



SLOVENSKI STANDARD
SIST EN 60551:1997

01-oktober-1997

Determination of transformer and reactor sound levels (IEC 551:1987 modified)

Determination of transformer and reactor sound levels

Bestimmung der Geräuschpegel von Transformatoren und Drosselspulen

Détermination des niveaux de bruit des transformateurs et des bobines d'inductance

Ta slovenski standard je istoveten z: EN 60551:1992

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ICS:

17.140.20	Emisija hrupa naprav in opreme	Noise emitted by machines and equipment
29.180	Transformatorji. Dušilke	Transformers. Reactors

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en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60551

December 1992

UDC 554.6:621.314.21:534.835.46

Supersedes HD 399 S2:1991

Descriptors: Power transformers, electric reactors, sound, acoustic measurement

English version

Determination of transformer and reactor sound levels
(IEC 551:1987, modified)

Détermination des niveaux de bruits
des transformateurs et des bobines
d'inductance
(CEI 551:1987, modifiée)

Bestimmung der Geräuschpegel
von Transformatoren und
Drosselpulen
(IEC 551:1987, modifiziert)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



REPUBLIKA SLOVENIJA
MINISTRSTVO ZA ZNANOST IN TEHNOLOGIJO
Urad RS za standardizacijo in meroslovje
LJUBLJANA

SIST. EN 60551
PREVZET PO METODI RAZGLASITVE

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

-10- 1997

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

At the request of CENELEC Technical Committee TC 14, Power transformers, HD 399 S2:1991 (IEC 551:1987, modified) was submitted to the CENELEC voting procedure for conversion into a European Standard.

The text of the International Standard together with the common modifications accepted for HD 399 S2:1992 was approved by CENELEC as EN 60551 on 15 September 1992.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1993-09-01
- latest date of withdrawal of conflicting national standards (dow) 1993-09-01

Annexes designated "normative" are part of the body of the standard. In this standard, annex ZA is normative.

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Endorsement notice

The text of the International Standard IEC 551:1987 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

2 Definitions

Add after 2.3:

2.4 *Sound spectrum*

The distribution of sound levels within the frequency range of interest. It is usually obtained as measurements of sound pressure levels in sequential frequency bands, e.g. in octave, third octave or narrow band bandwidths.

Note.— A method for determining the sound spectra is given in note 4 to subclause 5.2.

Change the numbering of subclauses 2.4 to 2.8 into 2.5 to 2.9.

4 Conditions for measurement

- 4.2 In note 1, replace "test report" by "report of sound level measurement".

5 Measurement of sound pressure levels

- 5.1 Modification to the French version only.
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- 5.2 Replace the third line of note 2 by:

... former and/or cooling equipment for determining an averaging record of the measurements for the determination of the sound pressure level. The number ...

Add to the notes:

- 4.—When required, the sound pressure level spectrum may also be obtained from measurements made in accordance with subclauses 5.2.1 to 5.2.4 as appropriate in octave, third octave or narrow band bandwidths. The sound pressure level spectra obtained at each measuring position may then be evaluated as sound power level spectra by using the procedure in clause 6.

The measurement bandwidth, i.e. octave, third octave or narrow band, is subject to agreement between the manufacturer and the purchaser. Sound spectra having small band widths, e.g. ≤ 5 Hz, are particularly advantageous if the sound pressure level of the transformer is not very much higher than the background level.

From narrow band measurements at frequencies of twice the network frequency and its multiples, spectrum sound power levels L_{WAj} may be calculated. The A-weighted sound power level L_{WA} of the transformer in decibels is then determined by using the following equation:

COMMON MODIFICATIONS

$$L_{WA} = 10 \log_{10} \left(\sum_{j=1}^{j=N_f} 10^{0,1 L_{WAj}} \right)$$

where

L_{WA} = A-weighted sound power level, in decibels — Reference 10^{-12} W

L_{WAj} = A-weighted sound power level at the j^{th} measuring frequency

N_f = Total number of measuring frequencies

This same equation applies to the calculation of L_{WA} from measurements taken at the centre frequencies of octave or third octave bandwidths.

5.2.1 Modification to the French version only.

5.2.2 **Add** to the last line of the last paragraph:

... structure. Figures 7 and 8 apply to large power transformers constructed for Schnabel-car transportation - self supporting tank - with integrated forced air cooling, equipped with large sound absorbers. Said figures 7 and 8 show the typical microphone positions for noise measurement.).

Add:

Note.— If, in large power transformers constructed for Schnabel-car transportation, very long (up to ca. 1,5 m) sound absorbers are installed to reduce fan noise, the clearances between measuring positions and absorber openings are so small that the sound pressure level measured in this region, when fans are operating, will be too high. It is therefore necessary for sound measurements made at 2 m from the principal radiating surface and fans in operation, to consider the sound absorbers as an integral part of the cooling equipment and correspondingly choose the principal radiating surface according to figure 8.

5.2.4 Modification to the French version only.

6 Calculation of surface sound pressure level and sound power level

6.1 **Delete** the word "energy" in the first line of note 1.

6.2 Modification to the French version only.

7 Presentation of results

In the first line of item d), **replace** "and method" by "as well as date and method".

REPORT OF SOUND LEVEL MEASUREMENT

Modification to the French version only.

Add figures 7 and 8.

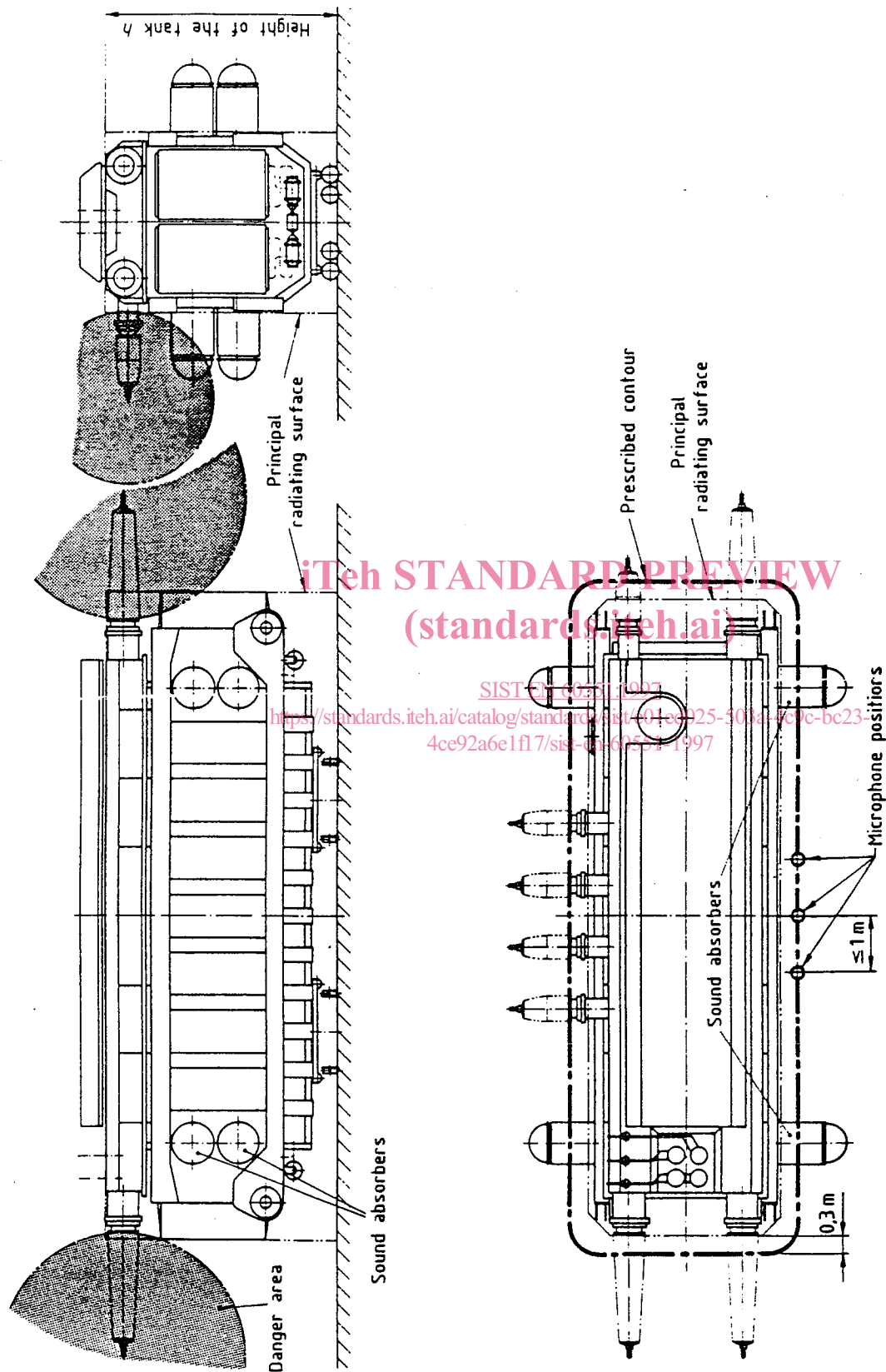
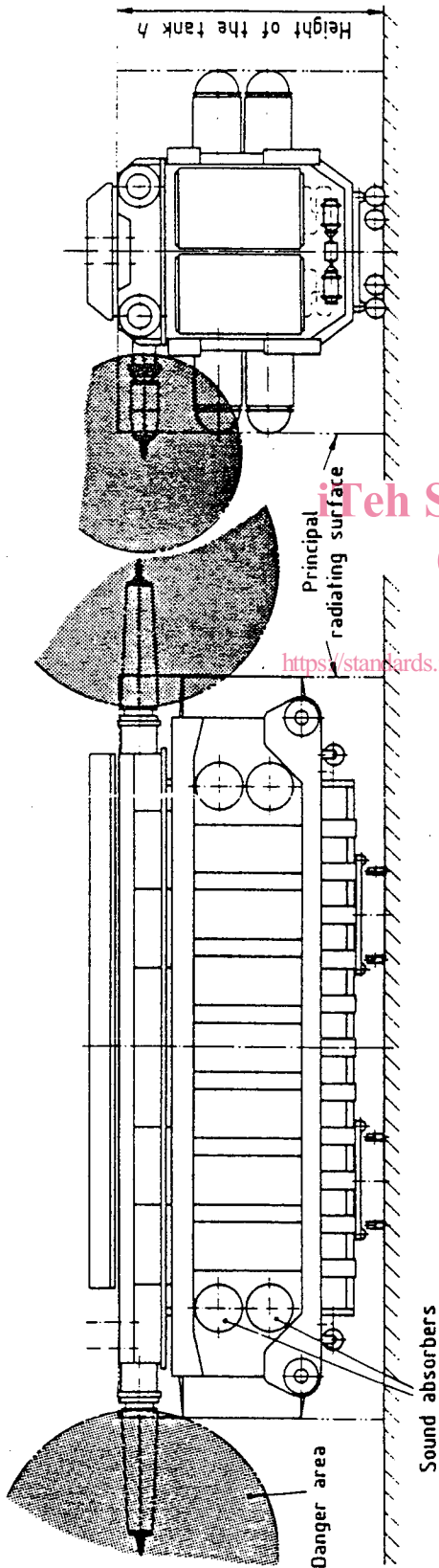


FIG. 7.— Prescribed contour and typical microphone positions for noise measurements according to 5.2.2 on a mobile transformer with Schnabel-car tank having horizontal bushings and integrated forced air cooling equipments with large sound absorbers in front of the eight fans.

Fans and circulating pumps are out of service.

No measurements are made on microphone positions along the prescribed contour within the danger area of the high-voltage bushings.



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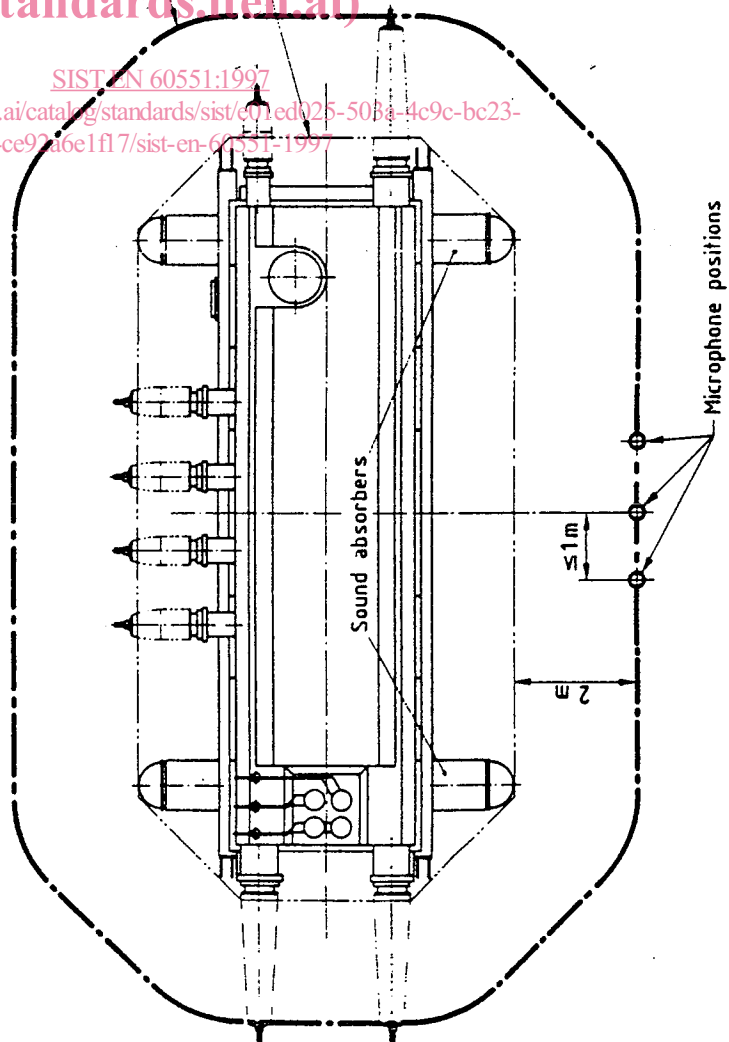


FIG. 8.— Prescribed contour and typical microphone positions for noise measurements according to 5.2.2 on a mobile transformer with Schnabel-car tank having horizontal bushings and integrated forced air cooling equipments with large sound absorbers in front of the eight fans.

Fans and circulating pumps are in service.

No measurements are made on microphone positions along the prescribed contour within the danger area of the high-voltage bushings

Annex ZA (normative)**Other international publications quoted in this standard
with the references of the relevant European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>IEC Publication</u>	<u>Date</u>	<u>Title</u>	<u>EN/HD</u>	<u>Date</u>
76	—	Power transformers	—	—
76-1 (mod)	1976	Part 1: General	HD 398.1 S1	1980
289*	1968	Reactors	—	—
651	1979	Sound level meters	HD 425 S1	1983
726 (mod)	1982	Dry-type power transformers	HD 464 S1* + A2	1988 1991

Other publications

<u>Publication</u>	<u>Date</u>	<u>Title</u>
ISO 3746	1979	Acoustics — Determination of sound power levels of noise sources Survey method

* IEC 289:1988 was harmonized as HD 539 S1:1991
HD 464 S1 includes A1:1986 to IEC 726.

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NORME INTERNATIONALE INTERNATIONAL STANDARD

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CEI
IEC
551

Deuxième édition
Second edition
1987



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

Détermination des niveaux de bruit des transformateurs
et des bobines d'inductance

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