

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



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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

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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.

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- withdrawn,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.

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.

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

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;

- 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