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AMENDMENT 1
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Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections

AMENDMENT 1

Acoustique — Bruit émis par les machines et équipements — Détermination des niveaux de pression acoustique d'émission au poste de travail et en d'autres positions spécifiées en appliquant des corrections d'environnement approximatives

AMENDEMENT 1

Reference number
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This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

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Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections

AMENDMENT 1

3.20, Note 2

Replace the note with the following:

"The work station can be located on the reference measurement surface, but this is not necessary. The reference measurement surface can be used to determine K_2."

3.21, Note 2

Replace the note with the following:

"For the purposes of this International Standard, the environmental correction, K_2, is used as an indicator to qualify the environment in 6.2 and is used to calculate the local environmental correction K_3 in A.2."

3.26

Replace the definition and Note with the following:

"mean distance from the work station to the closest major sound source of the machine under test, without screening objects protruding into the line of sight between the major sound source and the work station, given by:

$$d = \frac{d_2 + d_1}{2}$$

where

d_1 is the shortest distance from the sound radiating surface of the machine under test to the work station;

d_2 is the longest distance from the sound radiating surface of the machine under test to the work station"

12.5

In the Example, replace "sound power level" with "emission sound pressure level".

A.1.2, Equation (A.1)

Replace "(minimum 1 m)" with "(minimum 0,5 m)".

A.2.3

Add the following after the last paragraph:

"When measurements of both emission sound pressure and sound power are required, it can be expedient to use the same measurement surface in both cases. This is not a requirement; the optimum measurement surface for a sound power measurement (e.g. a hemisphere) is not always the best measurement surface for determination(s) of emission sound pressure level(s) around a machine.

NOTE Different measurement surfaces give different values for K_2 "

A.2.5

After Figure A.3, replace:

"The accuracy can be upgraded in some cases from 3 to 2 by"

with

"The accuracy can be upgraded in some cases from grade 3 to grade 2 by"

A.2.5

Replace the last sentence with:

"If this is not possible, determination in accordance with ISO 11204[18] can improve the accuracy."

C.4.2

Replace the title with:

"Contributions to the uncertainty, σ_{R0}, when the estimate of the local environmental correction, K_3, is based on a localized and well-defined sound-radiating area of the machine surface"

New C.4.3

Add the following after C.4.2, renumber the following equations and update cross-references accordingly:

"**C.4.3** Contributions to the uncertainty, σ_{R0}, when the estimate of the local environmental correction, K_3, is based on an approximate determination of the apparent work station directivity index

The general expression for the calculation of the final result of the emission sound pressure level measurement is identical to the formulation in C.4.2, with the addition of a term related to the apparent work station directivity index, $D^*_{\mathrm{I\,op}}$, and replacing the contribution from the local environmental correction, K_3, with the contribution due to the environmental correction for the room, K_2. The resulting expression for L_p is given by Equation (C.3):

$$L_p = L_p \left(L'_p, \delta_{D^*}, \delta_{K_2}, \delta_{(\mathrm{B})}, \delta_{\mathrm{slm}}, \delta_{\mathrm{mount}}, \delta_{\mathrm{oc}}, \delta_{\mathrm{pos}}, \delta_{\mathrm{met}} \right) \tag{C.3}$$

where

δ_{D^*} is an input quantity to allow for uncertainty due to the estimation of the apparent work station directivity index, $D^*_{\mathrm{I\,op}}$;

δ_{K_2} is an input quantity to allow for any uncertainty due to the environmental correction for the room, K_2.

Table C.3 provides, as an example for accuracy grade 2, some information about present expectations concerning the values for the components, c_i, u_i, that are necessary to calculate $\sigma_{R0} = \sqrt{\sum_i (c_i\, u_i)^2}$ dB.

Table C.3 — Uncertainty budget for determinations of emission sound pressure level

Quantity	Estimate dB	Standard uncertainty, u_i dB	Probability distribution	Sensitivity coefficient, c_i	Uncertainty contribution, $c_i u_i$ dB
L_p					
L'_p	$\overline{L'_p}$	$s_{L'_p}$ (e.g. 0,5)	Normal	1,25	0,63
δ_{D^*}	$D^*_{\mathrm{I\,op,approx}}$	0,7	Normal	0,6	0,4
δ_{K_2}	K_2 (e.g. 0,9)	$0{,}3K_2$	Normal	2,6	0,8
$\delta_{(\mathrm{B})}$	K_1	e.g. 0,7	Normal	0,25	0,18
δ_{slm}	0	0,5	Normal	1	0,5
δ_{pos}	0	0,2	Normal	1	0,2
δ_{met}	0	0,3	Normal	1	0,3

$\sigma_{R0} = \sqrt{\sum_i (c_i u_i)^2}$ dB = 1,3 dB

NOTE The values shown are examples related to accuracy grade 2 determinations.

Explanations for the additional uncertainty parameters in Table C.3 not found in Table C.2 are given below.

u_{D^*} is the uncertainty in determining the apparent work station directivity index, $D^*_{\mathrm{I\,op}}$. In accordance with Equation (A.2), this uncertainty is a function of the measured difference $D^*_{\mathrm{I\,op,approx}} = L^*_p - L^*_{p,\mathrm{approx}}$. Assuming $u_{\overline{L_{p,\mathrm{approx}}}} = u_{Lp}$ = 0,5 dB, this results in $u_{D^*} = \sqrt{0{,}5^2 + 0{,}5^2}$ dB = 0,7 dB.

c_{D^*} is the sensitivity coefficient associated with the uncertainty in $D^*_{\mathrm{I\,op,approx}}$. It is the derivative of L_p with respect to $D^*_{\mathrm{I\,op,approx}}$ when L_p is corrected using only K_3 [Equation (A.3)] and other corrections [e.g. the background noise correction in Equation (10)] are assumed to be independent.

$$c_{D^*} = 10^{0{,}1K_3} - 1$$

For the exemplary values in Table C.2, assume $D^*_{\mathrm{I\,op,approx}}$ = -3 dB, K_2 = 0,9 dB and K_3 = 2 dB resulting in c_{D^*} = 0,6.

NOTE 1 To account for source dimensions as in Figure A.3, $\left(D^*_{\mathrm{I\,op,approx}} - \Delta D^*_I\right)$ is substituted for $D^*_{\mathrm{I\,op,approx}}$.

u_{K_2} is the uncertainty due to influences of the room environment. From empirical experience, it is known that the uncertainty on K_2 can roughly be expressed as $K_2 \pm K_2/2$, where a rectangular distribution is assumed (total spread of values $\pm K_2/2$). Then the standard deviation can be calculated from $u = \frac{K_2}{2\sqrt{3}} \approx 0,3 K_2$.

c_{K_2} is the sensitivity coefficient related to the uncertainty caused by room environmental correction. It is similar to the previous calculation for c_{D^*}.

$$c_{K_2} = \frac{10^{0,1 K_3} - 1}{1 - 10^{0,1 K_2}}$$

For the exemplary values in Table C.3, assume $D^*_{\mathrm{I\,op,approx}}$ = −3 dB, K_2 = 0,9 dB and K_3 = 2 dB resulting in c_{K_2} = 2,6.

NOTE 2 To reproduce the results of Table C.2, if there is omnidirectional radiation from a small source area, $D^*_{\mathrm{I\,op,approx}}$ and u_{D^*} can both approach zero. In this case only, a different K_2 is calculated based on the small source area, i.e., not the same K_2 as used in Table C.3 which is based on a measuring surface that encloses the machine. In Table C.2, outside of the small source area, the rest of the machine is irrelevant because it is assumed it does not radiate any sound.

NOTE 3 If the sound from the source is directed primarily toward the operator, uncertainty contributions can be smaller in Table C.3 than in Table C.2.

NOTE 4 The validity of the uncertainty coefficients c_{D^*} and c_{K_2} is limited to $K_3 \leq 7$ dB [$z > 0,2$, Equation (A.4)]."

