IEC 62828-1

Edition 2.0 2026-06

INTERNATIONAL STANDARD

REDLINE VERSION

Reference conditions and procedures for testing industrial and process measurement transmitters -
Part 1: General procedures for all types of transmitters

ICS 17.020; 25.040.40

ISBN 978-2-8327-1334-1

IEC 62828-1:2026-06 RLV(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Reference conditions and procedures for testing industrial and process measurement transmitters - Part 1: General procedures for all types of transmitters

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62828-1:2017. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62828-1 has been prepared by subcommittee 65B: Measurement and control devices, of IEC Technical Committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This second edition cancels and replaces the first edition published in 2017. This edition constitutes a technical revision.

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

a) informative Annexes E, F, G and H have been removed;
b) a new informative Annex G “Example of signal current for a 4 mA to 20 mA PMT” has been introduced (it has been moved from IEC 62828-2:2017 to this document);
c) the definitions of warm-up time, settling time and output signal have been moved from IEC 62828-4:2020 to this document;
d) The definitions of “inaccuracy” and “accuracy” have been reworked;
e) The clause regarding test report has been reworked.

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

Draft	Report on voting
65B/1306/FDIS	65B/1320/RVD

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/publications.

A list of all parts in the IEC 62828 series, published under the general title *Reference conditions and procedures for testing industrial and process measurement transmitters*, can be found on the IEC website.

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, or
– revised.

INTRODUCTION

Most of the current IEC standards on industrial and process measurement transmitters are rather old and were developed having in mind devices based on analogue technologies. Today's digital industrial and process measurement transmitters are quite different from those analogue transmitters: they include more functions and newer interfaces, both towards the computing section (mostly digital electronic) and towards the measuring section (mostly mechanical). Even if some standards dealing with digital process measurement transmitters already exist, they are not sufficient, since some aspects of the performance are not covered by appropriate test methods.

In addition, existing IEC test standards for industrial and process measurement transmitters are spread over many documents, so that for manufacturers and users it is difficult, impractical and time-consuming to identify and select all the standards to be applied to a device measuring a specific process quantity (pressure, temperature, flow, level, etc.).

To help manufacturers and users, it was decided to review, complete and reorganize the relevant IEC standards and to create a more suitable, effective and comprehensive standard series that provides in a systematic way all the necessary specifications and tests required for different industrial and process measurement transmitters.

To solve the issues mentioned above and to provide an added value for the stakeholders, the new standard series on industrial and process measurement transmitters covers the following main aspects:

– applicable normative references;
– specific terms and definitions;
– typical configurations and architectures for the various types of industrial and process measurement transmitters;
– hardware and software aspects;
– interfaces (to the process, to the operator, to the other measurement and control devices);
– physical, mechanical and electrical requirements and relevant tests; clear definition of the test categories: type tests, acceptance tests and routine tests;
– performance (its specification, tests and verification);
– environmental protection, hazardous areas application, functional safety, etc.;
– structure of the ~~technical~~ product documentation.

To cover in a systematic way all the topics to be addressed, the standard series is organized in several parts. At the moment of the publication of this document, the IEC 62828 consists of the following parts:

– *Part 1: General procedures for all types of transmitters;*
– *Part 2: Specific procedures for pressure transmitters;*
– *Part 3: Specific procedures for temperature transmitters;*
– *Part 4: Specific procedures for level transmitters;*
– *Part 5: Specific procedures for flow transmitters.*

~~In preparing the IEC 62828 series many test procedures were taken, with the necessary improvements, from the IEC 61298 series. As the actual IEC 61298 series is applicable to all process measurement and control devices, when the IEC 62828 series is completed the IEC 61298 series will be revised to harmonise it with the IEC 62828 series, taking out from its scope the industrial and process measurement transmitters. During the time when 61298 scope is being updated, the new series IEC 62828 takes precedence for industrial and process measurement transmitters.~~

~~When the IEC 62828 series is published, the IEC 60770 series will be withdrawn.~~

1 Scope

This Part of IEC 62828 establishes a general framework for defining reference conditions and test procedures applicable ~~to~~ for assessing the measurement performances of all types of industrial and process measurement transmitters (PMTs) used in measuring and control systems for industrial process and machinery. ~~These reference test conditions are divided into "standard reference conditions", which apply when determining the accuracy of measurement, and "ambient and process reference conditions", which are used to assess the influence of external quantities on the measurement.~~

For the purpose of this document, an analogue PMT is a process measurement transmitter with ~~an~~ only analogue current and/or voltage output(s), irrespective ~~of~~ the technology adopted and the complexity of the circuitry. All the other process measurement transmitters, with digital output(s) only or with hybrid analogue and digital output(s) ~~(e.g. HART®)~~, are considered to be digital PMTs.

~~For general test procedures, reference is made to IEC 62828-1, which is applicable to all types of industrial and process measurement transmitters.~~

~~Additional specific test procedures for given types of PMTs (pressure, temperature, level, flow) are covered by other parts of this series.~~

This document constitutes a common reference for the other parts of the IEC 62828 series.

Specific test procedures and additional requirements for given types of PMTs (pressure, temperature, level, flow, etc.) are covered by other parts of this series.

Sensing devices according to the IEC 60947 series are excluded from the scope of this document.

NOTE 1 In industrial and process applications, to indicate the process measurement transmitters, it is common also to use the terms "industrial transmitters", or "process transmitters".

NOTE 2 For better clarity, when the complete definition "industrial and process measurement transmitter" makes the sentence too long in this document, the short term "transmitter", or PMT, is used instead.

~~Proximity devices with analogue output are excluded from the scope of this document.~~

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 60068-2-1, *Environmental testing - Part 2-1: Tests - Test A: Cold*

IEC 60068-2-2, *Environmental testing - Part 2-2: Tests - Test B: Dry heat*

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 60068-2-31, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*~~

IEC 60068-2-78, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state*

~~IEC 60079-10 (all parts): *Explosive atmospheres – Part 10: Classification of areas*~~

~~IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*~~
~~IEC 60529:1989/AMD1:1999~~
~~IEC 60529:1989/AMD2:2013~~

IEC 60654-1~~:1993~~, *Industrial-process measurement and control equipment - Operating conditions - Part 1: Climatic conditions*

IEC 60654-3~~:1983~~, *Operating conditions for industrial-process measurement and control equipment - Part 3: Mechanical influences*

~~IEC 60654-4:1987, *Operating conditions for industrial-process measurement and control equipment – Part 4: Corrosive and erosive influences*~~

~~IEC 60721-3-1, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 1: Storage*~~

~~IEC 60721-3-2, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 2: Transportation*~~

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

~~IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*~~

~~IEC 61298-1:2008, *Process measurement and control devices – General methods and procedures for evaluating performance – Part 1: General considerations*~~

~~IEC 61298-4:2008, *Process measurement and control devices – General methods and procedures for evaluating performance – Part 4: Evaluation report content*~~

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

IEC 61499 (all parts), *Function blocks*

~~IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*~~

~~IEC 61511 (all parts), *Functional safety – Safety instrumented systems for the process industry sector*~~

~~IEC 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*~~

~~IEC 61784-2, *Industrial communication networks – Profiles – Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3*~~

~~IEC 61784-5 (all parts), *Industrial communication networks – Profiles – Part 5: Installation of fieldbuses*~~

IEC 61804 (all parts), *Devices and integration in enterprise systems - Function blocks (FB) for process control and electronic device description language (EDDL)*

~~IEC 61804-2, *Function blocks (FB) for process control – Part 2: Specification of FB concept*~~

~~IEC 61918, *Industrial communication networks – Installation of communication networks in industrial premises*~~

~~IEC 61987-11:2016, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 11: List of properties (LOPs) of measuring equipment for electronic data exchange – Generic structures*~~

~~IEC 62061:2005, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*~~

~~IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK Code)*~~

~~IEC 62381:2012, *Automation systems in the process industry – Factory acceptance test (FAT), site acceptance test (SAT) and site integration test (SIT)*~~

~~ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement* (GUM:1995)~~

~~ISO/IEC Guide 99:2007, *International vocabulary of metrology – Basic and general concepts and associated terms* (VIM:2007)~~

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

3.1.1 Terms related to accuracy

3.1.1.1
accuracy
<of a measuring instrument> quality which characterizes the ability of a measuring instrument to provide an indicated value close to a true value of the measurand

Note 1 to entry: This term is used in the "true value" approach.

Note 2 to entry: Accuracy is all the better when the indicated value is closer to the corresponding true value.

[SOURCE: IEC 60050-311:2001, 311-06-08]