



SLOVENSKI STANDARD

SIST EN 60688:2013

01-marec-2013

Nadomešča:

SIST EN 60688:1995

SIST EN 60688:1995/A1:2001

SIST EN 60688:1995/A2:2002

Električni merilni pretvorniki za pretvarjanje izmeničnih električnih veličin v analogne ali digitalne signale (IEC 60688:2012)

Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals (IEC 60688:2012)

STANDARD PREVIEW

(standards.iteh.ai)

Elektrische Messumformer zur Umwandlung von elektrischen Wechselstromgrößen und Gleichstromgrößen in analoge oder digitale Signale (IEC 60688:2012)

<https://standards.iteh.ai/catalog/standards/sist/7ebd101f-f70d-41b1-b5b8-17fad2b50ed6/sist-en-60688-2013>

Transducteurs électriques de mesure convertissant les grandeurs électriques alternatives en signaux analogiques ou numériques (CEI 60688:2012)

Ta slovenski standard je istoveten z: EN 60688:2013

ICS:

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

SIST EN 60688:2013

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60688:2013

<https://standards.iteh.ai/catalog/standards/sist/7ebd101f-f70d-41b1-b5b8-17fad2b50ed6/sist-en-60688-2013>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60688

January 2013

ICS 17.220.20

Supersedes EN 60688:1992 + A1:1999 + A2:2001

English version

Electrical measuring transducers for converting A.C. and D.C. electrical quantities to analogue or digital signals
(IEC 60688:2012)

Transducteurs électriques de mesure convertissant les grandeurs électriques alternatives ou continues en signaux analogiques ou numériques
(CEI 60688:2012)

Elektrische Messumformer zur Umwandlung von elektrischen Wechselstromgrößen und Gleichstromgrößen in analoge oder digitale Signale
(IEC 60688:2012)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

This European Standard was approved by CENELEC on 2012-11-23. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 85/421/FDIS, future edition 3 of IEC 60688, prepared by IEC/TC 85 "Measuring equipment for electrical and electromagnetic quantities" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60688:2013.

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) 2013-08-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-11-23

This document supersedes EN 60688:1992 + A1:1999 + A2:2001.

EN 60688:2013 includes the following significant technical changes with respect to EN 60688:1992 + A1:1999 + A2:2001:

- extending the scope to DC quantities;
- extending the scope to harmonics, total harmonic distortion and apparent power;
- adaptation of the requirements for digital transducers;
- updating normative references;
- updating safety requirements with the EN 61010 series;
- updating EMC requirements with EN 61326-1.

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.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Endorsement notice

The text of the International Standard IEC 60688:2012 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 60044-7 | NOTE | Harmonised as EN 60044-7. |
| IEC 60044-8 | NOTE | Harmonised as EN 60044-8. |
| IEC 60051 Series | NOTE | Harmonised as EN 60051 Series (not modified). |
| IEC 60068-2-30 | NOTE | Harmonised as EN 60068-2-30. |
| IEC 60359 | NOTE | Harmonised as EN 60359. |
| IEC 60770-1 | NOTE | Harmonised as EN 60770-1. |
| IEC 60770-2 | NOTE | Harmonised as EN 60770-2. |
| IEC 60770-3 | NOTE | Harmonised as EN 60770-3. |

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.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|---|----------------|-------------|
| IEC 60051-1 | 1997 | Direct acting indicating analogue electrical measuring instruments and their accessories - Part 1: Definitions and general requirements common to all parts | EN 60051-1 | 1998 |
| IEC 60068-2-6 | - | Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) | EN 60068-2-6 | - |
| IEC 60068-2-27 | - | Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock | EN 60068-2-27 | - |
| IEC 60255-151 | - | Measuring relays and protection equipment - Part 151: Functional requirements for over/under current protection | EN 60255-151 | - |
| IEC 61010 | Series | Safety requirements for electrical equipment for measurement, control, and laboratory use | EN 61010 | Series |
| IEC 61010-1 | - | Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements | EN 61010-1 | - |
| IEC 61010-2-030 | - | Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-030: Particular requirements for testing and measuring circuits | EN 61010-2-030 | - |
| IEC 61326 | Series | Electrical equipment for measurement, control and laboratory use - EMC requirements | EN 61326 | Series |
| IEC 61326-1 | - | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements | EN 61326-1 | - |
| IEC 61557-12 | - | Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 12: Performance measuring and monitoring devices (PMD) | EN 61557-12 | - |
| IEC 60417-DB | | Graphical symbols for use on equipment | - | - |

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60688:2013

<https://standards.iteh.ai/catalog/standards/sist/7ebd101f-f70d-41b1-b5b8-17fad2b50ed6/sist-en-60688-2013>



IEC 60688

Edition 3.0 2012-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrical measuring transducers for converting A.C. and D.C. electrical quantities to analogue or digital signals

Transducteurs électriques de mesure convertissant les grandeurs électriques alternatives ou continues en signaux analogiques ou numériques

17fad2b50ed6/sist-en-60688-2013

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 17.220.20

ISBN 978-2-83220-435-1

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

| | |
|--|----|
| FOREWORD..... | 4 |
| INTRODUCTION..... | 6 |
| 1 Scope..... | 7 |
| 2 Normative references..... | 8 |
| 3 Terms and definitions..... | 8 |
| 3.1 General terms..... | 8 |
| 3.2 Description of transducers according to the measurand..... | 11 |
| 3.3 Description of transducers according to their output load..... | 12 |
| 3.4 Nominal values..... | 12 |
| 3.5 User adjustment..... | 13 |
| 3.6 Influence quantities and reference conditions..... | 14 |
| 3.7 Errors and variations..... | 14 |
| 3.8 Accuracy, accuracy class, class index..... | 14 |
| 4 Class index, permissible limits of intrinsic error, auxiliary supply and reference conditions..... | 15 |
| 4.1 Transducer general architecture..... | 15 |
| 4.2 Class index..... | 15 |
| 4.3 Class index for transducer used with sensors..... | 16 |
| 4.4 Intrinsic error..... | 16 |
| 4.5 Conditions for the determination of intrinsic error..... | 16 |
| 4.6 Auxiliary supply..... | 18 |
| 4.7 Safety requirements: Clearances and creepage distances..... | 19 |
| 5 Requirements..... | 19 |
| 5.1 Input values..... | 19 |
| 5.2 Analogue output signals..... | 19 |
| 5.3 Output transfer function..... | 20 |
| 5.4 Digital output signals..... | 23 |
| 5.5 Ripple (for analogue outputs)..... | 23 |
| 5.6 Response time..... | 23 |
| 5.7 Variation due to over-range of the measurand..... | 23 |
| 5.8 Limiting value of the output signal..... | 23 |
| 5.9 Limiting conditions of operation..... | 23 |
| 5.10 Limits of the measuring range..... | 24 |
| 5.11 Limiting conditions for storage and transport..... | 24 |
| 5.12 Sealing..... | 24 |
| 5.13 Stability..... | 24 |
| 6 Tests..... | 24 |
| 6.1 General..... | 24 |
| 6.2 Variations due to auxiliary supply voltage..... | 25 |
| 6.3 Variations due to auxiliary supply frequency..... | 26 |
| 6.4 Variations due to ambient temperature..... | 27 |
| 6.5 Variations due to the frequency of the input quantity(ies)..... | 27 |
| 6.6 Variations due to the input voltage..... | 28 |
| 6.7 Variations due to the input current..... | 29 |
| 6.8 Variations due to power factor..... | 29 |
| 6.9 Variation due to output load..... | 30 |

| | | |
|--|--|----|
| 6.10 | Variations due to distortion of the input quantity(ies) | 30 |
| 6.11 | Variation due to magnetic field of external origin | 31 |
| 6.12 | Variation due to unbalanced currents | 32 |
| 6.13 | Variation due to interaction between measuring elements | 32 |
| 6.14 | Variation due to self-heating | 33 |
| 6.15 | Variation due to continuous operation..... | 33 |
| 6.16 | Variation due to common mode interference..... | 34 |
| 6.17 | Variation due to series mode interference | 34 |
| 6.18 | Voltage test, insulation tests and other safety requirements | 35 |
| 6.19 | Impulse voltage tests..... | 35 |
| 6.20 | High frequency disturbance test | 36 |
| 6.21 | Test for temperature rise | 36 |
| 6.22 | Other tests | 36 |
| 7 | Marking and information | 36 |
| 7.1 | Marking on the case | 36 |
| 7.2 | Markings relating to the reference conditions and nominal ranges of use for transducers | 37 |
| 7.3 | Identification of connections and terminals | 38 |
| 7.4 | Information to be given in a separate document | 38 |
| | Bibliography..... | 40 |
| iTeh STANDARD PREVIEW (standards.iteh.ai) | | |
| | Figure 1 – Transducer architecture..... | 15 |
| | Figure 2 – Transfer function curves..... | 22 |
| <u>SIST EN 60688:2013</u> https://standards.iteh.ai/catalog/standards/sist/7ebd101f-f70d-41b1-b5b8-17fa2b50ed6/sist-en-60688-2013 | | |
| | Table 1 – Relationship between the limits of intrinsic error, expressed as a percentage of the fiducial value, and the class index..... | 16 |
| | Table 2 – Pre-conditioning | 16 |
| | Table 3 – Reference conditions of the influence quantities and tolerances or testing purposes..... | 17 |
| | Table 4 – Reference conditions relative to the measurand | 18 |
| | Table 5 – Usage groups..... | 25 |
| | Table 6 – Examples of marking relating to the reference conditions and nominal range of use for temperature | 37 |
| | Table 7 – Symbols for marking transducers | 38 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL MEASURING TRANSDUCERS
FOR CONVERTING A.C. AND D.C. ELECTRICAL
QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard 60688 has been prepared by IEC Technical Committee 85: Measuring equipment for electrical and electromagnetic quantities.

This third edition cancels and replaces the second edition published in 1992 and its Amendment 1 (1997) and Amendment 2 (2001). It constitutes a technical revision

This edition includes the following significant technical changes with respect to the previous edition:

- extending the scope to DC quantities;
- extending the scope to harmonics, total harmonic distortion and apparent power;
- adaptation of the requirements for digital transducers;
- updating normative references;
- updating safety requirements with the IEC 61010 series;
- updating EMC requirements with IEC 61326-1.

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

| FDIS | Report on voting |
|-------------|------------------|
| 85/421/FDIS | 85/436/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.

In this standard, the following print types are used:

- requirements and definitions: in roman type;
- NOTES: in smaller roman type;
- *compliance: in italic type.*

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.

ITEH STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60688:2013

<https://standards.iteh.ai/catalog/standards/sist/7ebd101f-f70d-41b1-b5b8-17fad2b50ed6/sist-en-60688-2013>

INTRODUCTION

New transducers can now be equipped with micro-processors that utilize digital data processing, communication methods and auxiliary sensors. This makes them more complex than conventional analogue transducers and gives them considerable added value.

The class index system of classification used in this standard is based upon the IEC 60051 series: *Direct acting indicating analogue electrical measuring instruments and their accessories*. Under this system, the permitted variations of the output signal due to varying influence quantities – ambient temperature, voltage, frequency, etc., – are implicit in the classification.

For those unfamiliar with the class index system, a word of warning is necessary. If, for example, a transducer is classified as Class 1, it does not mean that the error under practical conditions of use will be within ± 1 % of the actual value of the output or ± 1 % of the full output value. It means that the error should not exceed ± 1 % of the fiducial value under closely specified conditions. If the influence quantities are varied between the limits specified by the nominal ranges of use, a variation of amount comparable with the value of the class index may be incurred for each influence quantity.

The permissible error of a transducer under working conditions is the sum of the permissible intrinsic error and of the permissible variations due to each of the influence quantities. However, the actual error is likely to be much smaller because not all of the influence quantities are likely to be simultaneously at their most unfavourable values and some of the variations may cancel one another. It is important that these facts be taken into consideration when specifying transducers for a particular purpose.

Furthermore, some of the terms used in this standard are different from those used in IEC 60051 due to the fundamental differences between indicating instruments and measuring transducers.

<https://standards.iteh.ai/catalog/standards/sist/7ebd101f-f70d-41b1-b5b8-17fad2b50ed6/sist-en-60688-2013>

All statements of performance are related to the output which is governed by two basic terms:

- "the nominal value", which may have a positive or a negative sign or both;
- "the span", which is the range of values of the output signal from maximum positive to maximum negative, if appropriate.

ELECTRICAL MEASURING TRANSDUCERS FOR CONVERTING A.C. AND D.C. ELECTRICAL QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS

1 Scope

This International Standard applies to transducers with electrical inputs and outputs for making measurements of a.c. or d.c. electrical quantities. The output signal may be in the form of an analogue direct current, an analogue direct voltage or in digital form. In this case, that part of the transducer utilized for communication purposes will need to be compatible with the external system.

This standard applies to measuring transducers used for converting electrical quantities such as the following:

- current,
- voltage,
- active power,
- reactive power,
- power factor,
- phase angle,
- frequency,
- harmonics or total harmonic distortion,
- apparent power

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60688:2013

<https://standards.iteh.ai/catalog/standards/sist/7ebd101f-f70d-41b1-b5b8-17fad2b50ed6/sist-en-60688-2013>

to an output signal.

This standard is not applicable for:

- instrument transformers that comply with IEC 60044 series;
- transmitters for use in industrial process applications that comply with the IEC 60770 series;
- performance measuring and monitoring devices (PMD) that comply with IEC 61557-12.

Within the measuring range, the output signal is a function of the measurand. An auxiliary supply may be needed.

This standard applies:

- a) if the nominal frequency of the input(s) lies between 0 Hz and 1 500 Hz;
- b) if a measuring transducer is part of a system for the measurement of a non-electrical quantity, this standard may be applied to the electrical measuring transducer, if it otherwise falls within the scope of this standard;
- c) to transducers for use in a variety of applications such as telemetry and process control and in one of a number of defined environments.

This International Standard is intended:

- to specify the terminology and definitions relating to transducers whose main application is in industry;
- to unify the test methods used in evaluating transducer performance;