is generated at the distance of 1 m on the central axis from the reference point of that speaker. This sound pressure is pointed herein, and the sound pressure of 3- or 4-point frequency specified individually is calculated and averaged for indication.

In addition, for small-diameter speaker or the like (rated input less than 1 W), the measurement is made with the input of less than that value, and then it is converted to 1 W for indication.

In addition, the frequency characteristics and sound pressure level of the speaker receive an influence by the conditions of a room to be measured, baffle shape of JIS standard enclosure, etc., therefore, in some case comparison with other company’s measured data may not be possible to do.

Assurance of speaker reliability
For assurance activities of our speaker’s reliability, we have made efforts to improve the reliability of products and parts materials, develop the testing method, accumulate the trouble analysis and correcting remedies, and maintain and complete the reliability control system for long years.

The following are some examples of our concrete reliability assurance activities.
① Complete reliability design and evaluation in a stage of new product design.
② Implementation of reliability evaluation in a first lot
③ Trouble analysis and correcting remedies in activity
For determinations on assurance of products reliability, please contact us if the special specification is required, although the reliability assurance items, conditions or the like are specified with speakers classified by applications; for general, car mounting and outdoor.

Mounting of speaker
Since the tone quality, sound volume and service life of the speaker are influenced largely by its mounting method, please consider the following points.

Speaker mounting part to be clean
If there are foreign matters such as solder chip, lead (wire) chip, iron powder, etc. at the speaker mounting part and around it, an unusual noise may be emitted by touching the vibrating cone in the worst case, therefore, care should be taken.

Speaker performance receiving large change by baffle (cabinet)
The reproducing capacity of the speaker low sound part is influenced largely by the baffle (cabinet).
A large speaker is preferable in the allowable range, and making a cylindrical part at speaker front and placing obstructions, thick cloth, etc. are not good generally. In addition, if the content is excessively packed to the speaker rear and there is a large gap or hole between the speaker and baffle, the baffle may become useless and the original performance of the speaker may not utilized fully, causing emission of unusual noise in some case, and therefore care should be taken.

Forcible tightening causing unusual noise emitted
In mounting the speaker, consideration is necessary so that the force shall be uniformly applied to the entire frame periphery. If a part is pressed strongly for mounting, the frame and cone may be deformed or an unusual noise may be emitted.

Soldering in place to terminal lug
Soldering to terminal lugs should be prevented from the part where the voice coil lead (or flexible wire) is soldered. If “B” shown below is soldered, the lead (wire) (flexible wire) may be loosened, thereby causing emission of unusual noise in some case.

Speaker Rear Side
(Terminal lug)

DC electrical potential prevented applying to voice coil
If the DC electrical potential [allowing voice coil to reach (+)] is applied between the voice coil and frame (chassis), the voice coil may be disconnected due to electrolytic corrosion. In particular, if its wire diameter is thin or it is used in a place with much moisture, it may be so dangerous and should be avoided absolutely.