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Irish Standard I.S. EN 60688:2013

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

Incorporating amendments/corrigenda issued since publication:

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I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWIFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

<i>This document replaces:</i> EN 60688:1992 +A1:1999 + A2:2001	<i>This document is based on:</i> EN 60688:2013	<i>Publisi</i> 11 Jan	<i>hed:</i> uary, 2013
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EUROPEAN STANDARD

EN 60688

NORME EUROPÉENNE EUROPÄISCHE NORM

January 2013

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

ICS 17.220.20

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)

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.

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EN 60688:2013

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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.

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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	<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	-	-

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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.
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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.

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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.

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INTRODUCTION

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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.

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.

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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

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;

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- to specify accuracy limits and output values for transducers.

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 60051-1:1997, Direct acting indicating analogue electrical measuring instruments and their accessories – Part 1: Definitions and general requirements common to all parts

IEC 60068-2-6, Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)

IEC 60068-2-27, Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock

IEC 60255-151, Measuring relays and protection equipment – Part 151: Functional requirements for over/under current protection

IEC 61010 (all parts), Safety requirements for electrical equipment for measurement, control and laboratory use

IEC 61010-1, Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

IEC 61010-2-030, Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 30 Special requirements for testing and measuring circuits

IEC 61326 (all parts), *Electrical equipment for measurement, control and laboratory use – EMC requirements*

IEC 61326-1, Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

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)

IEC 60417, Graphical symbols for use on equipment

NOTE Please refer to the Bibliography for the list of informative references.

3 Terms and definitions

For the purpose of this document the following terms and definitions apply:

3.1 General terms

3.1.1 electrical measuring transducer transducer

device for converting an a.c or d.c.. measurand to a direct current, a direct voltage or a digital signal for measurement purposes



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