IEC 60688

Edition 4.0 2021-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Electrical measuring transducers for converting AC and DC electrical quantities to analogue or digital signals

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

IEC 60688:2021-09(en-fr)

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Electrical measuring transducers for converting AC and DC electrical quantities to analogue or digital signals

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRICAL MEASURING TRANSDUCERS FOR CONVERTING AC AND DC ELECTRICAL QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS

FOREWORD

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IEC 60688 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2012. This edition constitutes a technical revision.

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

a) updating normative references;
b) additional requirements for specific transducers used for LV monitoring applications;
c) creation of interface coding to ease selection by the end-user.

The text of this International Standard is based on the following documents:

CDV	Report on voting
85/748/CDV	85/781/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

In this document, 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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

INTRODUCTION

New transducers can now be equipped with microprocessors that utilise 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 document is based upon IEC 60051 (all parts). 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 document are different from those used in IEC 60051 (all parts) 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 AC AND DC ELECTRICAL QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS

1 Scope

This document applies to transducers with electrical inputs and outputs for making measurements of AC or DC electrical quantities. The output signal can be in the form of an analogue direct current, an analog direct voltage or in digital form.

This document applies to measuring transducers used for converting electrical quantities such as

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

to an output signal.

This document is not applicable for

– instrument transformers that comply with IEC 61869 (all parts),
– transmitters for use in industrial process application that comply with IEC 60770 (all parts), and
– performance measuring and monitoring devices (PMD) that comply with IEC 61557-12:2018.

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

This document applies

a) if the nominal frequency of the input(s) lies between 0 Hz and 1 500 Hz,
b) to the electrical measuring transducer if it is part of a system for the measurement of a non-electrical quantity, and if it otherwise falls within the scope of this document, and
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 document 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, and
– to specify accuracy limits and output values for transducers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements*
IEC 61010-1:2010/AMD1:2016

IEC 61010-2-030:2017, *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for equipment having testing or measuring circuits*

IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements*

IEC 61557-12:2018, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC - Equipment for testing, measuring or monitoring of protective measures - Part 12: Power metering and monitoring devices (PMD)*

IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations thereof - Part 1: General requirements and tests*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms

3.1.1
electrical measuring transducer
transducer
TRD
device for converting an AC or DC measurand to a direct or alternating current, a direct or alternating voltage or a digital signal for measurement purposes