
International Standard



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Road vehicles — Sound signalling devices — Technical specifications

Véhicules routiers — Avertisseurs sonores — Spécifications techniques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 512 was developed by Technical Committee ISO/TC 22, *Road vehicles*, and was circulated to the member bodies in October 1978.

It has been approved by the member bodies of the following countries :

Australia	Italy	New Zealand
Austria	Japan	Romania
Bulgaria	Korea, Dem. P. Rep. of	South Africa, Rep. of
France	Korea, Rep. of	Spain
Germany, F. R.	Mexico	Sweden
Iran	Netherlands	USSR

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Belgium	United Kingdom
Czechoslovakia	USA
Switzerland	

This second edition cancels and replaces the first edition (i.e. ISO 512-1974).

Road vehicles — Sound signalling devices — Technical specifications

1 Scope

This International Standard specifies the acoustic properties, such as the spectral distribution of acoustic energy, the sound pressure level, and also the test conditions of sound signalling devices which may be mounted on self-propelled vehicles, mopeds included, and function by means of an electrical current; electro-pneumatic sound signalling devices are included.

This International Standard concerns also sound signalling devices operated directly by compressed air.

2 Field of application

This International Standard applies to the following three categories classified according to their operating conditions:

Category 1: Sound signalling devices supplied by alternating current.

Category 2: Sound signalling devices supplied by direct current.¹⁾

Category 3: Sound signalling devices supplied by compressed air.

It does not apply to sound signalling devices producing a sequence of sounds of various frequencies used on priority vehicles: police vehicles, fire-fighting vehicles, and ambulances, for example.

3 References

ISO 3833, *Road vehicles — Types — Terms and definitions*.

IEC Publication 51, *Recommendations for direct acting indicating electrical measuring instruments and their accessories*.

IEC Publication 179, *Precision sound level meters*.

IEC Publication 225, *Octave, half-octave and third-octave band filters intended for the analysis of sounds and vibrations*.

4 Measuring apparatus

The measurements of the sound pressure levels shall be made using a sound level meter conforming to IEC Publication 179 and, for the determination of acoustic characteristics, applying a test procedure which is at least as good as that specified in IEC Publication 225.

When a device for protection against wind is used, its effect on the measuring accuracy is to be taken into account according to the indications of the manufacturer.

The electrical measurements shall be made using instruments of the class 0,5. (See IEC Publication 51.)

5 Expression of results

The results of the measurements of the sound pressure levels shall be in relation to 2×10^{-5} Pa (N/m²) weighted in accordance with the curve A and expressed in dB(A).

6 Test conditions

6.1 Test site and ambient conditions

6.1.1 The measurements of the sound pressure levels shall be carried out preferably in an anechoic room in which the cut-off frequency shall be lower than the frequency of the lowest component of the sound emitted by the sound signalling device under test.

6.1.2 Alternatively, the measurements of the sound pressure levels may be carried out either in a semi-anechoic room or on an open space²⁾. No other person than the observer taking the readings on the meter shall stay in the vicinity of the sound signalling device or of the microphone, since the presence of bystanders may have an appreciable influence on the meter readings. Care shall be taken to avoid reflections from the ground in the area of measurement (for example, by placing a set of absorbing screens).

1) Electro-pneumatic sound signalling devices are included, i.e. sound signalling devices consisting of an electro-compressor supplying trumpets.

2) An open space may be, for example, a space having a radius of 50 m, the central part of which, being intended for the execution of the measurements, shall be practically horizontal over at least 20 m radius, and covered with concrete, asphalt or any similar material, and be free from long grass, loose soil or ashes.

It shall be ensured that the hemispherical divergence is complied with to a limit of 1 dB(A) within a hemisphere of at least 5 m radius up to the maximum frequency to be measured, and this mainly in the measuring direction and at the height of the apparatus and of the microphone.

6.1.3 The ambient noise level within the entire range covered by frequencies of components of the sound emitted by the warning device shall be at least 10 dB(A) lower than the sound level of each of the components. However, this requirement is not applicable to components the measured sound level of which is lower than 70 dB(A).

6.1.4 No measurements shall be carried out when the wind speed is greater than 5 m/s.

6.1.5 The ambient temperature during the measurements shall be between + 10 and + 30 °C.

6.1.6 In case of dispute, only measurements carried out in an anechoic room will be taken into consideration.

6.2 Mounting of the apparatus

The apparatus to be tested shall be mounted in the manner specified by the manufacturer and, in any case, shall be fixed rigidly on a massive metallic base, the mass of which exceeds 10 times that of the apparatus to be tested and is at least equal to 30 kg.

The base shall be so designed that reflections from its faces, and also its vibrations, are without any noticeable effect on the measuring results.

6.3 Supply conditions for the measurement of acoustic characteristics

6.3.1 Supply with alternating current

For sound signalling devices operated by an a.c. supply, the electric current shall be supplied by a generator of the type normally used with this type of sound signalling device. The acoustic characteristics of this sound signalling device shall be recorded for generator speeds varying within the range between the maximum speed indicated by the generator manufacturer for continuous running and 50 % of that speed. There shall be no other electrical load on the generator during this test.

The endurance test described in clause 8 shall be carried out at a speed stipulated by the equipment manufacturer and selected from the range quoted above.

6.3.2 Supply with direct current

For sound signalling devices operated by a d.c. supply, the supply voltages shall be 6,5 V or 13,0 V or 26,0 V measured at the terminals of the source of electrical energy, corresponding respectively to rated voltages of 6 V or 12 V or 24 V.

The resistance in the system shall be :

0,05 Ω for a rated voltage of 6 V,

0,10 Ω for a rated voltage of 12 V,

0,20 Ω for a rated voltage of 24 V,

the resistance of the terminals and contacts being included in these values.

The supply voltage shall in no case vary more than $\pm 0,1$ V, ripple voltage included, if any.

For electro-pneumatic sound signalling devices, the connections between the trumpets and the electro-compressor shall be made according to the indications of the manufacturer.

6.3.3 Supply with compressed air

Pneumatic sound signalling devices shall be supplied according to the indications of the manufacturer.

6.4 Positioning of the microphone and the apparatus

6.4.1 The apparatus to be tested shall be placed at the same height as the microphone. This height shall be between 1,15 and 1,25 m.

6.4.2 The axis of maximum sensitivity of the microphone shall coincide with the acoustic axis of the apparatus indicated by the manufacturer.

6.4.3 The microphone shall be so placed that its diaphragm is at a distance of $2 \pm 0,01$ m from the sound outlet plane of the apparatus. In the case of apparatus having more than one sound outlet, the nearest sound outlet plane relative to the microphone shall be selected for the distance to the microphone.

6.4.4 The fast time constant shall be used.

7 Acoustic characteristics

7.1 Sound signalling devices shall emit a continuous and uniform sound; their acoustic spectra shall not vary substantially during operation. For sound signalling devices operated by an a.c. supply, the requirements apply only at a constant generator speed, this speed being within the range specified in 6.3.1.

7.2 Measured under the conditions specified in the preceding clauses, the sound level of the apparatus shall not exceed the following values :

a) 115 dB(A) for sound signalling devices intended mainly for use on mopeds;

- b) 120 dB(A) for sound signalling devices intended mainly for use on motorcycles of up to and including 12 kW power output of the engine;
- c) 125 dB(A) for sound signalling devices intended mainly for use on vehicles having at least four wheels, and for motorcycles with more than 12 kW power output of the engine.

Furthermore, the sound pressure level within the frequency band of 1 800 to 3 550 Hz shall be greater than that of each component of a frequency exceeding 3 550 Hz and in any case equal to or greater than :

- a) 90 dB for sound signalling devices intended mainly for use on mopeds;
- b) 95 dB for sound signalling devices intended mainly for use on motorcycles of up to and including 12 kW power output of the engine;
- c) 105 dB for sound signalling devices intended mainly for use on vehicles having at least four wheels, and for motorcycles with more than 12 kW power output of the engine.

Sound signalling devices complying with the conditions mentioned under c) may be used on vehicles mentioned under a) and b); sound signalling devices complying with the conditions mentioned under b) may be used on mopeds.

7.3 The time elapsed between the starting of the apparatus and the moment when the sound reaches the minimum value prescribed above shall not exceed 0,2 s when measured at an ambient temperature of 23 ± 5 °C.

7.4 In the case of multiple-tone sound signalling devices in which each sound-emitting unit is capable of functioning independently, the minimum values specified above shall be obtained when each of the single units is operated separately. The maximum value of the sound pressure level shall not be exceeded when all single units are operated simultaneously.

7.5 Peaks apparently unrelated to the characteristics of the general sound level shall not be taken into account in the reading.

7.6 The test time shall not exceed 30 consecutive seconds, after which it is necessary to allow the sound signalling device under test to cool down naturally for at least 20 min.

7.7 Test under extreme conditions

7.7.1 For sound signalling devices of category 2, it should be ensured that, at an ambient temperature of 23 ± 5 °C, these sound signalling devices shall emit a sound which is crackle-free and not obviously out of character for this type of equipment when the supply voltage is equal to the test voltage (defined in 6.3.2) ± 15 %.

At the test voltage, normal functioning of the apparatus shall be maintained when it has been brought to a temperature of $- 10$ °C, then subsequently $+ 40$ °C.

7.7.2 For sound signalling devices of category 3, it should be ensured that, at an ambient temperature of 23 ± 5 °C, these sound signalling devices shall emit a sound not obviously out of character when the supply pressure is equal to the test pressure (defined in 6.3.3) ± 25 %.

8 Endurance test

When supplied with current under the conditions provided for in 6.2 and 6.3, the sound signalling device under test shall be operated at least 50 000 times at the rate of 1 s operation followed by 4 s rest. The apparatus shall be ventilated by a current of air having a speed of about 10 m/s. The ambient temperature of the test room shall be between $+ 15$ and $+ 30$ °C.

If several devices are subjected simultaneously to this endurance test, appropriate precautions must be taken so that their operation does not result in mutual interference.¹⁾

When, after 25 000 operations, the characteristics of the sound level have changed in relation to those of the apparatus before the test, adjustment of the apparatus according to the indications of the manufacturer, without dismantling its constituent elements, may be carried out. For electro-pneumatic sound signalling devices, lubrication is allowed every 10 000 operations with the lubricating oil recommended by the manufacturer.

After the endurance test specified above, the sound signalling device, which may have been adjusted without dismantling its constituent elements, shall continue to comply with the acoustic characteristics specified in 7.1 to 7.6.

1) For example, it should be ensured that the supports of the various devices are mechanically isolated from each other; or they could be operated one after the other instead of simultaneously, if they are mounted on the same support.

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