SLOVENSKI STANDARD
SIST EN 62127-2:2008/A1:2014

01-februar-2014

Ultrazvok - Hidrofoni - 2. del: Kalibracija za ultrazvočna polja do 40 MHz (IEC 62127 -2:2007/A1:2013)

Ultrasonics - Hydrophones - Part 2: Calibration for ultrasonic fields up to 40 MHz

Ultraschall - Hydrophone - Teil 2: Kalibrierung für Ultraschallfelder bis zu 40 MHz

Ultrasons - Hydrophones - Partie 2: Etalonnage pour les champs ultrasonores jusqu'à 40 Mhz

Ta slovenski standard je istoveten z: **EN 62127-2:2007/A1:2013**

ICS:

11.040.01	Medicinska oprema na splošno	Medical equipment in general
17.140.50	Elektroakustika	Electroacoustics

SIST EN 62127-2:2008/A1:2014 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62127-2/A1

March 2013

ICS 11.040.50

English version

Ultrasonics - Hydrophones - Part 2: Calibration for ultrasonic fields up to 40 MHz

(IEC 62127-2:2007/A1:2013)

Ultrasons - Hydrophones - Partie 2: Etalonnage des champs ultrasoniques jusqu'à 40 Mhz (CEI 62127-2:2007/A1:2013)

Ultraschall - Hydrophone - Teil 2: Kalibrierung für Ultraschallfelder bis zu 40 MHz (IEC 62127-2:2007/A1:2013)

This amendment A1 modifies the European Standard EN 62127-2:2007; it was approved by CENELEC on 2013-03-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 62127-2:2007/A1:2013 E

Foreword

The text of document 87/519/FDIS, future amendment 1 to edition 1 of IEC 62127-2, prepared by IEC/TC 87 "Ultrasonics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62127-2:2007/A1:2013.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2013-12-15
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-03-15

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62127-2:2007/A1:2013 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

Modification in Annex ZA of EN 62127-2:2007:

Publication	Year	Title	EN/HD	Year

*In Annex ZA of EN 62127-2:2007, **replace** the references to IEC 60050-801:1994, IEC 61161:2006, IEC 61828:2001 and IEC 62127-1 by the following new references:*

IEC 60050-801	-	International Electrotechnical Vocabulary (IEV) - Chapter 801: Acoustics and electroacoustics	-	-
IEC 61161	-	Ultrasonics - Power measurement - Radiation force balances and performance requirements	EN 61161	-
IEC 61828	-	Ultrasonics - Focusing transducers - Definitions and measurement methods for the transmitted fields	EN 61828	-
IEC 62127-1 + corr. August + A1	2007 2008 2013	Ultrasonics - Hydrophones - Part 1: Measurement and characterization of medical ultrasonic fields up to 40 MHz	EN 62127-1 + A1	2007 2013

IEC 62127-2

Edition 1.0 2013-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Ultrasonics – Hydrophones – Part 2: Calibration for ultrasonic fields up to 40 MHz

Ultrasons – Hydrophones – Partie 2: Etalonnage des champs ultrasoniques jusqu'à 40 MHz

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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FOREWORD

This amendment has been prepared by IEC technical committee 87: Ultrasonics.

The text of this amendment is based on the following documents:

FDIS	Report on voting
87/519/FDIS	87/527/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Replace throughout the document:
“non-linear” by “nonlinear”,
This replacement applies to the English text only.

Replace throughout the document:
“non-linearity” by “nonlinearity”
This replacement applies to the English text only.

Replace throughout the document:
“non-linearities” by “nonlinearities”
This replacement applies to the English text only.

Replace throughout the document:
“non-linearly” by “nonlinearly”
This replacement applies to the English text only.

2 Normative references

Replace the references to IEC 60050-801:1994, IEC 61161:2006, IEC 61828:2006 and IEC 62127-1, *by the following new references:*

IEC 60050-801, *International Electrotechnical Vocabulary – Chapter 801: Acoustics and electroacoustics*

IEC 61161, *Ultrasonics – Power measurement – Radiation force balances and performance requirements*

IEC 61828, *Ultrasonics – Focusing transducers – Definitions and measurement methods for the transmitted fields*

IEC 62127-1:2007, *Ultrasonics - Hydrophones - Part 1: Measurement and characterization of medical ultrasonic fields up to 40 MHz*
Amendment 1:2013

3 Terms, definitions and symbols

3.9
effective radius of a non-focused ultrasonic transducer
Replace the term by **effective radius of a non-focusing ultrasonic transducer**

Replace the term in the Note by **effective radius of a non-focusing ultrasonic transducer**

3.14
external transducer aperture

*Replace, in Note 1, "*Figure 2*" by "*Figure 1*".*

3.15
far field

Replace the existing text of the definition (not including Note 1 and Note 2) by the following:

region of the field where $z > z_T$ aligned along the **beam axis** for planar non-focusing transducers.

Add the following new Note 3:

NOTE 3 If the shape of the transducer aperture produces several **transition distance**s, the one furthest from the transducer shall be used.

[SOURCE: IEC 62127-1:2007/Amendment 1:2013, definition 3.28]

3.23
instantaneous intensity

Replace the existing text of Note 1 by the following:

NOTE 1 **Instantaneous intensity** is the product of **instantaneous acoustic pressure** and particle velocity. It is difficult to measure intensity in the ultrasound frequency range. For the measurement purposes referred to in this International Standard and under conditions of sufficient distance from the **external transducer aperture** (at least one transducer diameter, or an equivalent transducer dimension in the case of a non-circular transducer) the **instantaneous intensity** can be approximated by the **derived instantaneous intensity.**

Replace the existing text of Note 2 by the following:

Instantaneous intensity is expressed in watts per square metre (W/m^2)

Add the following new definitions:

3.26
derived instantaneous intensity
approximation of the **instantaneous intensity**

For the measurement purposes referred to in this International Standard, and under conditions of sufficient distance from the transducer (at least one transducer diameter, or an equivalent transducer dimension in the case of a non-circular transducer) the **derived instantaneous intensity** is determined by

$$I(t) = \frac{p(t)^2}{\rho c} \quad (1)$$

where:

$p(t)$ is the **instantaneous acoustic pressure**;

ρ is the density of the medium;

c is the speed of sound in the medium.

NOTE 1 For measurement purposes referred to in this International Standard, the **derived instantaneous intensity** is an approximation of the **instantaneous intensity**.

NOTE 2 Increased uncertainty should be taken into account for measurements very close to the transducer.

NOTE 3 **Derived instantaneous intensity** is expressed in watts per square metre (W/m^2).

[SOURCE: IEC 62127-1:2007/ Amendment 1:2013, definition 3.78]

3.27
effective wavelength
λ
longitudinal speed of sound in the propagation medium divided by the **arithmetic-mean working frequency**

NOTE **Effective wavelength** is expressed in metres (m).

[SOURCE:IEC 61828:2001, definition 4.2.24].

3.28
longitudinal plane

plane defined by the **beam axis** and a specified orthogonal axis

NOTE See Figure 1 in IEC 62127-1.

[SOURCE: IEC 62127-1:2007, definition 3.35].

3.29
source aperture plane
closest possible measurement plane to the **external transducer aperture**, that is perpendicular to the **beam axis**

[SOURCE:IEC 61828:2001, definition 4.2.67].

3.30
source aperture width
L_{SA}
in a specified **longitudinal plane**, the greatest –20 dB **beamwidth** along the line of intersection between the designated **longitudinal plane** and the **source aperture plane**

NOTE 1 See Figure 2 in IEC 61828 2001.

NOTE 2 **Source aperture width** is expressed in metres (m).

[SOURCE:IEC 61828, definition 4.2.68].

3.31
transducer aperture width
L_{TA}
full width of the transducer aperture along a specified axis orthogonal to the beam axis of the unsteered beam at the centre of the transducer

NOTE 1 See Figure 4 in IEC 62127-1 .

NOTE 2 **Transducer aperture width** is expressed in metres (m).

[SOURCE:IEC 62127-1:2007/ Amendment 1:2013, definition 3.87].

3.32
transition distance
z_T
for a given **longitudinal plane**, the **transition distance** is defined based on the transducer design (when known) or from measurement:

a) from design: the **transition distance** is the equivalent area of the ultrasonic **transducer aperture width** divided by π times the **effective wavelength**, λ;

b) for measurements, the **transition distance** is the equivalent area of the **source aperture** width divided by π times the **effective wavelength**.

NOTE 1 Using method a), an unapodized **ultrasonic transducer** with circular symmetry about the **beam axis,** the equivalent area is πa^2, where a is the radius. Therefore the **transition distance** is $z_T = a^2/\lambda$. For the first example of a square **ultrasonic transducer,** the equivalent area is $(L_{TA})^2$, where L_{TA} is the **transducer aperture width** in the **longitudinal plane**. Therefore, the **transition distance** for both orthogonal **longitudinal planes** containing the sides or **transducer aperture widths,** is $z_T = (L_{TA})^2 /(\pi\lambda)$. For the second example, for a rectangular **ultrasonic transducer** with **transducer aperture widths** L_{TA1} and L_{TA2}, the equivalent area for the first linear transducer aperture width for the purpose of calculating the **transition distance** for the associated **longitudinal plane** is $(L_{TA1})^2$, where L_{TA1} is the **transducer aperture width** in this **longitudinal plane**. Therefore, the **transition distance** for this plane is $z_{T1} = (L_{TA1})^2/(\pi\lambda)$. For the orthogonal **longitudinal plane** that contains the other **transducer aperture width**, L_{TA2}, the equivalent area for the other for the purpose of calculating the transition distance for the associated **longitudinal plane** is $(L_{TA2})^2$, where L_{TA2} is the **transducer aperture width** in this **longitudinal plane**. Therefore, the **transition distance** for this plane is $z_{T2} = (L_{TA2})^2 /(\pi\lambda)$.

NOTE 2 Using method b) for measurements in a longitudinal plane, the source aperture width, L_{SA}, in the same plane is used in $z_T = (L_{SA})^2 /(\pi\lambda)$.

NOTE 3 **Transition distance** is expressed in metre (m).

[SOURCE IEC 61828:2001, definition 4.2.75, modified: There is significant difference in the layout of the definition]

4 List of symbols

Replace:

a_t **effective radius of a non-focused ultrasonic transducer**

by

a_t **effective radius of a non-focusing ultrasonic transducer**

Add the following new symbols:

L_{TA} **transducer aperture width**

L_{SA} **source aperture width**

z_T **transition distance**

5 Overview of calibration procedures

5.3 Reporting of results

Add, after the sixth bullet point ("in situations where the mounting arrangement…") the following new Note 5 and renumber existing Notes 5 and 6 accordingly:

NOTE 5 Care should be taken in designing the **hydrophone** mount at low frequencies (below 200 kHz) where the acoustic wavelengths are sufficiently large that the use of long-bursts may lead to the direct acoustic signal being contaminated by reflections from the mount. The importance of the effect may be investigated through varying the burst length and observing the influence of reflections on the **hydrophone** signal. Acoustic absorbers may be useful in suppressing these reflections. **Hydrophone** sensitivity may also be affected by the way the **hydrophone** is clamped, and again this may be evaluated by systematically investigating the various configurations.

6 Generic requirements of a hydrophone calibration system

6.1 Mechanical positioning

6.1.2 Accuracy of the axial hydrophone position

Add, after Note 1, the following new Note 2 and renumber existing Notes 3 and 4 accordingly.:

NOTE 2 The distance of the **hydrophone** from the transducer can be estimated from a knowledge of the time elapsed between the electrical excitation applied to the transducer and the arrival time of the acoustic wave at the **hydrophone,** through a knowledge of the speed of sound in water at that particular temperature.

6.1.3 Accuracy of the lateral hydrophone position

Replace the existing first sentence of the subclause by the following:

The variation of the **hydrophone** output voltage should be checked when the lateral **hydrophone** position is changed to ensure that the signal is maximized.

6.3 Hydrophone size

Number the existing note as Note 1 and add the following new Note 2:

NOTE 2 Guidance in assessing the influence of spatial-averaging on calibrations may be found in IEC 62127-1 and Annex J.

6.4 Measurement vessel and water properties

Replace the existing first paragraph with the following:

The test tank shall be sufficiently large to allow the establishment of free field conditions at the lowest frequency of interest. It should also be large enough to allow the transducer-**hydrophone** separation to be varied to a degree consistent with the requirements of the applied calibration technique.

7.2 Earthing

Add the following new note:

NOTE This condition may be relaxed when a tone burst is used such that the acoustic signal arrives at the **hydrophone** after the electrical excitation is completed.