SLOVENSKI STANDARD
SIST EN 61786-1:2014

01-julij-2014

Meritve enosmernih magnetnih polj, izmeničnih magnetnih in električnih polj v območju od 1 Hz do 100 kHz z vidika izpostavljenosti ljudi - Zahteve za instrumente (IEC 61786-1:2013)

Measurement of DC magnetic fields, AC magnetic and electric fields from 1 Hz to 100 kHz with regard to exposure of human beings - Requirements for instruments

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Mesure de champs magnétiques continus et de champs magnétiques et électriques alternatifs dans la plage de fréquences de 1 Hz à 100 kHz dans leur rapport à l'exposition humaine - Exigences applicables aux instruments

Ta slovenski standard je istoveten z: **EN 61786-1:2014**

ICS:

17.220.20	Merjenje električnih in magnetnih veličin	Measurement of electrical and magnetic quantities

SIST EN 61786-1:2014 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61786-1

March 2014

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English version

Measurement of DC magnetic, AC magnetic and AC electric fields from 1 Hz to 100 kHz with regard to exposure of human beings - Part 1: Requirements for measuring instruments

(IEC 61786-1:2013)

Mesure de champs magnétiques continus et de champs magnétiques et électriques alternatifs dans la plage de fréquences de 1 Hz à 100 kHz dans leur rapport à l'exposition humaine - Partie 1: Exigences applicables aux instruments de mesure (CEI 61786-1:2013)

Messung von magnetischen Gleichfeldern und von elektrischen und magnetischen Wechselfeldern von 1 Hz bis 100 kHz im Hinblick auf die Exposition von Personen - Teil 1: Anforderungen an Messgeräte (IEC 61786-1:2013)

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CENELEC

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 106/292/FDIS, future edition 1 of IEC 61786-1, prepared by IEC TC 106, Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61786-1:2014.

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)	2014-10-16
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-01-16

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Endorsement notice

The text of the International Standard IEC 61786-1:2013 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 62110:2009	NOTE	Harmonised as EN 62110:2009 (not modified).
ISO 80000-1:2009	NOTE	Harmonised as EN ISO 80000-1:2013 (not modified).
ISO/IEC 17025:2005	NOTE	Harmonised as EN ISO/IEC 17025:2005 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

Publication	Year	Title	EN/HD	Year
IEC 61000-3-2	-	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)	EN 61000-3-2	-
IEC 61000-4-2	-	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	-
IEC 61000-4-3	-	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	-
IEC 61000-4-4	-	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	-
IEC 61000-4-6	-	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	-
IEC 61000-4-8	-	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8	-
CISPR 11 (mod)	-	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	-
ISO/IEC Guide 98-3	-	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-
IEC Guide 108	-	Guidelines for ensuring the coherency of IEC publications - Application of horizontal standards	-	-

IEC 61786-1

Edition 1.0 2013-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

HORIZONTAL STANDARD
NORME HORIZONTALE

Measurement of DC magnetic, AC magnetic and AC electric fields from 1 Hz to 100 kHz with regard to exposure of human beings – Part 1: Requirements for measuring instruments

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MEASUREMENT OF DC MAGNETIC, AC MAGNETIC AND AC ELECTRIC FIELDS FROM 1 Hz TO 100 kHz WITH REGARD TO EXPOSURE OF HUMAN BEINGS –

Part 1: Requirements for measuring instruments

FOREWORD

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International Standard IEC 61786-1 has been prepared by IEC technical committee 106: Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure.

The first editions of IEC 61786-1 and IEC 61786-2 replace IEC 61786:1998. Part 1 deals with measuring instruments, and Part 2 deals with measurement procedures. The content of the standard was revised in order to give up-to-date and practical information to the user.

It has the status of a horizontal standard in accordance with IEC Guide 108.

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

FDIS	Report on voting
106/292/FDIS	106/298/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61786 series, published under the general title *Measurement of DC magnetic fields and AC magnetic and electric fields from 1 Hz to 100 kHz with regard to exposure of human beings,* can be found on the IEC website.

The committee has decided that the contents of this 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

MEASUREMENT OF DC MAGNETIC, AC MAGNETIC AND AC ELECTRIC FIELDS FROM 1 Hz TO 100 kHz WITH REGARD TO EXPOSURE OF HUMAN BEINGS –

Part 1: Requirements for measuring instruments

1 Scope

This part of IEC 61786 provides guidance for measuring instruments used to measure the field strength of quasi-static magnetic and electric fields that have a frequency content in the range 1 Hz to 100 kHz and with DC magnetic fields to evaluate the exposure levels of the human body to these fields.

Sources of fields include devices that operate at power frequencies and produce power frequency and power frequency harmonic fields, as well as devices that produce fields within the frequency range of this document, including devices that produce static fields, and the earth's static magnetic field. The magnitude ranges covered by this standard are 0,1 μT to 200 mT in AC (1 μT to 10 T in DC) and 1 V/m to 50 kV/m for magnetic fields and electric fields, respectively.

When measurements outside this range are performed, most of the provisions of this standard will still apply, but special attention should be paid to specified uncertainty and calibration procedures.

Specifically, this standard

– defines terminology;
– identifies requirements on field meter specifications;
– indicates methods of calibration;
– defines requirements on instrumentation uncertainty;
– describes general characteristics of fields;
– describes operational principles of instrumentation.

NOTE Measurement methods that achieve defined goals pertaining to assessment of human exposure are described in IEC 61786-2

Sources of uncertainty during calibration are also identified. In regard to electric field measurements, this standard considers only the measurement of the unperturbed electric field strength at a point in free space (i.e. the electric field prior to the introduction of the field meter and operator) or above conducting surfaces.

This horizontal standard is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 108.

One of the responsibilities of a technical committee is, wherever applicable, to make use of horizontal standards in the preparation of its publications. The contents of this horizontal standard will not apply unless specifically referred to or included in the relevant publications.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For

undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

CISPR 11, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement* (GUM:1995)

Guide 108, *Guidelines for ensuring the coherency of IEC publications – Application of horizontal standards*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE 1 Internationally accepted SI-units are used throughout the standard.

NOTE 2 For other units, see Annex G.

NOTE 3 Throughout this standard, the words "magnetic flux density" and "magnetic field" will be considered synonymous.

3.1 Meters

3.1.1
measuring instrument
device intended to be used to make measurements, alone or in conjunction with supplementary devices

[SOURCE: IEC 60050-300:2001, 311-03-01]

3.1.2
field meter
meter designed to measure electric, magnetic and electromagnetic fields

Note 1 to entry: Field meters usually consist of three parts: the probe, the detector circuit and the display.

3.1.3
probe
input device of a measuring instrument, generally made as a separate unit and connected to it by means of a flexible cable, which transmits the measurand in a suitable form

Note 1 to entry: A probe can be composed of one or several sensors.

[SOURCE: IEC 60050-300:2001, 313-09-11, modified – a note to entry has been added.]

3.1.4
detector
device for discerning the existence or variations of waves, oscillations or signals, usually for extracting information conveyed.

EXAMPLES Peak detector, rms detector

[SOURCE: IEC 60050-702:1992, 702-09-39, modified – the examples are different.]

3.1.5
free-body meter
meter that measures the unperturbed electric field strength at a point above the ground and is supported in space without conductive contact to ground

3.1.6
fluxgate magnetometer
instrument designed to measure magnetic fields by making use of the non-linear magnetic characteristics of a probe or sensing element that has a ferromagnetic core

3.1.7
ground reference meter
meter that measures the electric field at or close to the surface of the ground, frequently implemented by measuring the induced current or charge oscillating between an isolated electrode and ground.

Note 1 to entry: The isolated electrode is usually a plate located at ground level or slightly above the ground surface.

3.1.8
survey meter
lightweight battery-operated meter that gives a real time read-out and that can be held conveniently by hand in order to conduct survey type measurements in different locations

3.1.9
coil probe
magnetic flux density sensor comprised of a coil of wire that produces an induced voltage proportional to the time derivative of the magnetic field

3.1.10
Hall effect probe
magnetic flux density sensor containing an element exhibiting the Hall effect to produce a voltage proportional to the magnetic flux density

3.2 Meter characteristics

3.2.1
crest factor
ratio of the maximum absolute value of an alternating quantity to its root-mean-square value

[SOURCE: IEC 60050-103:2009, 103-14-57, modified – the original term was "peak factor" and the note has been deleted.]

3.2.2
crosstalk
the appearance of undesired energy in a channel, owing to the presence of a signal in another channel, caused by, for example induction, conduction or non-linearity

[SOURCE: IEC 60050-722:1992, 722-15-03]

3.2.3
frequency response
for a linear time-invariant system with a sinusoidal input variable in steady state the ratio of the phasor of the output variable to the phasor of the corresponding input variable, represented as a function of the angular frequency ω

[SOURCE: IEC 60050-351:2006, 351-24-33, modified – the note in the original has been deleted.]

3.2.4
isotropy of the probe
a measure of the degree to which the response of a field probe is independent of the polarization and direction of propagation of the incident field

3.2.5
pass-band
frequency band throughout which the attenuation is less than a specified value

[SOURCE: IEC 60050-151:2001, 151-13-52]

3.2.6
root-mean-square value
rms value

1) for n quantities $x_1, x_2, \ldots x_n$, positive square root of the mean value of their squares:

$$X_q = \left[\frac{1}{n}\left(x_1^2 + x_2^2 + \ldots + x_n^2\right)\right]^{1/2} \quad (1)$$

2) for a quantity x depending of a variable t, positive square root of the mean value of the square of the quantity taken over a given interval $[t_0, t_0+T]$ of the variable

$$X_q = \left[\frac{1}{T}\int_{t_0}^{t_0+T}[x(t)]^2\,dt\right]^{1/2} \quad (2)$$

Note 1 to entry: The rms value of a periodic quantity is usually taken over an integration interval the range of which is the period multiplied by a natural number

[SOURCE: IEC 60050-103:2009, 103-02-02, modified – the second note in the original definition has been deleted.]

3.3 Field characteristics

3.3.1
unperturbed field
field at a point that would exist in the absence of persons or movable objects