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Acoustics — Measurement of the *in situ* sound attenuation of a removable screen

Acoustique — Mesurage de l'atténuation acoustique in situ d'un écran amovible

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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International Standard ISO 11821 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

Annex A of this International Standard is for information only.

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Introduction

This International Standard specifies *in situ* methods for the determination of the sound attenuation performance of removable sound-protecting screens for industrial purposes. A screen is any object (e.g. panels, flexible curtains, etc.) breaking the line of sight between source and receiver; such a screen may be flat or curved. A removable screen is a screen that can be dismantled without the other environmental conditions being changed. The purpose of such a screen is to shield a work station or a complete work area from the noise emitted by sound source(s). Such an area can be a zone where one operator is located or a zone occupied by several operators at no fixed positions. For example, screens can be used by a maintenance unit to reduce the effect of noise at a given location, from repair work, and to reduce the noise at a work station located close to a machine or process.

Related standards concern noise attenuation measurements of enclosures under *in situ* conditions (ISO 11546-2), and sound insulation measurements of cabins under *in situ* conditions (ISO 11957).

Other International Standards dealing with screens in other situations are ISO 10053 (sound attenuation of screens for open plan offices) and ISO 10847 (sound attenuation of outdoors screens).

Technical information about noise reduction in workrooms can be found in ISO 11690-2.

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Acoustics — Measurement of the *in situ* sound attenuation of a removable screen

1 Scope

This International Standard specifies methods for evaluating the *in situ* sound attenuation performance of a removable screen, either indoors or outdoors. This engineering grade method is based on an insertion loss measurement that can be carried out either with shielding of the actual sound source(s) or using an artificial sound source.

The sound attenuation performance achieved by such a screen, as evaluated by the present International Standard, depends on:

— diffraction around the edges of the screen;

— transmission through the components of the screen;

— absorption of the panels of the screen, as well as in its surroundings;

— the room in which the screen stands if indoors.

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When a specific work station is to be shielded, the *in situ* sound attenuation value describes the effect of the screen. However, when a complete area is to be shielded, the performance of the screen will vary depending on the positions used for measurement. Therefore, it is recommended that the maximum and minimum values of sound attenuation are given. The sound attenuation performance is determined in terms of insertion loss.

When assessing the performance of a screen located indoors, the room geometry and reflections from walls, ceilings and room fittings will influence the performance. As a consequence, the comparison of screen performance can only be made if the test conditions are identical.

This International Standard is applicable to screens with height and length greater than 1,5 m. However, it may also be used for smaller screens provided that the interested parties come to an agreement on this.

As environmental conditions can affect the measurements outdoors, it is recommended that measurements should be restricted to within 25 m of the screen. However, measurements may also cover a greater distance provided that the interested parties come to an agreement on this.

Differences can occur between *in situ* test results. Therefore, comparison of the performance of different screens can be made only on the basis of data based on the same measurement method performed at the same location.

This International Standard applies to a complete screen only and not to individual components from which it is made. Sound insulation and sound absorption for screen components (such as panel elements, doors, windows) should be measured according to other relevant standards.

This International Standard is not applicable to open plan offices screens nor to outdoor barriers dealing with community noise. It is also not intended for qualification purposes.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 651:1979, *Sound level meters.*

IEC 804:1985, *Integrating-averaging sound level meters.*

IEC 942:1988, *Sound calibrators.*

IEC 1260:1995, *Electroacoustics — Octave-band and fractional-octave-band filters.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 screen: Any object that is specially designed to shield one or more specified positions in a given area from the noise of specific sound source(s).

NOTE — Examples are panels and flexible curtains.

3.2 removable screen: A screen that can be dismantled without the other environmental conditions being changed.

3.3 actual sound source(s): The sound source(s) to be shielded.

3.4 sound pressure level, L_p: Ten times the logarithm to the base 10 of the ratio of the mean-square sound pressure of a sound to the square of the reference sound pressure 20 µPa. The sound pressure level is expressed in decibels.

3.5 A-weighted sound pressure level, L_{pA}: Sound pressure level weighted in accordance with IEC 651. The A-weighted sound pressure level is expressed in decibels.

3.6 unscreened sound pressure level, L_{p1}: Sound pressure level measured at one position not screened from the sound source(s) without the screen in its intended position. The unscreened sound pressure level is expressed in decibels.

3.7 screened sound pressure level, L_{p2}: Sound pressure level measured at the same position as in 3.6 but screened from the sound source(s) by the screen in its intended position. the screened sound pressure level is expressed in decibels.

3.8 *in situ* sound attenuation, D_p: Difference, in decibels, between L_{p1} and L_{p2} at the particular position defined in 3.6, L_{p1} and L_{p2} being determined in either one-third-octave or octave bands.

3.9 A-weighted *in situ* sound attenuation, D_{pA}: Difference, in decibels, between L_{pA1} and L_{pA2} at the position defined in 3.6 when using the actual sound source(s).

3.10 directivity index, DI_i: Difference, in decibels, between L_{360} (the logarithmic mean value of the sound pressure level in 12 positions evenly distributed on a horizontal circle surrounding the sound source) and $L_{30,i}$ (the sound pressure level in position i of the twelve positions).

The radius of the circle shall be approximately 1,5 m.

$$DI_i = L_{360} - L_{30,i}$$

NOTE — The definition of the directivity index stated in this International Standard is in principle equivalent to the definition given in ISO 140-3. However, the procedure in this International Standard is somewhat simplified by allowing the directivity