IEC 61987-1

Edition 2.0 2024-10
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Industrial-process measurement and control – Data structures and elements in process equipment catalogues –
Part 1: Generic structures for measuring equipment ~~with analogue and digital output~~

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INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL – DATA STRUCTURES AND ELEMENTS IN PROCESS EQUIPMENT CATALOGUES –

Part 1: Generic structures for measuring equipment ~~with analogue and digital output~~

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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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61987-1:2006. 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 61987-1 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement and control. It is an International Standard.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

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

a) Addition of a subclause “Digital communication” in Clause 5, in order to allow a more comprehensive description of the properties of such an interface;
b) Alignment of clause headings, as described in the introduction, to correspond with those of the IEC CDD.

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

Draft	Report on voting
65E/1113/FDIS	65E/1136/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 61987 series, published under the general title *Industrial-process measurement and control – Data structures and elements in process equipment catalogues,* 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.

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

In recent years, industry has become alert to the fact that a great deal of time and effort is wasted in the transposition of measuring equipment data from one form to another. The technical data of an instrument, for example, may exist at the manufacturer's facility as two separate data sets for paper and electronic presentation: the end-user requires much the same data for works standards, engineering data bases or commercial data bases. In most cases, however, the data cannot be automatically re-used because each application has its own particular data storage format.

A second problem that belies the re-use of technical data is the content of the product descriptions themselves. There is little agreement between manufacturers on what information a technical data sheet should contain, how it should be arranged, or how the results, for example of particular performance tests, should be presented. When transferring this information into a data base, an end-user will always find gaps and proprietary interpretations that make the task more difficult.

This part of IEC 61987 aims to solve these problems by defining a generic structure and its content for industrial process measuring and control equipment. It builds upon the assumption that, for a given class of measuring equipment, for example, pressure measuring equipment, temperature measuring equipment or electromagnetic flow-measuring equipment, a set of non-proprietary structures and product features can be specified. The resulting documents can not only be exchanged electronically, but they can also be presented to humans in an easily understandable form.

This part of IEC 61987 is applicable to electronic catalogues of process measuring equipment ~~with analogue and digital output. Further parts with similar classification structures will be produced for measuring equipment with binary output and interface equipment in the future.~~ The structure also contains a great many product features that are common to measuring equipment with binary output. Similarly, Annex B has been prepared with a view to future standardisation.

This part of IEC 61987 is not intended as a replacement for existing standards, but rather as a guiding document for all future standards which are concerned with the specifications of process measuring equipment. Every revision of an existing standard should take into account the structures and product features defined in Clause 5 or work towards a harmonisation.

Annex A contains a tabular overview of the classification and catalogue structure of process measuring equipment. Annex B contains tables with a further sub-classification for specific measured variables.

Wherever possible, existing terms from international standards have been used to name the product features within the structures. In accordance with ISO 10241, Clause ~~3 of this standard~~3 contains a list of terms, definitions and sources.

Documents created according to the standard are structured. A possible means of exchanging structured information free of layout information is given by SGML (Standard Generalised Mark-Up Language, ISO 8879) or XML (Extensible Mark-Up Language), which is derived from it.

This part of IEC 61987 could also provide the basis for arranging of properties (data element types) that conform to IEC 61360 or ISO 13584. This would require that the features, which in this part of IEC 61987 can be textual units, graphical and tabular representations etc., be broken down into properties (data element types) conformant to the said standards. For example, a range would be expressed as a lower range-limit (LRL) and upper range-limit (URL) with unit of measure; dimensions (L x B x H) as three separate elements, length, breadth and height with unit of measure; or a derating curve as an appropriate series of data element pairs.

This part of IEC 61987 conforms to ISO 15926-1 and -2 with respect to the data model and associated reference data library (ISO 15926-4), for example, as used for the limited classification structure. At the same time, it is also aligned to STEP: Standard for the Exchange of Product Model Data. The data model and definitions of ISO 10303-221 use the ISO 15926-4 TS Reference Data Library as "library". The current standard can reproduce the data fields as per this ISO 10303-221, including, for example, product structure data, dimensional data, electrical connection data and product properties such as measuring range or power supply.

Since the publication of Edition 1 (2006) of this document a great deal of work has been done on the development of the IEC Common Data Dictionary for equipment for industrial-process automation. This, published as further parts of IEC 61987, covers not only measuring instruments with a variety of inputs and outputs, but also final control elements, infrastructure devices and in future process analysers.

For this reason, the title has been adjusted and the scope has been revised to reflect the current content of the whole IEC 61987 standard series.

During the development of the IEC CDD a number of questions arose regarding the structure proposed in this document, in particular the assignment of any digital communication interface to the output. Although this is not strictly incorrect, it was thought that the properties of such an interface could be better described separately. For this reason, a clause "Digital communication" has been added to this Edition 2. In addition, the clause "Mechanical construction" has been renamed "Mechanical and electrical construction" to reflect its true content.

"Ordering information" is not found as a separate block in the IEC CDD, as it is assumed that the properties there describe the type and particular instance of an already purchased device. For an ordering process using IEC CDD properties, the necessary information is retrieved from the "Identification" which also includes the ordering information.

"Certificates and approvals" can be found both in the device list of properties (0112/2///61987#ABC156) and as a device aspect within the "device documents supplied" (0112/2///61987#ABH517). This is also the location of the information contained in "Documentation".

In preparing the current edition of this document all terms and definitions have been checked and where necessary the references updated. Since the publication of Edition 1 in 2006 a number of standards have been withdrawn. Where no suitable alternative source has been found, a note to this effect has been added, but the original term and definition have been left unchanged.

INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL – DATA STRUCTURES AND ELEMENTS IN PROCESS EQUIPMENT CATALOGUES –

Part 1: Generic structures for measuring equipment ~~with analogue and digital output~~

1 Scope

This part of IEC 61987 defines a generic structure in which product features of industrial process measurement ~~and control equipment with analogue or digital output should~~ devices shall be arranged, in order to facilitate the understanding of product descriptions when they are transferred from one party to another. It applies to the production of catalogues ~~of process measuring equipment~~ supplied by the manufacturer of ~~the product~~ such devices and helps the user to formulate their requirements.

This document will also serve as a reference document for all future standards which are concerned with process measuring equipment ~~catalogues. In addition, it is intended as a guide for the production of further standards on process equipment documentation for similar systems, for example, for other measuring equipment and actuators~~.

In addition, this document also provides a basic structure for the production of further standards listing the properties of process control equipment, for example, for actuators and infrastructure devices.

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 60529:2001, *Degrees of protection provided by enclosures (IP Code)*~~

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

~~IEC 60559:1989, *Binary floating-point arithmetic for microprocessor systems*~~

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

IEC 60721-3 (all parts), *Classification of environmental conditions – Classification of groups of environmental parameters and their severities*

IEC 60751:2022, *Industrial platinum resistance thermometers and platinum temperature sensors*

~~IEC 60770-1:1999, *Transmitters for use in industrial-process control systems – Part 1: Methods for performance evaluation*~~

IEC TR 61000-1-1:2023, *Electromagnetic compatibility (EMC) – Part 1: General – Section 1: Application and interpretation of fundamental definitions and terms*

~~IEC 61000-4 (all parts), *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques*~~

IEC 61069 (all parts), *Industrial-process measurement, control and automation – Evaluation of system properties for the purpose of system assessment*

IEC 61298 (all parts), *Process measurement and control devices – General methods and procedures for evaluating performance*

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

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

ISO 3511-1:1977, *Process measurement control functions and instrumentation – Symbolic representation – Part 1: Basic requirements*

3 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**~~
~~**ambient conditions**~~
~~**environmental conditions**~~
~~characteristics of the environment which may affect performance of the device or system~~

~~NOTE Examples of ambient conditions are pressure, temperature, humidity, vibration, radiation.~~

~~[IEV 151-16-03]~~

3.1
accuracy
inaccuracy
<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 measured value under reference conditions

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.

Note 3 to entry: Inaccuracy as defined in IEC 61298-2 includes the errors of non-linearity, non-repeatability and hysteresis.

Note 4 to entry: Accuracy can be expressed as percentage of reading, span or full range etc. or as an absolute value

[SOURCE IEC 60050-311:—, 311-06-08, modified – measured value instead of measurand, under reference conditions added, Notes 3 and 4 added]

3.2
accuracy class
category of instruments or components thereof, all of which are intended to comply with a set of specifications regarding uncertainty

[SOURCE IEC 60050-311:—, 311-06-09 modified – "or components" added]

3.3
ambient temperature
temperature measured at a representative point within the local environment, including adjacent heat generating equipment, in which the measurement and control equipment will normally operate, be stored or transported

SEE: 3.15

3.4
ambient temperature limits
extreme values of ambient temperature to which a device may be subjected without permanent impairment of operating characteristics

Note 1 to entry: The performance characteristics may be exceeded in the range between the limits of normal operation and the operating temperature limits.

SEE: 3.3, 3.33

3.5
ambient temperature range
range of ambient temperatures within which a device is designed to operate within specified accuracy limits

SEE: 3.31, 3.33

3.6
analog signal
~~signal whose information parameter may assume any value within a given continuous range~~

~~[IEV 351-12-18]~~

signal each information parameter of which directly represents the respective variable quantity

Note 1 to entry: An analog signal may be a continuous-value signal or a discrete-value signal as well as a continuous-time or a discrete-time signal. Examples may be the pressure in a pneumatic final controlling element with continuous-value and continuous-time information parameter (value of the pressure) as well as a position-modulated pulse signal as an output signal of a computer based controller.

[SOURCE: IEC 60050-351:2013, 351-41-24]

3.7
binary signal
~~digital signal whose information parameter may assume one out of two discrete values~~

~~[IEV 351-12-20]~~

discrete-value signal each information parameter of which may assume one of two values

[SOURCE: IEC 60050-351:2013, 351-41-21]

3.8
climate class
climatic conditions, i.e. ambient temperature, pressure and humidity, to which the measurement equipment can be subjected during operation (including shutdown), transport and storage (over land or sea)

~~[IEC 60654-1, Clause 4]~~

~~**3.7.1**~~
~~**class A: air-conditioned location**~~
~~location in which both air temperature and humidity are controlled within specific limits~~

~~**3.7.2**~~
~~**class B: heated and/or cooled enclosed location**~~
~~location where only air temperature is controlled within specific limits~~

~~**3.7.3**~~
~~**class C: sheltered location**~~
~~location where neither air temperature nor humidity are controlled. The equipment is protected against direct exposure to sunlight, rain or other precipitation and full wind pressure~~

~~**3.7.4**~~
~~**class D: outdoor location**~~
~~location where neither air temperature nor humidity are controlled. The equipment is exposed to outdoor atmospheric condition such as direct sunlight, rain, hail, sleet, snow, icing, wind and blown sand~~

3.9
degree of protection
extent of protection provided by an enclosure against access to hazardous parts, against ingress of solid foreign objects and/or ingress of water, and verified by standardized test methods

[SOURCE: IEC 60529:1989, 3.3]

3.10
dependability
extent to which a system can be relied upon to perform ~~exclusively and correctly a task~~ a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external sources are provided

[SOURCE: ~~IEC 61069-5, 3.1~~ IEC 61069-1:2016, 3.1.22]

3.11
device
material element or assembly of such elements intended to perform a required function

Note 1 to entry: A device may form part of a larger device.

[SOURCE: IEC 60050-151: 2001, 151-11-20]

3.12
digital signal
~~signal, the information parameter of which may assume one out of a set of discrete values~~

~~[IEV 351-12-19]~~

signal each information parameter of which represents the respective variable quantity in coded manner as a symbol of a character set

Note 1 to entry: In most technical cases a digital signal is discrete-value and discrete-time.

Note 2 to entry: A digital signal requires an agreement about the code between transmitter and receiver of the signal.

Note 3 to entry: In many technical cases the symbols may be interpreted as numbers.

[SOURCE: IEC 60050-351:2013, 351-41-25]

3.13
drift
change in the indication of a measuring system, generally slow, continuous, not necessarily in the same direction and not related to a change in the quantity being measured

[SOURCE: IEC 60050-311:—, 311-06-13, modified – quantity being measured for measurand]

3.14
electromagnetic compatibility
ability of ~~measuring~~ equipment or a ~~measuring~~ system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

[SOURCE: IEC 60050-161:1990, 161-01-07~~, modified~~]

3.15
environmental condition
characteristics of the environment which may affect the performance of the device or system

Note 1 to entry: Examples of environmental conditions are pressure, temperature, humidity, vibration, radiation.

[SOURCE: IEC 60050-151:2001, 151-16-03]

3.16
environmental condition class
alphanumeric character sequence denoting a set of environmental conditions to which the equipment is or can be subjected to during operation

Note 1 to entry: The IEC 60721 series defines classes for climatic, mechanical and other environmental influences.

3.17
environmental influence
change in the output of an instrument caused solely by the departure of one of the specified environmental conditions from its reference value, all other conditions being held constant

SEE: 3.21, 3.39

3.18
equipment
single apparatus or set of devices or apparatuses, or the set of main devices of an installation, or all devices necessary to perform a specific task

Note 1 to entry: Examples of equipment are a power transformer, the equipment of a substation, measuring equipment.

[SOURCE: IEC 60050-151:2001, 151-11-25]

3.19
hysteresis
property of a device or instrument whereby it gives different output values in relation to its input values depending upon the directional sequence in which the input values have been applied

[SOURCE: IEC 61298-2:2008, 3.11]

3.20
influence of ambient temperature
change in zero (lower range-value) and/or span caused by a change in ambient temperature from the reference temperature up to the limits of the ambient temperature range quoted in the performance specifications

SEE: 3.17

3.21
influence quantity
quantity that is not the subject of the measurement and whose change affects the relationship between the indication and the result of the measurement ~~[≈ VIM 2.7]~~

~~NOTE 1 This term is used in the "uncertainty" approach.~~

~~NOTE 2 Influence quantities can originate from the measured system, the measuring equipment or the environment.~~

~~NOTE 3 As the calibration diagram depends on the influence quantities, in order to assign the result of a measurement it is necessary to know whether the relevant influence quantities lie within the specified range.~~

[SOURCE: IEC 60050-311:—, 311-06-01]

3.22
integrity
assurance provided by the system that the tasks will be performed correctly unless notice is given of any state of the system, which could lead to the contrary

[SOURCE: ~~IEC 61069-5, 3.5~~ IEC 61069-1:2016, 3.1.37]

~~**3.18**~~
~~**limiting condition**~~
~~extreme condition that a measuring system is required to withstand without damage and without degradation of specified metrological characteristics when it is subsequently operated under its rated operating conditions.~~

~~NOTE 1 Limiting conditions for storage, transport or operation can differ.~~

~~NOTE 2 Limiting conditions can include limiting values of the quantity being measured and of any influence quantity.~~

~~[VIM 5.6]~~

~~**3.19**~~
~~**limiting values for operation**~~
~~extreme values which an influence quantity can assume during operation without damaging the measuring instrument so that it no longer meets its performance requirements when it is subsequently operated under reference conditions~~

~~NOTE The limiting values can depend on the duration of their application.~~

~~[IEV 311-07-06]~~

~~**3.20**~~
~~**limiting values for storage**~~
~~extreme values which an influence quantity can assume during storage without damaging the measuring instrument so that it no longer meets its performance requirements when it is subsequently operated under reference conditions~~

~~NOTE The limiting values can depend on the duration of their application.~~

~~[IEV 311-07-07]~~

~~**3.21**~~
~~**limiting values for transport**~~
~~extreme values which an influence quantity can assume during transport without damaging the measuring instrument so that it no longer meets its performance requirements when it is subsequently operated under reference conditions~~

~~NOTE The limiting values can depend on the duration of their application.~~

~~[IEV 311-07-08]~~

3.23
long-term drift
drift in output monitored for 30 days at 90 % of span

[SOURCE: IEC 61298-2:2008, 7.2, modified – subclause condensed]

3.24
maintainability
ability of an item under given conditions of use, to be retained in, or restored to a state in which it can perform a required function, when maintenance is performed under given conditions and using stated procedures and resources

[SOURCE: ~~IEC 61069-5, 3.3~~ IEC 61069-1, 3.1.39]

3.25
~~**maximum**~~ **measured error**
largest positive or negative value of error of the average upscale or downscale value at each point of measurement

[SOURCE: ~~IEC 60770-2, 3.7~~ IEC 61298-2:2008, 3.7, modified – "s" removed from error and value]

3.26
measured variable
quantity intended to be measured

[SOURCE: ISO/IEC Guide 99:2007, 2.3 – modified – term changed to reflect usage in control technology, notes to entry removed]

3.27
measuring instrument
device intended to be used to make measurements, alone or in conjunction with supplementary devices

[SOURCE: IEC 60050-311:—, 311-03-01]

3.28
measuring range
range of values defined by two extreme values within which a variable can be measured within the specified accuracy

Note 1 to entry: The extreme values are usually termed the upper range-limit and the lower range-limit.

[SOURCE: IEC 60050-351:2013, 351-48-11]

3.29
measuring principle
measurement principle
phenomenon or process serving as the basis of a measurement

Note 1 to entry: The measurement principle can be a physical, chemical, or biological phenomenon.

~~[VIM 2.3]~~

[SOURCE: ISO/IEC Guide 99:2007, 2.4, modified – term "measuring principle" added, note from ISO/IEC Guide 99:2007, 2.3 retained in preference to current notes]

3.30
non-repeatability
repeatability error
algebraic difference between the extreme values obtained by a number of consecutive measurements of the output over a short period of time for the same value of the input under the same operating conditions, approaching from the same direction, for full range traverses

Note 1 to entry: It is usually expressed in percentage of span and does not include hysteresis and drift.

~~[IEC 61298-2, 3.12, modified]~~

3.31
nominal range of use
specified range of values which an influence quantity can assume without causing a variation exceeding specified limits

[SOURCE: IEC 60050-311:—, 311-07-05]

3.32
normal operating conditions
range of operating conditions within which a device is designed to operate within specified performance limits

3.33
operating conditions
conditions to which a device is subjected, not including the variables handled by the device

Note 1 to entry: Examples of operating conditions include: ambient pressure, ambient temperature, electromagnetic fields, gravitational force, inclination, power supply variation (voltage, frequency, harmonics), radiation, shock and vibration. Both static and dynamic variations in these conditions should be considered. (see IEC 60654 (all parts)).

[SOURCE: ~~351-18-33, modified] (see also [IEV 151-16-01])~~ IEC 60050-351:1998, 351-18-33, modified – Note to entry added]

3.34
operating limits
range of operating conditions to which a device may be subject without permanent impairment of operating characteristics

Note 1 to entry: In general, performance characteristics are not stated for the region between the limits of normal operation conditions and the operating limits.

Note 2 to entry: Upon returning within the limits of normal operating conditions, a device may require adjustments that restore normal performance.

Note 3 to entry: The limiting conditions for storage, transport and operation may be different.

3.35
output variable
~~recordable variable of a system, influenced only by the system and its input variables~~

~~[IEV 351-12-04]~~

recordable variable quantity generated by a system, influenced only by the system and via the system by its input variables

[SOURCE: IEC 60050-351:2013, 351-41-07]

3.36
performance
characteristics defining the ability of a measuring instrument to achieve the intended functions.

[SOURCE: IEC 60050-311:—, 311-06-11]

3.37
power source
primary source, usually AC mains, from which the system's energy is derived

3.38
power supply ~~device~~
separate unit which can convert, rectify, regulate or otherwise modify the form of energy from the power source to provide suitable energy for a system or elements of a system for measurement and control

~~**3.37**~~
~~**rangeability**~~
~~ratio of the maximum span to the minimum span to which an instrument can be adjusted within the specified accuracy rating.~~

~~Example: If the span of a device is adjustable from 10 to 90, its rangeability is 90/10 = 9~~

3.39
rated operating condition
~~condition to be fulfilled during measurement in order that a measuring system performs as designed~~

~~NOTE The rated operating condition generally specifies intervals of values for the quantity being measured and for any influence quantity.~~

~~[VIM 5.5]~~

operating condition that shall be achieved in order that a measuring instrument or measuring system performs as designed

Note 1 to entry: The rated operating condition generally specifies intervals of values for the quantity being measured and for any influence quantity.

[SOURCE: ISO/IEC Guide 99:2007, 4.9]

3.40
reference operating condition
reference condition
condition of use prescribed for evaluating the performance of a measuring system or for comparison of measurement results

Note 1 to entry: Reference operating conditions ~~generally~~ specify intervals of values ~~for any~~ of the measurand and of the influence quantities.

~~[VIM 5.7]~~

Note 2 to entry: In IEC 60050-300, International Electrotechnical Vocabulary – Electrical and electronic measurements and measuring instruments, definition 311-06-02, the term "reference condition" refers to an operating condition under which the specified instrumental measurement uncertainty is the smallest possible.

[SOURCE: ISO/IEC Guide 99:2007, 4.11, modified – "measuring instrument" removed from definition]

3.41
reliability
ability of an item to perform a required function under given conditions for a given period of time ~~interval~~

[SOURCE: ~~IEC 61069-5, 3.2~~ IEC 61069-1:2016, 3.1.50]

3.42
rise time
for a step response, duration of the time interval between the instant when the output ~~signal~~ variable reaches a small, specified percentage of the difference between the final and the initial steady state vales and the instant when it reaches for the first time a large, specified percentage of the same steady state difference

Note 1 to entry: Conventional values are 5 % to 95 % or 10 % to 90 %.

[SOURCE: IEC 61298-2:2008, 3.14, modified – definition modified and Note 1 to entry added]

3.43
security
assurance provided by a system that any incorrect input or unauthorised access is denied

[SOURCE: ~~IEC 61069-5, 3.6~~ IEC 61069-1:2016, 3.1.57]

3.44
settling time
~~duration of the time interval between the instant of a step change in one of the input variables and the instant when the output variable does not deviate by more than a specified tolerance (e.g. 5 %) from the difference between its final and initial steady-state values~~

~~NOTE 1 Conventional values for tolerance are ±2 % and ±5 %.~~

~~NOTE 2 For non-linear behaviour, both magnitude and position of the input variable should be specified.~~

~~[IEV 351-14-43]~~

time interval between the stepwise variation of the input variable und the instant, when the difference between the step response and their steady-state value is smaller than the transient value tolerance

[SOURCE: IEC 60050-351:2013, 351-45-37, modified – definition modified]

3.45
shock
sudden non-periodic motion caused by a blow, impact, collision, concussion or violent shake or jar

Note 1 to entry: There are two methods to measure shock

a) the first is to specify a value of acceleration or deceleration together with its duration;

b) the second is to specify a height of free fall on to a specified flat surface.

3.46
signal
physical variable quantity, one or more parameters of which carry information about one or more ~~variables which the signal represents~~ variable quantities

Note 1 to entry: These parameters are called the "information parameters".

[SOURCE: ~~351-12-16~~ IEC 60050-351:2013, 351-41-17]

3.47
span
algebraic difference between ~~the values of~~ the upper and lower limit values of the measuring range ~~[= VIM 5.2]~~

[SOURCE: IEC 60050-311:—, 311-03-13]

3.48
standardized signal
signal, the lower and upper range-values of which are standardized

Examples: 4 mA DC to 20 mA DC; 20 kPa to 100 kPa.

3.49
start-up drift
drift in output monitored over a period of 4 h after power is switched on

[SOURCE: IEC 61298-2:2008, 7.1, modified – subclause condensed]

3.50
storage and transportation conditions
specified conditions to which a device may be subject between the time of construction and the time of operation ~~(see 3.20 and 3.21)~~

~~NOTE~~ SEE: 3.14

Note 1 to entry: During storage and transportation, the device is inoperative and appropriately protected and/or packed to meet the specified condition limits so that the device will not be damaged or suffer a degradation of performance.

3.51
storage temperature
ambient temperature to which a device may be subject between the time of construction and the time of operation

SEE: 3.1

3.52
thermal response time ~~**(thermal)**~~
time a thermometer takes to respond at a specified percentage to a step change in temperature

Note 1 to entry: To specify response time it is necessary to declare:

~~a) the percentage of response (usually 50 % or 90 %);~~

~~b) the test medium and the flow conditions (usually water with 0,4 m/s and air with 3 m/s).~~

a) the percentage of response, usually t0.9, t0.5, or t0.1, which gives the time for 90 %, 50 % or 10 % of the response.

b) the test medium and its flow conditions have to be specified (usually flowing water and/or flowing air).

[SOURCE: IEC 60751:2022, 3.12, modified – Notes to entry added]

3.53
type of protection
set of specific measures applied to ~~electrical apparatus~~ equipment to avoid ignition of a surrounding explosive atmosphere ~~by such apparatus~~

[SOURCE: IEC 60050-426:2020, 426-01-02]

~~**3.53**~~
~~**variation** (due to an influence quantity)~~
~~difference between the indications of a measuring system for the same value of the quantity being measured when an influence quantity assumes, successively, two different values~~

~~[VIM 4.19]~~

3.54
vibration
periodic motion, reciprocating, rotary or both, usually with a well-defined fundamental frequency

Note 1 to entry: A typical example is the vibration of rotating machinery.

3.55
vibration resistance
range of sinusoidal vibrations of a given severity the measurement equipment can withstand without permanent impairment of operating characteristics

Note 1 to entry: The severity is determined by four parameters: frequency, range, amplitude of vibration and duration of loading.

Note 2 to entry: The term is derived from the content of IEC 60068-2-6

3.56
warm-up time
duration between the instant when the power supply is energized and the instant when the measuring instrument may be used, as specified by the manufacturer

[SOURCE: IEC 60050-311:—, 311-03-18]

3.57
zero adjustment
means provided in an instrument to cause a parallel shift in the input-output ~~curve~~ relationship

[SOURCE: ~~IEC 60770-1, 3.1~~ IEC 60873-1:2003, 3.9]

4 Metadocuments

4.1 General

A metadocument is a document that describes how other documents for a particular purpose, in this case for the exchange of product catalogue data, are to be created and structured.

Metadocuments in this part of IEC 61987 describe the non-proprietary structures (clauses) and product features (textual descriptions, tables, diagrams, photographs or single properties) of a class of process measuring equipment. They serve as specimen and procedural instructions for the production of process equipment catalogues by the equipment manufacturer.

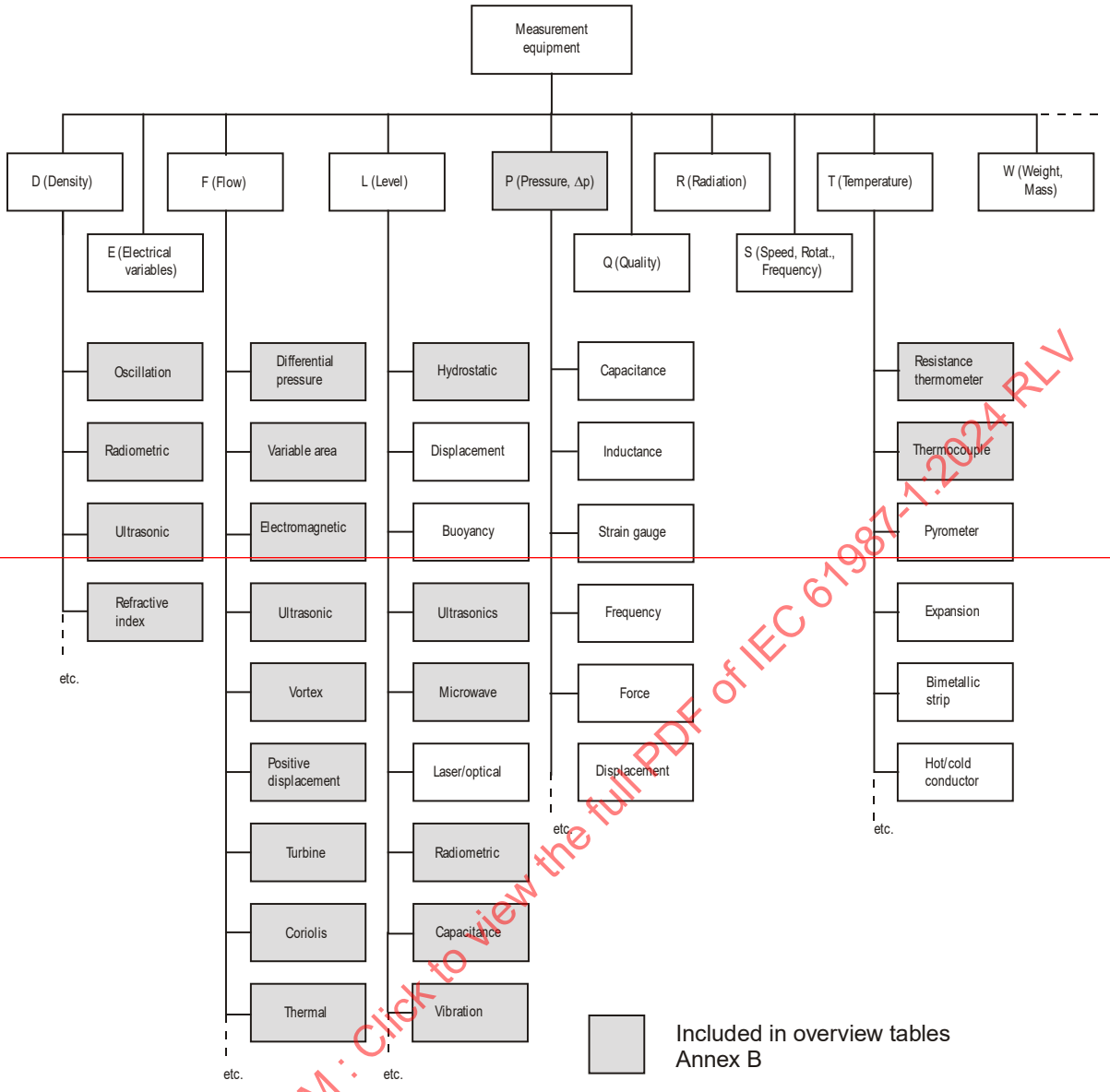
Metadocuments form a document hierarchy corresponding to the hierarchical classification of the process measuring equipment. A metadocument can exist at each level of the hierarchy which describes structures and features common to all equipment at this hierarchical level. Metadocuments at lower hierarchical levels inherit the structure and features from the metadocuments at levels above them.

Figure 1 shows the classification scheme for process measuring equipment used in this document. It is based on the table of letter codes for identification of instrument functions to be found in ISO 3511-1. Process measuring equipment may be further subdivided into continuous measuring equipment, the measurement value of which is expressed as a quantitative value through analogue or digital output, and limit detecting equipment, the measurement value of which is expressed as a binary-state signal. The metadocument defined in Clause 5 defines the common structures and features that are to be found at this level in the hierarchy.

Each piece of equipment is designed to measure one or more process variables, for example level, pressure, flow or temperature. To fully define the technical data of say, a flowmeter, additional features, for example inlet and outlet run, shall be added to those inherited from the level above.

The methods used to measure a particular process variable form a further level in the hierarchy. Thus, flow may be measured by a differential pressure transmitter sensing the ~~differential~~ pressure ~~produced~~ drop across a primary element, a variable area flowmeter, an electromagnetic flowmeter etc.

Depending on the measuring method used, additional features can again be added to the structure to adequately characterise the equipment. Such additional features have already been defined for the measurement methods shaded grey in Figure 1 (see Annex B).



NOTE Letter codes D, F, L, etc. identifying the measuring equipment function are taken from ISO 3511-1.

Figure 1 – Classification scheme for process measuring equipment

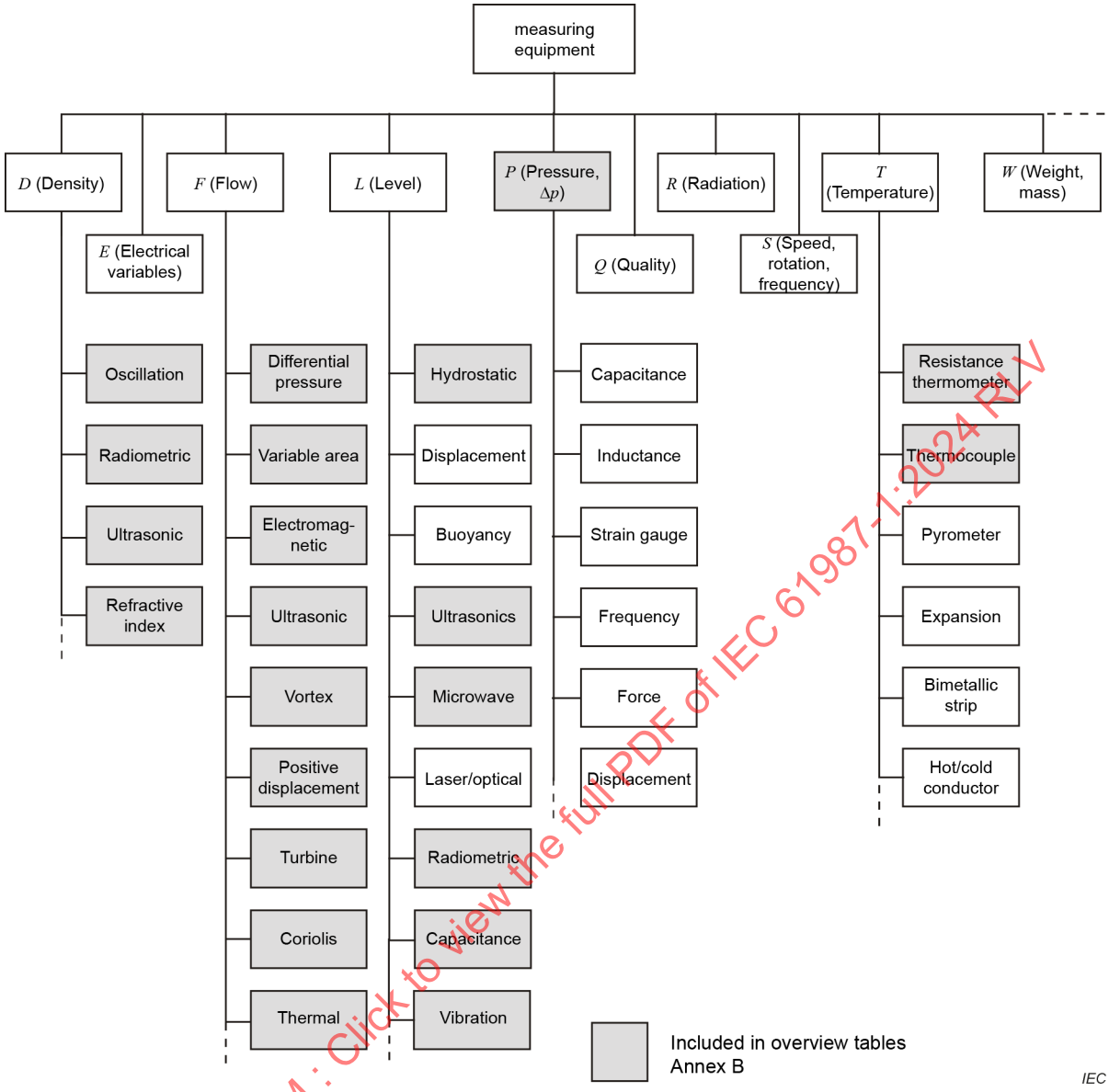


Figure 1 – Classification scheme for process measuring equipment (letter codes *D*, *F*, *L* etc. identifying the measuring equipment function taken from ISO 3511-1)

4.2 Metadocument clauses and features

4.2.1 General

The metadocument ~~shall~~ is to be structured for all process measuring equipment as follows:

1 Identification
2 Application
3 Function and system design
4 Input
5 Output
6 Digital communication
7 Performance characteristics

NOTE 1 If the process measuring equipment has no digital communication interface, Clause 6 can be omitted.

This part of IEC 61987 shall be used by the equipment manufacturer, in that they take the metadocuments and organises the technical data for their measuring equipment under the structure and features defined for each clause. The document may also contain photographs, drawings and tables.

NOTE 2 For the preparation of metadocument data, see also IEC 82045. For the preparation of diagrams, tables and lists, see also IEC 61082.

Features common to all process measuring equipment are compiled in Clause 5. At the start of each subclause, for example 5.1, it is stated what information is expected to be entered at that point in the metadocument. The information itself is then entered under the appropriate feature. Where necessary, the vendor/manufacturer is free to specify additional, non-standard features at each point in the structure.

If no feature is specified for a part of the structure, the vendor/manufacturer is free to present their information as they like under the structure heading, for example by the use of non-standard features.

NOTE 3 The nomenclature adopted in the metadocument defined in Clause 5 is based on terms and concepts drawn from international standards.

NOTE 4 Clause 5 also includes so-called synonymous names. A synonymous name is a related designation or concept. It is intended for electronic searches only and ~~should~~ is not ~~be substituted~~ a substitute for the preferred term.

NOTE 5 Each term in Clause 5 is accompanied by an explanation of what is to be entered in the data element. These explanations are informative only, and do not constitute normative definitions.

The metadocument of the measuring equipment for particular measured variables is summarised in Table A.1.

Annex B contains tables for various measurement methods. The tables indicate general specifications to be made in all documents and particular specifications to be made for the different types of measurement equipment, i.e., for flow, level, pressure, temperature and density. Terms and definitions for specific measuring equipment and measurement methods are not the subject of this document but are included in informative Annex B for completeness.

4.2.2 Composite measuring equipment

Process measuring equipment may comprise one or more modules combined in different ways: for example, for temperature it may comprise a sensing element (thermocouple or RTD) and a temperature transmitter. Such modular measuring equipment can be described using the features for the corresponding equipment class, either for the equipment as a whole or for each separate module, according to the manufacturer's preference. The equipment architecture and

the way in which the modules work together shall always be described under Clause 3 of the metadocument, Function and System Design.

4.2.3 Measuring equipment with ~~fieldbus~~ a digital communication interface

~~Where measuring equipment offers digital communication by means of a fieldbus protocol, the corresponding features are to be described in Chapter 5 (output).~~

Where measuring equipment offers a digital communication interface the user can choose to follow the structure in Edition 1 (2006) of this document and describe the corresponding features in Clause 5 Output or list them separately in Clause 6. The latter option is to be preferred when bidirectional properties, i.e., both input and output functions, are to be described.

4.3 Nomenclature

The nomenclature adopted in the metadocument defined in Clause 5 is based on terms and concepts drawn from international standards.

The metadocument also includes so-called synonymous names. A synonymous name is a related designation or concept. It is intended for electronic searches only and should not be substituted for the preferred term.

Each term in the metadocument is accompanied by an explanation of what is to be entered in the data element. These explanations are informative only, and do not constitute normative definitions.

5 Metadocument for process measuring equipment

5.1 Identification

5.1.1 General

The information necessary for unambiguous identification of the measurement equipment shall be specified here. This information may be supplemented by illustrations, for example drawings or photographs.

5.1.2 Document identification

Type, code number and version and if appropriate, the revision number of the document.

5.1.3 Date of issue

Date of issue of the document in the form: year, month and, if appropriate, day.

NOTE The manufacturer is encouraged to supplement this information with a "valid until" date.

5.1.4 Product type

Type of product, for example capacitance level transmitter, differential pressure transmitter, Pt100 resistance thermometer, variable area flowmeter, see also Figure 1.

5.1.5 Product name

Product name under which the measuring equipment is marketed.

NOTE There is no conformity under manufacturers regarding the naming of their products. The name ~~may~~ can comprise a product name, a product model number or a combination of both. If necessary, the manufacturer ~~should~~ can add a separate feature for the product model number.

5.1.6 Version

Hardware, firmware and software version of the measuring equipment.

5.1.7 Manufacturer

Name of the manufacturer of the measurement equipment, optionally with address.

NOTE For OEM products, the vendor's name ~~should~~ can be entered here.

5.2 Application

Application for which the measurement equipment is designed, together with the reasons for its use, shall be specified here.

5.3 Function and system design

5.3.1 General

Method by which the physical quantity is acquired, processed and output as a signal by the measurement equipment shall be specified here. The measuring principle and the components comprising the measurement equipment shall be specified. ~~Terms such as those listed in IEC 60770-1, Annex A (transmitter, meter, indicator, switch, transducer and sensor), should be used. If appropriate, the signal processing, including any diagnostic functions, shall be described.~~ Terms such as those listed in IEC 61987-11 shall be used (transmitter, gauge, switch, indicator and sensing element). If appropriate, the signal processing, including any diagnostic functions, shall be described.

NOTE 1 The term "flowmeter" can be used as an alternative to "flow transmitter".

NOTE 2 If a device has no standardised signal output, the term "transducer" can be used.

5.3.2 Measuring principle

Principle used to measure a physical quantity in order to determine the value of a measured variable.

5.3.3 Equipment architecture

Components, devices, assemblies or systems used to perform the measuring activity.

~~Synonymous name: modularity.~~

5.3.4 Communication and data processing

Components, hardware and software necessary for communication with external systems and execution of complex functions.

5.3.5 Dependability

5.3.5.1 General

Information on the dependability of the equipment as defined in IEC 61069. The scheme as per IEC 61069-5 ~~should~~ shall be followed.

5.3.5.2 Reliability

Where appropriate, the Mean Time Between Faults (MTBF), fault tolerance, internal redundancy etc. shall be entered here.

5.3.5.3 Maintainability

Where appropriate, any special tools, the smallest replaceable units, any consumables required for the correct operation and maintenance of the equipment shall be entered here.

5.3.5.4 Integrity

Where appropriate, any mechanism which ensures the integrity of the equipment output on the discovery of a fault shall be described here.

5.3.5.5 Security

Where appropriate, any measures or conformance to recognised standards or regulatory guidelines regarding access authorisation to and protection of device data shall be entered here.

5.4 Input

5.4.1 General

Information on the measured variable shall be entered here, i.e., the physical, physicochemical or chemical quantity, the size of which is to be acquired and indicated by the measurement.

5.4.2 Measured variable

Variable(s) measured by the equipment.

~~For multi-sensor instruments, the various main measuring sensors and/or auxiliary sensors supporting the main sensor(s) shall be defined.~~

For multivariable instruments, all measured variables shall be listed. Where supporting measurements are necessary, it shall be specified whether these are made internally or externally. In the case of external measurements, the properties of any auxiliary input interface shall be described.

5.4.3 Measuring range

Range of values of the measured variable that the equipment has been designed to measure.

The measuring range is defined by a lower range-limit (LRL) and an upper range-limit (URL). Within this range, measurements are made within the accuracies specified in 5.7. In addition, depending upon the physical quantity being measured, adjustment ranges for the lower and upper range-limits or a turndown ratio ~~may~~ can also be specified. These ~~may~~ can be expressed as a percentage of the maximum span, as absolute values or as a ratio.

~~NOTE 1~~

- The way in which the measuring range is expressed is a matter of convention and ~~may~~ can differ according to the physical quantity measured and type of instrument.

~~NOTE 2~~

- For some measurement methods, additional information on the physical starting point of the measuring range should be specified, for example for ultrasonic level measurement.

~~NOTE 3~~

- The accuracies specified in 5.7 ~~should~~ shall also apply after any permitted adjustments to the measuring range have been made, otherwise the associated accuracies ~~should~~ shall be stated.

Where a device provides a means of zero and span adjustment, this should be described.

5.5 Output

5.5.1 General

The information signal (output) after the processing of measured variable(s) shall be specified here. ~~For analogue and digital equipment,~~ The size of output signal indicates unequivocally the size of the measured variable.

Where the ~~process~~ measuring equipment has more than one output, all shall be described.

5.5.2 Output signal

Type and characterising quantities of the output signal.

The output signal might be electrical, mechanical, hydraulic, pneumatic, optical, digital etc. It may be variable over a specified range or assume specific values only. If the output is configurable, the possible operating modes should be described.

~~If the output of a device, element or system is a foreign system interface, then the physical layer, transmission rate, transmission protocol and primary information parameters shall also be specified.~~

EXAMPLE: 4 mA to 20 mA analogue signal, configurable as binary signal 8/16 mA.

~~Digital signal as floating point number according to IEC 60559.~~

In the case of a digital signal, the user has the option entering the type of communication interface in Clause 5 or describing it in detail in Clause 6, Digital communication.

5.5.3 Signal on alarm

Value(s) or status assumed by the output signal when there is a fault in the process measuring equipment.

5.5.4 Load

For analogue outputs, the electrical, optical, pneumatic, hydraulic or mechanical load presented to the output of a device, element or system by the external devices connected to it.

5.6 Digital Communication

5.6.1 General

If the measuring equipment possesses a digital communication interface, its properties can be described here. Properties in addition to the ones listed in 5.6.2 to 5.6.4 can also be added under an appropriate clause heading.

Where the measuring equipment has more than one digital communication interface, all shall be described.

5.6.2 Communication protocol

The name, type and supported version of the communication interface shall be entered here. Should particular device profiles be supported, the names and versions shall be entered. Similarly, any roles the equipment can adopt and any special functionality it can support shall also be described.

5.6.3 Communication variable

The designation of all communication channels, the variables assigned by default to them and the type of variable shall be entered here.

Example: Communication channel 1, mass flow, analog input
...
Communication channel 6, accumulated mass flow, totalizer output

Where the measuring equipment possesses a totalizer output, the means of resetting together with the reset value and function shall be described.

5.6.4 Physical layer

The physical layer used by the communication interface shall be described here. This shall include the possible baud rate settings, the default baud rate settings, the assigned address and the means of setting the address.

For wired communication interfaces the means of connection together with the cable specification shall be described. If appropriate, the fieldbus explosion protection concept supported by the interface shall be specified.

For optical communication interfaces, the marking, designation and type of optical connection shall be described together with the operating wavelength and mode.

For wireless communication interfaces, the transmission standard shall be specified together with the type of antenna used.

5.7 Performance characteristics

5.7.1 General

Specifications regarding for example the accuracy and dynamic behaviour of the measurement equipment under normal operating conditions and reference operating conditions shall be made here.

For measurement equipment with a span setting and analogue output, the performance characteristics concerning accuracy shall be expressed in relation to the span. If one value only is stated, it shall be applicable to all permitted span settings.

For digital output equipment, characteristics shall be expressed in relation to the reading or upper range-limit.

NOTE 1 For reference conditions, refer to IEC 61298-1.

NOTE 2 For details on performance testing and presentation of the results, see in particular IEC 61298 (all parts) and ~~IEC 60770-1~~ IEC 62828 (all parts) as well as the test standards quoted in the normative references and bibliography.

5.7.2 Accuracy

Inaccuracy, as determined for example by the method described in IEC 61298-2.

Where an accuracy class exists for the type of instrument under consideration, this can be specified as an alternative.

NOTE According to IEC 61298-2, the accuracy of the equipment is adequately expressed by the three quantities specified in 5.7.2, 5.7.3 and 5.7.4. If desired, accuracy can also be expressed in terms of inaccuracy and hysteresis, or non-linearity/non-conformity, hysteresis and dead band. These alternatives are not included at this level of the structure.

5.7.3 ~~Maximum~~ Measured error

~~Maximum~~ Measured error, as determined for example by the method described in IEC 61298-2.

5.7.4 Hysteresis

Hysteresis, as determined for example by the method described in IEC 61298-2.

5.7.5 Non-repeatability

Non-repeatability, as determined, for example, by the method described in IEC 61298-2. The non-repeatability is synonymous with repeatability error.

~~NOTE 1 According to IEC 61298-2, the accuracy of the equipment is adequately expressed by the three quantities specified in 5.6.1, 5.6.2 and 5.6.3. If desired, the manufacturer may also express accuracy in terms of inaccuracy and hysteresis, or non-linearity/non-conformity, hysteresis and dead band. These alternatives are not included at this level of the structure.~~

~~NOTE 2 Standardized accuracy classes also exist for some types of process measuring equipment. These should be specified at a lower hierarchical level.~~

5.7.6 Start-up drift

Start-up drift as determined by for example the method described in IEC 61298-2.

5.7.7 Long-term drift

Long-term drift as determined by for example the method described in IEC 61298-2.

5.7.8 Influence of ambient temperature

Effect of temperature changes on the output signal as determined by for example the method described in IEC 61298-3.

NOTE IEC 61298-3 expresses the influence as the average error over the entire ambient temperature range. It ~~may~~ can also be expressed as a percentage of span over a given temperature span.

5.7.9 Influence of medium temperature

Effect of changes in medium temperature on the output signal determined and expressed in a similar manner to the influence of ambient temperature, see 5.7.8.

Where appropriate, for equipment not in direct contact with the process medium, this information can be given in the form of a derating curve of ambient temperature versus process temperature.

5.7.10 Settling time

Settling time, as determined by for example the method described in IEC 61298-2.

Synonymous names: rise time; response time.

5.8 Operating conditions

5.8.1 General

The nominal range of use, i.e. the conditions under which the measuring equipment can be operated within its specified accuracy limits and without permanent impairment of its operating characteristics, shall be specified here. A distinction is made between normal operating conditions, operating limits and storage and transport conditions ~~(see Annex C)~~, see Clause 3.

5.8.2 Installation

5.8.2.1 General

Installation conditions, in particular any special precautions necessary to obtain the specified performance of the measuring equipment, shall be specified here.

5.8.2.2 Climate class/Environmental condition class

General indication of the climatic conditions, to which the measuring equipment can be subjected during operation (including shutdown), for example expressed by a location or climate class according to IEC 60654-1.

Alternatively, or in addition, a climate condition class and other environmental condition classes expressed according to IEC 60721-3-x shall be used.

5.8.2.3 Installation instructions

Brief instructions, and if appropriate warnings, on the mounting of measuring equipment, so as to obtain the best performance from it. These might include orientation, cable length, inlet and outlet run (for flow), emitting angle (microwave and ultrasonics) etc.

5.8.2.4 Start-up conditions

Conditions to be upheld at the measuring point to ensure correct start-up of the measurement equipment. If special precautions ~~should~~ must be taken to avoid for example pressure or thermal overload, these should be stated.

5.8.2.5 Warm-up time

Time required after energising the measuring equipment before its performance characteristics apply.

NOTE Although many modern instruments warm up in a matter of seconds, some systems take considerably longer, for example radiometric level and density measurement or temperature measurement (where the warm-up time is dependent upon the response time of the complete temperature measuring device including the inset and thermowell).

5.8.3 Environment

5.8.3.1 General

Environmental conditions under which the measuring equipment can be stored and operated within its specified accuracy limits and without permanent impairment of its operating characteristics shall be specified here.

5.8.3.2 Ambient temperature range

Range of ambient temperatures, within which the measuring equipment is designed to operate within the specified accuracy limits.

Synonymous names: normal operating temperature, operating temperature, nominal temperature range, working temperature.

5.8.3.3 Ambient temperature limits

Extreme values of ambient temperature, to which the measuring equipment may be subjected during operation without permanent impairment of operating characteristics.

Synonymous names: Limiting temperature range.

5.8.3.4 Storage ~~temperature~~ and transportation conditions

~~Range of ambient temperatures within which the measuring equipment may be safely transported and stored.~~

~~Synonymous names: transportation temperature.~~

Conditions under which the measuring equipment may be safely transported and stored.

NOTE Typical values are storage temperature, transportation temperature as well as any special conditions regarding air pressure and humidity.

5.8.3.5 Relative humidity

Range of relative humidity, within which the measuring equipment is designed to operate within the specified accuracy limits.

5.8.3.6 Immunity to temperature change

Ability of the measuring equipment to withstand given changes in ambient temperature.

NOTE IEC 60068-2-14 describes tests to simulate both sudden changes (Test Na) and gradual changes (Nb) in ambient temperature. ~~The test(s) used, together with the conditions, should be presented in accordance with this standard.~~ IEC 60068-2-14 also specifies how the test(s), together with the conditions, are to be presented.

Synonymous name: thermal cycling; temperature cycling; resistance to thermal shock.

5.8.3.7 Shock resistance

Ability of the measuring equipment to withstand sudden mechanical loading without permanent impairment of operating characteristics as for example described in IEC 61298-3.

5.8.3.8 Vibration resistance

Ability of the measuring equipment to withstand sinusoidal vibrations without permanent impairment of operating characteristics as for example described in IEC 61298-3.

5.8.3.9 Electromagnetic compatibility

Electromagnetic compatibility of the measuring equipment expressed as either the results of the individual tests for example IEC 61000-4 series or conformance to a particular standard, for example IEC 61326, which incorporates these tests.

Synonymous names: electromagnetic interference, electromagnetic immunity, RFI.

5.8.4 Process

5.8.4.1 General

Allowable process conditions under which the measurement equipment can be operated within its specified accuracy limits and/or without permanent impairment of its operating characteristics shall be specified here.

NOTE For the purposes of this document, the term wetted part refers not only to parts directly in contact with the process medium, but also to those parts of non-contact measuring equipment that intrude into the process vessel.

5.8.4.2 Process temperature range

Permissible range of temperatures for the wetted parts if the measuring equipment is to operate within the specified accuracy limits.

5.8.4.3 Process temperature limits

Extreme values of temperature, to which the wetted parts of the measuring equipment may be subjected without permanent impairment of operating characteristics.

~~NOTE~~

- If higher temperatures are allowed for short periods, for example for cleaning in process, then these, together with the permissible length of time, ~~should~~ shall be stated.

5.8.4.4 Process pressure range

Permissible range of pressures for the wetted parts, if the measuring equipment is to operate within specified accuracy limits.

5.8.4.5 Process pressure limits

Extreme values of pressure, to which the wetted parts of the measuring equipment may be subjected without permanent impairment of operating characteristics.

NOTE For temperature measurement, this is not a fixed value. The maximum pressure is dependent for example on the immersion depth of the thermometer, the process temperature, the viscosity of the medium and the flowrate. Guidelines for water and air are sufficient.

5.9 Mechanical and electrical construction

5.9.1 General

The mechanical construction of the measuring equipment shall be specified here. Details shall be given of all parts of direct relevance to its use, for example process connections, seals, wetted parts, electrical connections, special cases (special materials, special versions) and accessories.

5.9.2 Design

Design of the measuring equipment with respect to the manner in which it is installed at the measuring point. For example, head transmitter or rail-mounted transmitter or 19" plug-in card; compact transmitter or separated transmitter, etc.

5.9.3 Dimensions

Principal dimensions of the measuring equipment.

~~NOTE 1~~

- Dimensions should be expressed at least as "length x breadth x height", and where appropriate be supported by a dimensional drawing.

~~NOTE 2~~

- Clearances required for the mounting of the instrument should also be indicated.

~~NOTE 3~~

- Where several equipment versions are available, dimensions and weight may be presented together or under 5.9.9, process connection, as appropriate. If necessary, a note to this effect should be added to 5.9.3, 5.9.4 or 5.9.5.

5.9.4 Weight

Weight of the measuring equipment or its component parts.

5.9.5 Material

Materials used in the construction of the equipment, in particular for parts which come into contact with the process or environment.

5.9.6 Electrical connection

Information regarding the provisions for electrical connection(s) of the measuring equipment.

NOTE In addition to the degree and type of protection afforded by the device enclosure, this might include, for example, type of terminal, type of cable, cable cross-section, cable gland, galvanic isolation etc. for both signal and power circuits.

5.9.7 Degree of protection

The degree of ingress protection of the enclosure expressed as an IP rating as per IEC 60529 or other internationally recognised enclosure classification.

Synonymous names: ingress protection; enclosure classification.

5.9.8 Type of protection

The type of protection offered by the enclosure against the ignition of a surrounding explosive atmosphere, for example EEx ia, Ex d.

5.9.9 Process connection

Where appropriate, the type of process connection(s) used by the measuring equipment, indicating nominal diameters, rated pressures and standards. ~~See also Note 3 in 5.8.2.~~

5.10 Operability

Details of the design, operating concept, structure and functionality of the human interface shall be specified here. Operating elements, displays, foreign system interfaces (when allowing human operation), testing and configuration elements, for example solder bridges, DIP-switches, re-ranging elements, handheld terminals, auxiliary stations shall be described here.

Where software can be used for configuration and/or operation, the required version shall be specified.

NOTE The operability of a device can be assessed and documented as described in IEC 61069-6:1998.

5.11 Power supply

The permanent or temporary power to be supplied to the measurement equipment in order to maintain its function, which cannot be taken from the input signal, together with the permissible tolerances for the power supply, shall be specified here.

Examples:

Electrical power supply:

- Voltage
- Frequency
- Harmonic distortion level (for AC supply)
- Residual ripple (for DC supply)
- Power consumption

Pneumatic power supply:

- Pressure
- Oil and dust content

- Dew point of air supply
- Air consumption

Hydraulic power supply

5.12 Certificates and approvals

Certificates, approvals and other formal documentation concerning the measurement equipment shall be specified here, for example legal requirements, regulations, technical guidelines, approvals and test certificates.

Examples are electrical area classification, marine approvals, sanitary approvals, CE mark, etc.

5.13 Ordering information

The information required for the procurement of the measurement equipment shall be specified here. ~~Normally, the information is summarized in the form of an ordering table. Details of the equipment type, software and firmware version as well as the order number should be given.~~

The information can be given in the form of an ordering table or as a link or QR code®[1] that leads to an on-line sizing or ordering process. In all cases, the user shall have, at the minimum, information on the equipment type that has been ordered as well as the associated ordering code.

5.14 Documentation

A bibliography of documentation relevant to the measuring equipment shall be specified here, for example operating manuals, specifications of components and auxiliary equipment etc.

[1] QR code is the trade name of a product supplied by Denso Wave Incorporated. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Annex A
(normative)

Classification of features as a function of measuring equipment

Table A.1 shows how the document structure defined in Clause 5 for measuring equipment in general applies to equipment designed to measure a particular process variable.

A shaded cell indicates that the feature defined for measuring equipment also applies to the measurement principle concerned.

A hatched cell indicates that the feature defined for measuring equipment is dependent upon output or equipment construction.

Table A.1 – Classification and documentation structure of measuring equipment

		Measuring equipment	Flow	Level	Pressure	Temperature	Density
1	**Identification**						
	Document identification						
	Date of issue						
	Product type						
	Product name						
	Version						
	Vendor/Manufacturer						
2	**Application**						
3	**Function and System Design**						
	Measuring principle						
	Equipment architecture						
	Communication and data processing						
	Dependability						
	Reliability						
	Maintainability						
	Integrity						
	Security						
4	**Input**						
	Measured variable						
	Measuring range						
5	**Output**						
	Output signal						
	Signal on alarm						
	Load						

		Measuring equipment	Flow	Level	Pressure	Temperature	Density
6	**Digital Communication**						
7	**Performance Characteristics**						
	Accuracy						
	~~Maximum~~ Measured error						
	Hysteresis						
	Non-repeatability						
	Start-up drift						
	Long-term drift						
	Influence of ambient temperature						
	Influence of medium temperature						
	Settling time						
8	**Operating Conditions**						
8.1	**Installation**						
	Climate class/Environmental condition class						
	Installation instructions						
	Start-up conditions						
	Warm-up time						
8.2	**Environment**						
	Ambient temperature range						
	Ambient temperature limits						
	Storage temperature						
	Relative humidity						
	Immunity to temperature change						
	Shock resistance						
	Vibration resistance						
	Electromagnetic compatibility						
8.3	**Process**						
	Process temperature range						
	Process temperature limits						
	Process pressure range						
	Process pressure limits						

		Measuring equipment	Flow	Level	Pressure	Temperature	Density
9	**Mechanical and Electrical Construction**						
	Design						
	Dimensions (length x breadth x height)						
	Weight						
	Material						
	Electrical connection						
	Degree of protection						
	Type of protection						
	Process connection						
10	**Operability**						
11	**Power Supply**						
12	**Certificates and Approvals**						
13	**Ordering Information**						
14	**Documentation**						

For analog signals only

Dependent upon equipment construction

Annex B
(informative)

Classification of features as a function of measurement principle

B.1 Additional features proposed for flow measurement principles

B.1.1 Overview

Table B.1 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Flow equipment". This property applies to all flow measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Flow equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.1.

Table B.1 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.1 – Classification and documentation structure of flow measuring equipment

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
1	**Identification**										
	Document identification										
	Date of issue										
	Product type										
	Product name										
	Version										
	Vendor/Manufacturer										
2	**Application**										

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
3	**Function and System Design**										
	Measuring principle	■									
	Equipment architecture	■									
	Communication and data processing	■									
	Dependability	■									
	Reliability	■									
	Maintainability	■									
	Integrity	■									
	Security	■									
4	**Input**										
	Measured variable	■									
	Measuring range	■									
5	**Output**										
	Output signal	■									
	Signal on alarm	■									
	Load	■									
	Signal resolution					■	■			■	
	Low-flow cut-off		■	■	■		■	■	■	■	■
6	**Digital Communication**										
7	**Performance Characteristics**										
	Accuracy	■									
	~~Maximum~~ Measured error	■									
	Hysteresis	■									
	Non-repeatability	■									
	Start-up drift	■									
	Long-term drift	■									
	Influence of ambient temperature	■									
	Influence of medium temperature	■									
	Influence of Reynolds number					■	■	■	■		
	Influence of medium pressure			■							■
	Settling time	■									

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
8	**Operating Conditions**										
8.1	**Installation**										
	Climate class/Environmental condition class	■									
	Installation instructions	■									
	Start-up conditions	■									
	Warm-up time	■									
	Inlet and outlet run		■	■	■	■	■	■	■	■	■
	Cable length		■	■	■	■	■	■	■	■	■
8.2	**Environment**										
	Ambient temperature range	■									
	Ambient temperature limits	■									
	Storage temperature	■									
	Relative humidity	■									
	Immunity to temperature change	■									
	Shock resistance	■									
	Vibration resistance	■									
	Electromagnetic compatibility	■									
8.3	**Process**										
	Process temperature range	■									
	Process temperature limits	■									
	Process pressure range	■									
	Process pressure limits	■									
	State of aggregation		■								
	Density		■								
	Viscosity		■								
	Conductivity			■							
	Reynolds number				■	■					
	Gas content			■	■			■			
	Limiting flow					■	■			■	■
	Pressure loss		■	■	■	■	■	■	■	■	■
	Downstream pressure		■			■	■	■			

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
9	**Mechanical and Electrical Construction**										
	Design	■									
	Dimensions (length x breadth x height)	■									
	Weight	■									
	Material	■									
	Electrical connection	■									
	Degree of protection	■									
	Type of protection	■									
	Field coil isolation class			■							
	Process connection	■									
10	**Operability**	■									
11	**Power Supply**	■									
12	**Certificates and Approvals**	■									
13	**Ordering Information**	■									
14	**Documentation**	■									
■	**For analog signals only**										

B.1.2 Output

B.1.2.1 Signal resolution

Resolution of the output signal.

B.1.2.2 Low flow cut off

Section of the measurement range, starting at the lower range value, where the output signal will be equal to the lower range value (zero).

B.1.3 Performance characteristics

B.1.3.1 Influence of Reynolds number

Change in lower range value (zero) and/or span caused by a change in the Reynolds number of the flow.

B.1.3.2 Rise time

Rise time for 10 % to 90 % as defined in IEC 61298-2.

B.1.3.3 Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change in the static pressure of the fluid.

B.1.4 Installation

B.1.4.1 Inlet and outlet run

Portion of the conduit upstream and downstream of the primary, whose axis is straight and in which the cross-sectional area and shape are constant.

B.1.4.2 Cable length

Maximum length of the electrical cable between the primary and secondary device.

B.1.5 Process

B.1.5.1 State of aggregation

Permissible state of aggregation of the fluid (for example liquid, gas, steam).

B.1.5.2 Density

Range of the density of the medium, within which a device will operate within specified accuracy limits.

B.1.5.3 Viscosity

Range of the viscosity of the medium, within which a device will operate within specified accuracy limits.

B.1.5.4 Conductivity

Minimum conductivity of the medium, above which a device will operate within specified accuracy limits.

B.1.5.5 Reynolds number

Range of the Reynolds number of the flow, within which a device will operate within specified accuracy limits.

B.1.5.6 Gas content

Maximum gas content of a liquid, below which a device will operate within specified accuracy limits.

B.1.5.7 Limiting flow

Maximum flowrate of the flowmeter, below which no damage to the primary device is to be expected.

B.1.5.8 Pressure loss

Irrecoverable pressure loss caused by the presence of a primary device in the conduit.

B.1.5.9 Downstream pressure

Minimum downstream static pressure, above which no damage to the primary device ~~must~~ shall be expected (cavitation).

B.1.6 Mechanical construction – Field coil isolation class

Isolation class of the field coils of the primary device.

B.2 Additional features proposed for level measurement principles

B.2.1 Overview

Table B.2 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Level equipment". This property applies to all level measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Level equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.2.

Table B.2 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.2 – Classification and documentation structure of level measuring equipment

		Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
1	**Identification**							
	Document identification							
	Date of issue							
	Product type							
	Product name							
	Version							
	Vendor/Manufacturer							
2	**Application**							

		Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
3	**Function and System Design**							
	Measuring principle	■						
	Equipment architecture	■						
	Communication and data processing	■						
	Dependability	■						
	Reliability	■						
	Maintainability	■						
	Integrity	■						
	Security	■						
4	**Input**							
	Measured variable	■						
	Measuring range	■						
	Blocking distance			■	■			
	Operating frequency			■	■			■
5	**Output**							
	Output signal	■						
	Signal on alarm	■						
	Load	▒						
	Signal resolution			■	■			
6	**Digital Communication**							
7	**Performance Characteristics**							
	Accuracy	■						
	~~Maximum~~ Measured error	■						
	Hysteresis	■						
	Non-repeatability	■						
	Start-up drift	■						
	Long-term drift	■						
	Influence of ambient temperature	■						
	Influence of medium temperature	■						
	Settling time	■						

		Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
8	**Operating Conditions**							
8.1	**Installation**							
	Climate class/Environmental condition class	■						
	Installation instructions	■						
	Start-up conditions	■						
	Warm-up time	■						
	Emission angle			■	■		■	
8.2	**Environment**							
	Ambient temperature range	■						
	Ambient temperature limits	■						
	Storage temperature	■						
	Relative humidity	■						
	Immunity to temperature change	■						
	Shock resistance	■						
	Vibration resistance	■						
	Electromagnetic compatibility	■						
8.3	**Process**							
	Process temperature range	■						
	Process temperature limits	■						
	Thermal shock resistance		■					
	Process pressure range	■						
	Process pressure limits	■						
	Viscosity			▒				■
	Conductivity				▒			
	Dielectric constant				■	■		
9	**Mechanical and Electrical Construction**							
	Design	■						
	Dimensions (length x breadth x height)	■						
	Weight	■						
	Material	■						
	Electrical connection	■						
	Degree of protection	■						
	Type of protection	■						
	Field coil isolation class			■				
	Process connection	■						

		Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
10	**Operability**							
11	**Power Supply**							
12	**Certificates and Approvals**							
13	**Ordering Information**							
14	**Documentation**							
	For analog signals only							
	Dependent upon mode of operation							

B.2.2 Input

B.2.2.1 Blocking distance

Distance immediately below an ultrasonic or radar sensor, within which measurements are technically impossible.

B.2.2.2 Operating frequency

Frequency at which the measuring equipment operates.

B.2.3 Output – Signal resolution

Resolution of the output signal.

B.2.4 Performance characteristics – Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change in the static pressure of the fluid.

B.2.5 Installation – Emitting angle

Solid angle at which radiation is emitted from the source of radiation.

B.2.6 Process

B.2.6.1 Thermal shock resistance

Ability of the measuring equipment to withstand an abrupt change in process medium temperature.

NOTE Test Nc of IEC 60068-2-14 simulates sudden changes in process medium temperature. ~~The test conditions should be presented in accordance with this standard.~~ IEC 60068-2-14 also specifies how test conditions are to be presented.

B.2.6.2 Viscosity

Range of the viscosity of the medium, within which a device will operate within specified accuracy limits.

B.2.6.3 Conductivity

Minimum conductivity of the medium, above which a device will operate within specified accuracy limits.

B.2.6.4 Dielectric constant

Range of the dielectric constant of the medium, within which a device will operate within specified accuracy limits.

B.3 Additional features proposed for pressure measurement principles

B.3.1 Overview

Table B.3 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Pressure equipment". This property applies to all pressure measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Pressure equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.3.

Table B.3 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.3 – Classification and documentation structure of pressure measuring equipment

		Inherited features for all pressure equipment	Relative/absolute	Differential
1	**Identification**			
	Document identification			
	Date of issue			
	Product type			
	Product name			
	Version			
	Vendor/Manufacturer			

		Inherited features for all pressure equipment	Relative/absolute	Differential
2	**Application**			
3	**Function and System Design**			
	Measuring principle			
	Measurement type			
	Equipment architecture			
	Communication and data processing			
	Dependability			
	Reliability			
	Maintainability			
	Integrity			
	Security			
4	**Input**			
	Measured variable			
	Measuring range			
	Maximum span			
	Turndown ratio			
5	**Output**			
	Output signal			
	Signal on alarm			
	Signal on overload			
	Load			
	Output damping			
6	**Digital Communication**			
7	**Performance Characteristics**			
	Accuracy			
	~~Maximum~~ Measured error			
	Dead time			
	Rise time			
	Step response time			
	Time constant			
	Hysteresis			
	Non-repeatability			
	Start-up drift			

		Inherited features for all pressure equipment	Relative/absolute	Differential
	Long-term drift			
	Influence of ambient temperature			
	Influence of medium temperature			
	Influence of medium pressure			
	Influence of mounting position			
	Influence of supply voltage			
	Influence of load			
	Settling time			
8	**Operating Conditions**			
8.1	**Installation**			
	Climate class/Climatic condition class			
	Installation instructions			
	Start-up conditions			
	Warm-up time			
	Emission angle			
8.2	**Environment**			
	Ambient temperature range			
	Ambient temperature limits			
	Storage temperature			
	Relative humidity			
	Immunity to temperature change			
	Shock resistance			
	Vibration resistance			
	Electromagnetic compatibility			
8.3	**Process**			
	Process temperature range			
	Process temperature limits			
	Thermal shock resistance			
	Process pressure range			
	Static pressure range			
	Process pressure limits			
	Static pressure limits			
	Overpressure limits			

		Inherited features for all pressure equipment	Relative/absolute	Differential
9	**Mechanical Construction**			
	Design	■		
	Proof pressure		■	■
	Burst pressure		■	■
	Dimensions (length x breadth x height)	■		
	Weight	■		
	Material	■		
	Sensor fill fluid		■	■
	Diaphragm material		■	■
	Electrical connection	■		
	Degree of protection	■		
	Type of protection	■		
	Process connection	■		
10	**Operability**	■		
11	**Power Supply**	■		
12	**Certificates and Approvals**	■		
13	**Ordering Information**	■		
14	**Documentation**	■		
■	For analog signals only			
▒	Dependent upon process connection			

B.3.2 Function and system design – Measurement type

Type of measurement performed by the measuring equipment, defined as differential, gauge (relative) and absolute.

B.3.3 Input

B.3.3.1 Maximum span

Maximum span of the transmitter, specified as a value with associated unit.

NOTE The maximum span defines the maximum calibration range, whereby the calibration range is defined by a lower range-value (LRV) and upper range-value (URV). ~~Neither of the two values URV and LRV may exceed the lower range-limit (LRL) and/or upper range-limit (URV) specified by the measuring range.~~ The value LRV is greater than or equal to the lower range-limit (LRL) and the value URV is less than or equal to the upper range-limit (URL) as specified by the measuring range.

In this case, the maximum span might be considered as the normal value and other possible larger spans might be allowed but as extended values (see examples). The maximum span could be used to define the reference calibration range.

Examples:

– Differential pressure transmitter

Max. span:	1 000 kPa
Reference range:	0 bar to 1 000 kPa
Extended span:	2 000 kPa (Range ±1 000 kPa)

– Gauge pressure transmitter

Max. span:	1 000 kPa
Reference range:	0 bar to 1 000 kPa
Extended span:	1 100 kPa (Range: –100 kPa to 1 000 kPa) with the lower range limit at 15 Pa abs

– Absolute pressure transmitter

Max. span:	1 000 kPa abs
Reference range:	0 kPa abs to 900 kPa abs
Extended range:	not applicable with the lower range limit at 0,1 Pa abs

B.3.3.2 Turndown ratio

Turndown is the ratio of the max. span to the calibrated span.

The turndown (TD) can be specified as:

- reference value;
- normal range;
- extended value range(s).

If no other limitation is implied, the TD values define all allowed calibrations of the transmitter, always considering that for any range the URV and LRV shall not exceed URL and/or LRL.

The TD may be adjusted continuously or in discrete steps. In this case, the step changes should be specified.

Example:	Differential pressure transmitter
Reference TD:	1
Normal range:	1 to 10
Extended range:	0,5 to 1; 10 to 30

B.3.4 Output

B.3.4.1 Signal on overload (overrange)

Value assumed by the output signal when the input pressure exceeds the upper and lower range-limits of the transmitter.

B.3.4.2 Output damping

Range of time parameters, in seconds, which can be set to influence the output response to a sudden change in input value (63,2 % of final steady-state value).

B.3.5 Performance characteristics

~~**B.3.5.1 Accuracy (inaccuracy)**~~

~~Inaccuracy as defined in IEC 61298-2, i.e. including the errors of non-linearity, non-repeatability and hysteresis.~~

~~NOTE If the accuracy is stated in this manner, then "see accuracy" can be entered under "Max. measured error"~~

B.3.5.1 Dead time

Dead time as defined in IEC 61298-2.

B.3.5.2 Rise time

Rise time for 10 % to 90 % as defined in IEC 61298-2.

B.3.5.3 Step response time

Step response time as defined in IEC 61298-2.

B.3.5.4 Time constant

Time constant as defined in IEC 61298-2.

B.3.5.5 Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change of the static pressure of the fluid.

B.3.5.6 Influence of mounting position

Effect of change in mounting position on the measurement as defined for example in IEC 61298-3.

B.3.5.7 Influence of supply voltage

Effect of a change in supply voltage on the measurement as defined for example in IEC 61298-3.

B.3.5.8 Influence of load

For devices with analogue output signal, effect of a change in output load on the measurement as defined for example in IEC 61298-3.

B.3.6 Operating conditions/process

B.3.6.1 Static pressure range

Range of static pressures, within which a differential pressure transmitter is designed to operate within its specified accuracy limits.

B.3.6.2 Static pressure limits

Extreme values of static pressure to which a differential pressure transmitter may be subjected, without permanent impairment of operating characteristics.

B.3.6.3 Overpressure limits

Peak pressure to which a pressure transmitter may be subjected, without permanent impairment of operating characteristics.

B.3.7 Mechanical and electrical construction

B.3.7.1 Proof pressure

Design pressure applied to the transmitter to verify structural integrity. No deformation or leakage is permitted at this pressure and the transmitter ~~should~~ shall function normally subsequent to this test. The exact testing conditions should be stated.

B.3.7.2 Burst pressure

Design test pressure that allows for permanent deformation and leakage, but parts ~~should~~ shall remain assembled.

B.3.7.3 Sensor fill fluid

Fill fluid used to transmit the process pressure, working on the diaphragm, to the measuring sensor.

B.3.7.4 Diaphragm material

Material of the separation element, between the process fluid and fill fluid.

B.4 Additional features proposed for temperature measurement principles

B.4.1 Overview

Table B.4 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Flow equipment". This property applies to all temperature measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Temperature equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.4.

Table B.4 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.4 – Classification and documentation structure of temperature measuring equipment

		Inherited features for all temperature equipment	RTD	Thermocouple
1	**Identification**			
	Document identification	■		
	Date of issue	■		
	Product type	■		
	Product name	■		
	Version	■		
	Vendor/Manufacturer	■		
2	**Application**	■		
3	**Function and System Design**			
	Measuring principle	■		
	Equipment architecture	■		
	Communication and data processing	■		
	Dependability	■		
	Reliability	■		
	Maintainability	■		
	Integrity	■		
	Security	■		
4	**Input**			
	Measured variable	■		
	Measuring range	■		
	Sensor type		■	■
	Sensor connection		■	■
	Insulation resistance		■	■
5	**Output**			
	Output signal	■		
	Signal on alarm	■		
	Load	▒		
	Linearisation		■	■
			■	■
6	**Digital Communication**		■	■

		Inherited features for all temperature equipment	RTD	Thermocouple
7	**Performance Characteristics**			
	Accuracy	■		
	~~Maximum~~ Measured error	■		
	Hysteresis	■		
	Non-repeatability	■		
	Start-up drift	■		
	Long-term drift	■		
	Influence of ambient temperature	■		
	Influence of medium temperature	■		
	Settling time	■		
	Rise time		■	■
	Thermal response time		■	■
8	**Operating Conditions**			
8.1	**Installation**			
	Climate class	■		
	Installation instructions	■		
	Start-up conditions	■		
	Warm-up time	■		
	Emission angle			
8.2	**Environment**			
	Ambient temperature range	■		
	Ambient temperature limits	■		
	Storage temperature	■		
	Relative humidity	■		
	Immunity to temperature change	■		
	Shock resistance	■		
	Vibration resistance	■		
	Electromagnetic compatibility	■		
8.3	**Process**			
	Process temperature range	■		
	Process temperature limits	■		
	Process pressure range	■		
	Process pressure limits	■		

		Inherited features for all temperature equipment	RTD	Thermocouple
9	**Mechanical and Electrical Construction**			
	Design			
	Dimensions (length x breadth x height)			
	Weight			
	Material			
	Electrical connection			
	Degree of protection			
	Type of protection			
	Process connection			
10	**Operability**			
11	**Power Supply**			
12	**Certificates and Approvals**			
13	**Ordering Information**			
14	**Documentation**			
	For analog signals only			

B.4.2 Input

B.4.2.1 Sensor type

Type of resistance temperature detector according to IEC 60751 or thermocouple according to IEC 60584.

B.4.2.2 Sensor connection

Type of sensor connection, for example 2-wire, 3-wire or 4-wire for RTD or jack-plug etc for thermocouple.

B.4.2.3 Insulation resistance

Resistance value measured between all parts of the electric circuit and the sheath at ambient or elevated temperatures and with a specified measuring voltage.

B.4.3 Output – Linearization

Means used to linearize the input of a resistance temperature detector or thermocouple to obtain a linear temperature (or temperature-proportional electrical) output.

B.4.4 Performance characteristics

B.4.4.1 Rise time

Rise time for 10 % to 90 % as defined in IEC 61298-2.

B.4.4.2 Thermal response time

Thermal response time, t_{05}, in flowing water with a flowrate of 0,4 m/s and in flowing air with a flowrate of 3 m/s.

B.5 Additional features proposed for density measurement principles

B.5.1 Overview

Table B.5 indicates the additional features for density measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Density equipment". This property applies to all density measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Density equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.5.

Table B.5 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.5 – Classification and documentation structure of ~~temperature~~ density measuring equipment

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
1	**Identification**					
	Document identification					
	Date of issue					
	Product type					
	Product name					
	Version					
	Vendor/Manufacturer					
2	**Application**					

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
3	**Function and System Design**					
	Measuring principle					
	Equipment architecture					
	Communication and data processing					
	Dependability					
	Reliability					
	Maintainability					
	Integrity					
	Security					
4	**Input**					
	Measured variable					
	Measuring range					
5	**Output**					
	Output signal					
	Signal on alarm					
	Load					
6	**Digital Communication**					
7	**Performance Characteristics**					
	Accuracy					
	~~Maximum~~ Measured error					
	Hysteresis					
	Non-repeatability					
	Start-up drift					
	Long-term drift					
	Influence of ambient temperature					
	Influence of medium temperature					
	Influence of medium pressure					
	Settling time					

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
8	**Operating Conditions**					
8.1	**Installation**					
	Climate class	■				
	Installation instructions	■				
	Start-up conditions	■				
	Warm-up time	■				
	Cable length		■			
8.2	**Environment**					
	Ambient temperature range	■				
	Ambient temperature limits	■				
	Storage temperature	■				
	Relative humidity	■				
	Immunity to temperature change	■				
	Shock resistance	■				
	Vibration resistance	■				
	Electromagnetic compatibility	■				
8.3	**Process**					
	Process temperature range	■				
	Process temperature limits	■				
	Process pressure range	■				
	Process pressure limits	■				
	State of aggregation		■			
	Density		■			
	Viscosity		■			
	Gas content		■			
9	**Mechanical Construction**					
	Design	■				
	Dimensions (length x breadth x height)	■				
	Weight	■				
	Material	■				
	Electrical connection	■				
	Degree of protection	■				
	Type of protection	■				
	Process connection	■				

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
10	Operability	▒				
11	Power Supply	▒				
12	Certificates and Approvals	▒				
13	Ordering Information	▒				
14	Documentation	▒				
▒	For analog signals only					

B.5.2 Performance characteristics – Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change of the static pressure of the fluid.

B.5.3 Installation conditions – Cable length

The maximal length of the electrical cable between the primary and secondary device.

B.5.4 Process conditions

B.5.4.1 State of aggregation

Permissible state of aggregation of the fluid (for example liquid, gas, steam).

B.5.4.2 Density

Range of the density of the medium, within which a device will operate within specified accuracy limits.

B.5.4.3 Viscosity

The range of the viscosity of the medium, within which a device will operate within specified accuracy limits.

B.5.4.4 Gas content

Maximum gas content of a liquid, below which a device will operate within specified accuracy limits.

Bibliography

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

~~IEC 60050-300:2001, *International Electrotechnical Vocabulary – Part 300: Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements*~~

~~IEC 60050-351:1998, *International Electrotechnical Vocabulary – Part 351: Automatic control*~~

~~IEC 60050-426:1990, *International Electrotechnical Vocabulary – Part 426: Electrical apparatus for Explosive atmospheres*~~

~~IEC 60068 (all parts), *Environmental testing*~~

~~IEC 60751:1983, *Industrial platinum resistance thermometer sensors*~~

~~IEC 60770-2:2003, *Transmitters for use in industrial-process control systems – Part 2: Methods for inspection and routine testing*~~

~~IEC 60854:1986, *Methods of measuring the performance of ultrasonic pulse-echo diagnostic equipment*~~

~~IEC 61082 (all parts), *Preparation of documents used in electrotechnology*~~

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

~~IEC 61360 (all parts), *Standard data element types with associated classification scheme for electric components*~~

~~IEC 82045-1:2001, *Document management – Part 1: Principles and methods*~~

~~ISO 8879, *Information processing – Text and office systems – Standard Generalized Markup Language (SGML)*~~

~~ISO 10241, *International terminology standards – Preparation and layout*~~

~~ISO 10303-21, *Industrial automation systems and integration – Product data representation and exchange – Part 21: Implementation methods: Clear text encoding of the exchange structure*~~

~~ISO 13584 (all parts), *Industrial automation systems and integration – Parts library*~~

~~ISO 15926 (all parts), *Industrial automation systems and integration – Integration of life-cycle data for process plants including oil and gas production facilities*~~

~~*VIM International Vocabulary of Basic and general Terms in Metrology*~~

IEC 60050-311:—[2], *International Electrotechnical Vocabulary – Part 311: General terms relating to measurements*

[2] Under consideration. Stage at the time of publication: IEC/ACD 60050-311:2024.

IEC 60050-351:2013, *International Electrotechnical Vocabulary (IEV) – Part 351: Control technology*

IEC 60050-426:2020, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres*

IEC 60068 (all parts), *Environmental testing*

ISO/IEC 60559:2020 , *Floating-point arithmetic*

IEC 60873-1:2003, *Electrical and pneumatic analogue chart recorders for use in industrial-process systems – Part 1: Methods for performance evaluation*

IEC 61082-1:2014, *Preparation of documents used in electrotechnology – Part 1: Rules*

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

IEC 61987-10:2009, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 10: List of Properties (LOPs) for Industrial-Process Measurement and Control for Electronic Data Exchange – Fundamentals*

IEC 62828 (all parts), *Reference conditions and procedures for testing industrial and process measurement transmitters*

IEC 82045-1:2001, *Document management – Part 1: Principles and methods*

ISO IEC GUIDE 99:2007, *International vocabulary of metrology -- Basic and general concepts and associated terms (VIM)*

IEC 61987-1

Edition 2.0 2024-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Industrial- process measurement and control – Data structures and elements in process equipment catalogues – Part 1: Generic structures for measuring equipment

Mesure et commande dans les processus industriels – Eléments et structures de données dans les catalogues d'équipements de processus – Partie 1: Structures génériques pour équipements de mesure

IEC 61987-1:2024-10(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL – DATA STRUCTURES AND ELEMENTS IN PROCESS EQUIPMENT CATALOGUES –

Part 1: Generic structures for measuring equipment

FOREWORD

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IEC 61987-1 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement and control. It is an International Standard.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

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

a) Addition of a subclause “Digital communication” in Clause 5, in order to allow a more comprehensive description of the properties of such an interface;

b) Alignment of clause headings, as described in the introduction, to correspond with those of the IEC CDD.

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

Draft	Report on voting
65E/1113/FDIS	65E/1136/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 61987 series, published under the general title *Industrial-process measurement and control – Data structures and elements in process equipment catalogues,* 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

In recent years, industry has become alert to the fact that a great deal of time and effort is wasted in the transposition of measuring equipment data from one form to another. The technical data of an instrument, for example, may exist at the manufacturer's facility as two separate data sets for paper and electronic presentation: the end-user requires much the same data for works standards, engineering data bases or commercial data bases. In most cases, however, the data cannot be automatically re-used because each application has its own particular data storage format.

A second problem that belies the re-use of technical data is the content of the product descriptions themselves. There is little agreement between manufacturers on what information a technical data sheet should contain, how it should be arranged, or how the results, for example of particular performance tests, should be presented. When transferring this information into a data base, an end-user will always find gaps and proprietary interpretations that make the task more difficult.

This part of IEC 61987 aims to solve these problems by defining a generic structure and its content for industrial process measuring and control equipment. It builds upon the assumption that, for a given class of measuring equipment, for example, pressure measuring equipment, temperature measuring equipment or electromagnetic flow-measuring equipment, a set of non-proprietary structures and product features can be specified. The resulting documents can not only be exchanged electronically, but they can also be presented to humans in an easily understandable form.

This part of IEC 61987 is applicable to electronic catalogues of process measuring equipment. The structure also contains a great many product features that are common to measuring equipment with binary output. Similarly, Annex B has been prepared with a view to future standardisation.

This part of IEC 61987 is not intended as a replacement for existing standards, but rather as a guiding document for all future standards which are concerned with the specifications of process measuring equipment. Every revision of an existing standard should take into account the structures and product features defined in Clause 5 or work towards a harmonisation.

Annex A contains a tabular overview of the classification and catalogue structure of process measuring equipment. Annex B contains tables with a further sub-classification for specific measured variables.

Wherever possible, existing terms from international standards have been used to name the product features within the structures. In accordance with ISO 10241, Clause 3 contains a list of terms, definitions and sources.

Documents created according to the standard are structured. A possible means of exchanging structured information free of layout information is given by SGML (Standard Generalised Mark-Up Language, ISO 8879) or XML (Extensible Mark-Up Language), which is derived from it.

This part of IEC 61987 could also provide the basis for arranging of properties (data element types) that conform to IEC 61360 or ISO 13584. This would require that the features, which in this part of IEC 61987 can be textual units, graphical and tabular representations etc., be broken down into properties (data element types) conformant to the said standards. For example, a range would be expressed as a lower range-limit (LRL) and upper range-limit (URL) with unit of measure; dimensions (L x B x H) as three separate elements, length, breadth and height with unit of measure; or a derating curve as an appropriate series of data element pairs.

This part of IEC 61987 conforms to ISO 15926-1 and -2 with respect to the data model and associated reference data library (ISO 15926-4), for example, as used for the limited classification structure. At the same time, it is also aligned to STEP: Standard for the Exchange of Product Model Data. The data model and definitions of ISO 10303-221 use the ISO 15926-4 TS Reference Data Library as "library". The current standard can reproduce the data fields as per this ISO 10303-221, including, for example, product structure data, dimensional data, electrical connection data and product properties such as measuring range or power supply.

Since the publication of Edition 1 (2006) of this document a great deal of work has been done on the development of the IEC Common Data Dictionary for equipment for industrial-process automation. This, published as further parts of IEC 61987, covers not only measuring instruments with a variety of inputs and outputs, but also final control elements, infrastructure devices and in future process analysers.

For this reason, the title has been adjusted and the scope has been revised to reflect the current content of the whole IEC 61987 standard series.

During the development of the IEC CCD a number of questions arose regarding the structure proposed in this document, in particular the assignment of any digital communication interface to the output. Although this is not strictly incorrect, it was thought that the properties of such an interface could be better described separately. For this reason, a clause "Digital communication" has been added to this Edition 2. In addition, the clause "Mechanical construction" has been renamed "Mechanical and electrical construction" to reflect its true content.

"Ordering information" is not found as a separate block in the IEC CDD, as it is assumed that the properties there describe the type and particular instance of an already purchased device. For an ordering process using IEC CDD properties, the necessary information is retrieved from the "Identification" which also includes the ordering information.

"Certificates and approvals" can be found both in the device list of properties (0112/2///61987#ABC156) and as a device aspect within the "device documents supplied" (0112/2///61987#ABH517). This is also the location of the information contained in "Documentation".

In preparing the current edition of this document all terms and definitions have been checked and where necessary the references updated. Since the publication of Edition 1 in 2006 a number of standards have been withdrawn. Where no suitable alternative source has been found, a note to this effect has been added, but the original term and definition have been left unchanged.

INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL – DATA STRUCTURES AND ELEMENTS IN PROCESS EQUIPMENT CATALOGUES –

Part 1: Generic structures for measuring equipment

1 Scope

This part of IEC 61987 defines a generic structure in which product features of industrial process measurement devices shall be arranged, in order to facilitate the understanding of product descriptions when they are transferred from one party to another. It applies to the production of catalogues supplied by the manufacturer of such devices and helps the user to formulate their requirements.

This document will also serve as a reference document for all future standards which are concerned with process measuring equipment.

In addition, this document also provides a basic structure for the production of further standards listing the properties of process control equipment, for example, for actuators and infrastructure devices.

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 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 60721-3 (all parts), *Classification of environmental conditions – Classification of groups of environmental parameters and their severities*

IEC 60751:2022, *Industrial platinum resistance thermometers and platinum temperature sensors*

IEC TR 61000-1-1:2023, *Electromagnetic compatibility (EMC) – Part 1: General – Section 1: Application and interpretation of fundamental definitions and terms*

IEC 61069 (all parts), *Industrial-process measurement, control and automation – Evaluation of system properties for the purpose of system assessment*

IEC 61298 (all parts), *Process measurement and control devices – General methods and procedures for evaluating performance*

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

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

ISO 3511-1:1977, *Process measurement control functions and instrumentation – Symbolic representation – Part 1: Basic requirements*

3 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
accuracy
inaccuracy
<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 measured value under reference conditions

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.

Note 3 to entry: Inaccuracy as defined in IEC 61298-2 includes the errors of non-linearity, non-repeatability and hysteresis.

Note 4 to entry: Accuracy can be expressed as percentage of reading, span or full range etc. or as an absolute value

[SOURCE IEC 60050-311:—, 311-06-08, modified – measured value instead of measurand, under reference conditions added, Notes 3 and 4 added]

3.2
accuracy class
category of instruments or components thereof, all of which are intended to comply with a set of specifications regarding uncertainty

[SOURCE IEC 60050-311:—, 311-06-09 modified – "or components" added]

3.3
ambient temperature
temperature measured at a representative point within the local environment, including adjacent heat generating equipment, in which the measurement and control equipment will normally operate, be stored or transported

SEE: 3.15

3.4
ambient temperature limits
extreme values of ambient temperature to which a device may be subjected without permanent impairment of operating characteristics

Note 1 to entry: The performance characteristics may be exceeded in the range between the limits of normal operation and the operating temperature limits.

SEE: 3.3, 3.33

3.5
ambient temperature range
range of ambient temperatures within which a device is designed to operate within specified accuracy limits

SEE: 3.31, 3.33

3.6
analog signal
signal each information parameter of which directly represents the respective variable quantity

Note 1 to entry: An analog signal may be a continuous-value signal or a discrete-value signal as well as a continuous-time or a discrete-time signal. Examples may be the pressure in a pneumatic final controlling element with continuous-value and continuous-time information parameter (value of the pressure) as well as a position-modulated pulse signal as an output signal of a computer based controller.

[SOURCE: IEC 60050-351:2013, 351-41-24]

3.7
binary signal
discrete-value signal each information parameter of which may assume one of two values

[SOURCE: IEC 60050-351:2013, 351-41-21]

3.8
climate class
climatic conditions, i.e. ambient temperature, pressure and humidity, to which the measurement equipment can be subjected during operation (including shutdown), transport and storage (over land or sea)

3.9
degree of protection
extent of protection provided by an enclosure against access to hazardous parts, against ingress of solid foreign objects and/or ingress of water, and verified by standardized test methods

[SOURCE: IEC 60529:1989, 3.3]

3.10
dependability
extent to which a system can be relied upon to perform a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external sources are provided

[SOURCE: IEC 61069-1:2016, 3.1.22]

3.11
device
material element or assembly of such elements intended to perform a required function

Note 1 to entry: A device may form part of a larger device.

[SOURCE: IEC 60050-151: 2001, 151-11-20]

3.12
digital signal
signal each information parameter of which represents the respective variable quantity in coded manner as a symbol of a character set

Note 1 to entry: In most technical cases a digital signal is discrete-value and discrete-time.

Note 2 to entry: A digital signal requires an agreement about the code between transmitter and receiver of the signal.

Note 3 to entry: In many technical cases the symbols may be interpreted as numbers.

[SOURCE: IEC 60050-351:2013, 351-41-25]

3.13
drift
change in the indication of a measuring system, generally slow, continuous, not necessarily in the same direction and not related to a change in the quantity being measured

[SOURCE: IEC 60050-311:—, 311-06-13, modified – quantity being measured for measurand]

3.14
electromagnetic compatibility
ability of equipment or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

[SOURCE: IEC 60050-161:1990, 161-01-07]

3.15
environmental condition
characteristics of the environment which may affect the performance of the device or system

Note 1 to entry: Examples of environmental conditions are pressure, temperature, humidity, vibration, radiation.

[SOURCE: IEC 60050-151:2001, 151-16-03]

3.16
environmental condition class
alphanumeric character sequence denoting a set of environmental conditions to which the equipment is or can be subjected to during operation

Note 1 to entry: The IEC 60721 series defines classes for climatic, mechanical and other environmental influences.

3.17
environmental influence
change in the output of an instrument caused solely by the departure of one of the specified environmental conditions from its reference value, all other conditions being held constant

SEE: 3.21, 3.39

3.18
equipment
single apparatus or set of devices or apparatuses, or the set of main devices of an installation, or all devices necessary to perform a specific task

Note 1 to entry: Examples of equipment are a power transformer, the equipment of a substation, measuring equipment.

[SOURCE: IEC 60050-151:2001, 151-11-25]

3.19
hysteresis
property of a device or instrument whereby it gives different output values in relation to its input values depending upon the directional sequence in which the input values have been applied

[SOURCE: IEC 61298-2:2008, 3.11]

3.20
influence of ambient temperature
change in zero (lower range-value) and/or span caused by a change in ambient temperature from the reference temperature up to the limits of the ambient temperature range quoted in the performance specifications

SEE: 3.17

3.21
influence quantity
quantity that is not the subject of the measurement and whose change affects the relationship between the indication and the result of the measurement

[SOURCE: IEC 60050-311:—, 311-06-01]

3.22
integrity
assurance provided by the system that the tasks will be performed correctly unless notice is given of any state of the system, which could lead to the contrary

[SOURCE: IEC 61069-1:2016, 3.1.37]

3.23
long-term drift
drift in output monitored for 30 days at 90 % of span

[SOURCE: IEC 61298-2:2008, 7.2, modified – subclause condensed]

3.24
maintainability
ability of an item under given conditions of use, to be retained in, or restored to a state in which it can perform a required function, when maintenance is performed under given conditions and using stated procedures and resources

[SOURCE: IEC 61069-1, 3.1.39]

3.25
measured error
largest positive or negative value of error of the average upscale or downscale value at each point of measurement

[SOURCE: IEC 61298-2:2008, 3.7, modified – "s" removed from error and value]

3.26
measured variable
quantity intended to be measured

[SOURCE: ISO/IEC Guide 99:2007, 2.3 – modified – term changed to reflect usage in control technology, notes to entry removed]

3.27
measuring instrument
device intended to be used to make measurements, alone or in conjunction with supplementary devices

[SOURCE: IEC 60050-311:—, 311-03-01]

3.28
measuring range
range of values defined by two extreme values within which a variable can be measured within the specified accuracy

Note 1 to entry: The extreme values are usually termed the upper range-limit and the lower range-limit.

[SOURCE: IEC 60050-351:2013, 351-48-11]

3.29
measuring principle
measurement principle
phenomenon or process serving as the basis of a measurement

Note 1 to entry: The measurement principle can be a physical, chemical, or biological phenomenon.

[SOURCE: ISO/IEC Guide 99:2007, 2.4, modified – term "measuring principle" added, note from ISO/IEC Guide 99:2007, 2.3 retained in preference to current notes]

3.30
non-repeatability
repeatability error
algebraic difference between the extreme values obtained by a number of consecutive measurements of the output over a short period of time for the same value of the input under the same operating conditions, approaching from the same direction, for full range traverses

Note 1 to entry: It is usually expressed in percentage of span and does not include hysteresis and drift.

3.31
nominal range of use
specified range of values which an influence quantity can assume without causing a variation exceeding specified limits

[SOURCE: IEC 60050-311:—, 311-07-05]

3.32
normal operating conditions
range of operating conditions within which a device is designed to operate within specified performance limits

3.33
operating conditions
conditions to which a device is subjected, not including the variables handled by the device

Note 1 to entry: Examples of operating conditions include: ambient pressure, ambient temperature, electromagnetic fields, gravitational force, inclination, power supply variation (voltage, frequency, harmonics), radiation, shock and vibration. Both static and dynamic variations in these conditions should be considered. (see IEC 60654 (all parts)).

[SOURCE: IEC 60050-351:1998, 351-18-33, modified – Note to entry added]

3.34
operating limits
range of operating conditions to which a device may be subject without permanent impairment of operating characteristics

Note 1 to entry: In general, performance characteristics are not stated for the region between the limits of normal operation conditions and the operating limits.

Note 2 to entry: Upon returning within the limits of normal operating conditions, a device may require adjustments that restore normal performance.

Note 3 to entry: The limiting conditions for storage, transport and operation may be different.

3.35
output variable
recordable variable quantity generated by a system, influenced only by the system and via the system by its input variables

[SOURCE: IEC 60050-351:2013, 351-41-07]

3.36
performance
characteristics defining the ability of a measuring instrument to achieve the intended functions.

[SOURCE: IEC 60050-311:—, 311-06-11]

3.37
power source
primary source, usually AC mains, from which the system's energy is derived

3.38
power supply
separate unit which can convert, rectify, regulate or otherwise modify the form of energy from the power source to provide suitable energy for a system or elements of a system for measurement and control

3.39
rated operating condition
operating condition that shall be achieved in order that a measuring instrument or measuring system performs as designed

Note 1 to entry: The rated operating condition generally specifies intervals of values for the quantity being measured and for any influence quantity.

[SOURCE: ISO/IEC Guide 99:2007, 4.9]

3.40
reference operating condition
reference condition
condition of use prescribed for evaluating the performance of a measuring system or for comparison of measurement results

Note 1 to entry: Reference operating conditions specify intervals of values of the measurand and of the influence quantities.

Note 2 to entry: In IEC 60050-300, International Electrotechnical Vocabulary – Electrical and electronic measurements and measuring instruments, definition 311-06-02, the term "reference condition" refers to an operating condition under which the specified instrumental measurement uncertainty is the smallest possible.

[SOURCE: ISO/IEC Guide 99:2007, 4.11, modified – "measuring instrument" removed from definition]

3.41
reliability
ability of an item to perform a required function under given conditions for a given period of time

[SOURCE: IEC 61069-1:2016, 3.1.50]

3.42
rise time
for a step response, duration of the time interval between the instant when the output variable reaches a small, specified percentage of the difference between the final and the initial steady state vales and the instant when it reaches for the first time a large, specified percentage of the same steady state difference

Note 1 to entry: Conventional values are 5 % to 95 % or 10 % to 90 %.

[SOURCE: IEC 61298-2:2008, 3.14, modified – definition modified and Note 1 to entry added]

3.43
security
assurance provided by a system that any incorrect input or unauthorised access is denied

[SOURCE: IEC 61069-1:2016, 3.1.57]

3.44
settling time
time interval between the stepwise variation of the input variable und the instant, when the difference between the step response and their steady-state value is smaller than the transient value tolerance

[SOURCE: IEC 60050-351:2013, 351-45-37, modified – definition modified]

3.45
shock
sudden non-periodic motion caused by a blow, impact, collision, concussion or violent shake or jar

Note 1 to entry: There are two methods to measure shock

a) the first is to specify a value of acceleration or deceleration together with its duration;

b) the second is to specify a height of free fall on to a specified flat surface.

3.46
signal
physical variable quantity, one or more parameters of which carry information about one or more variable quantities

Note 1 to entry: These parameters are called the "information parameters".

[SOURCE: IEC 60050-351:2013, 351-41-17]

3.47
span
algebraic difference between the upper and lower limit values of the measuring range

[SOURCE: IEC 60050-311:—, 311-03-13]

3.48
standardized signal
signal, the lower and upper range-values of which are standardized

Examples: 4 mA DC to 20 mA DC; 20 kPa to 100 kPa.

3.49
start-up drift
drift in output monitored over a period of 4 h after power is switched on

[SOURCE: IEC 61298-2:2008, 7.1, modified – subclause condensed]

3.50
storage and transportation conditions
specified conditions to which a device may be subject between the time of construction and the time of operation

SEE: 3.14

Note 1 to entry: During storage and transportation, the device is inoperative and appropriately protected and/or packed to meet the specified condition limits so that the device will not be damaged or suffer a degradation of performance.

3.51
storage temperature
ambient temperature to which a device may be subject between the time of construction and the time of operation

SEE: 3.1

3.52
thermal response time
time a thermometer takes to respond at a specified percentage to a step change in temperature

Note 1 to entry: To specify response time it is necessary to declare:

a) the percentage of response, usually t0.9, t0.5, or t0.1, which gives the time for 90 %, 50 % or 10 % of the response.

b) the test medium and its flow conditions have to be specified (usually flowing water and/or flowing air).

[SOURCE: IEC 60751:2022, 3.12, modified – Notes to entry added]

3.53
type of protection
set of specific measures applied to equipment to avoid ignition of a surrounding explosive atmosphere

[SOURCE: IEC 60050-426:2020, 426-01-02]

3.54
vibration
periodic motion, reciprocating, rotary or both, usually with a well-defined fundamental frequency

Note 1 to entry: A typical example is the vibration of rotating machinery.

3.55
vibration resistance
range of sinusoidal vibrations of a given severity the measurement equipment can withstand without permanent impairment of operating characteristics

Note 1 to entry: The severity is determined by four parameters: frequency, range, amplitude of vibration and duration of loading.

Note 2 to entry: The term is derived from the content of IEC 60068-2-6

3.56
warm-up time
duration between the instant when the power supply is energized and the instant when the measuring instrument may be used, as specified by the manufacturer

[SOURCE: IEC 60050-311:—, 311-03-18]

3.57
zero adjustment
means provided in an instrument to cause a parallel shift in the input-output relationship

[SOURCE: IEC 60873-1:2003, 3.9]

4 Metadocuments

4.1 General

A metadocument is a document that describes how other documents for a particular purpose, in this case for the exchange of product catalogue data, are to be created and structured.

Metadocuments in this part of IEC 61987 describe the non-proprietary structures (clauses) and product features (textual descriptions, tables, diagrams, photographs or single properties) of a class of process measuring equipment. They serve as specimen and procedural instructions for the production of process equipment catalogues by the equipment manufacturer.

Metadocuments form a document hierarchy corresponding to the hierarchical classification of the process measuring equipment. A metadocument can exist at each level of the hierarchy which describes structures and features common to all equipment at this hierarchical level. Metadocuments at lower hierarchical levels inherit the structure and features from the metadocuments at levels above them.

Figure 1 shows the classification scheme for process measuring equipment used in this document. It is based on the table of letter codes for identification of instrument functions to be found in ISO 3511-1. Process measuring equipment may be further subdivided into continuous measuring equipment, the measurement value of which is expressed as a quantitative value through analogue or digital output, and limit detecting equipment, the measurement value of which is expressed as a binary-state signal. The metadocument defined in Clause 5 defines the common structures and features that are to be found at this level in the hierarchy.

Each piece of equipment is designed to measure one or more process variables, for example level, pressure, flow or temperature. To fully define the technical data of say, a flowmeter, additional features, for example inlet and outlet run, shall be added to those inherited from the level above.

The methods used to measure a particular process variable form a further level in the hierarchy. Thus, flow may be measured by a differential pressure transmitter sensing the pressure drop across a primary element, a variable area flowmeter, an electromagnetic flowmeter etc.

Depending on the measuring method used, additional features can again be added to the structure to adequately characterise the equipment. Such additional features have already been defined for the measurement methods shaded grey in Figure 1 (see Annex B).

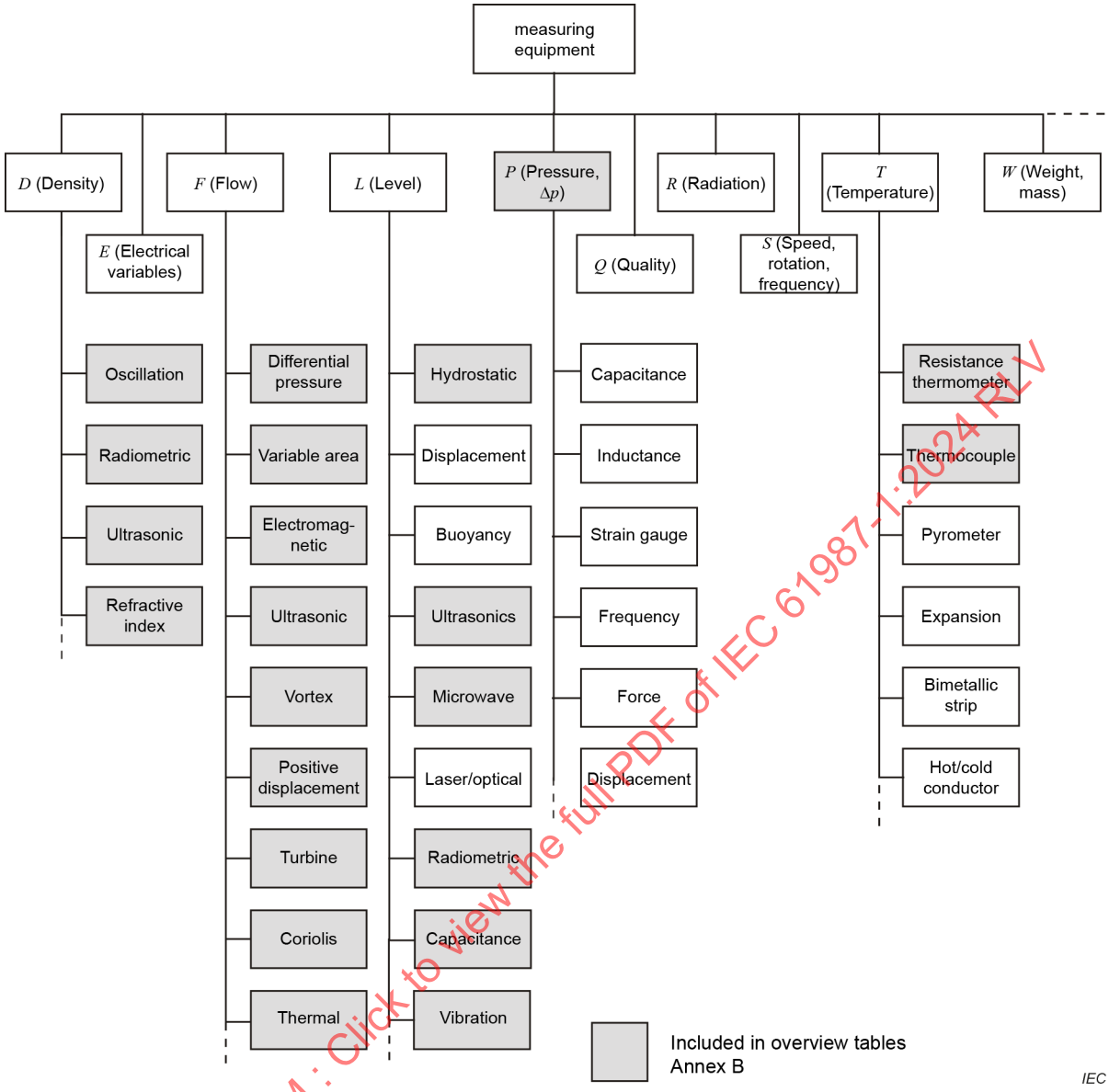

Figure 1 – Classification scheme for process measuring equipment (letter codes *D*, *F*, *L* etc. identifying the measuring equipment function taken from ISO 3511-1)

4.2 Metadocument clauses and features

4.2.1 General

The metadocument is to be structured for all process measuring equipment as follows:

1 Identification
2 Application
3 Function and system design
4 Input
5 Output
6 Digital communication
7 Performance characteristics

NOTE 1 If the process measuring equipment has no digital communication interface, Clause 6 can be omitted.

This part of IEC 61987 shall be used by the equipment manufacturer, in that they take the metadocuments and organises the technical data for their measuring equipment under the structure and features defined for each clause. The document may also contain photographs, drawings and tables.

NOTE 2 For the preparation of metadocument data, see also IEC 82045. For the preparation of diagrams, tables and lists, see also IEC 61082.

Features common to all process measuring equipment are compiled in Clause 5. At the start of each subclause, for example 5.1, it is stated what information is expected to be entered at that point in the metadocument. The information itself is then entered under the appropriate feature. Where necessary, the vendor/manufacturer is free to specify additional, non-standard features at each point in the structure.

If no feature is specified for a part of the structure, the vendor/manufacturer is free to present their information as they like under the structure heading, for example by the use of non-standard features.

NOTE 3 The nomenclature adopted in the metadocument defined in Clause 5 is based on terms and concepts drawn from international standards.

NOTE 4 Clause 5 also includes so-called synonymous names. A synonymous name is a related designation or concept. It is intended for electronic searches only and is not a substitute for the preferred term.

NOTE 5 Each term in Clause 5 is accompanied by an explanation of what is to be entered in the data element. These explanations are informative only, and do not constitute normative definitions.

The metadocument of the measuring equipment for particular measured variables is summarised in Table A.1.

Annex B contains tables for various measurement methods. The tables indicate general specifications to be made in all documents and particular specifications to be made for the different types of measurement equipment, i.e., for flow, level, pressure, temperature and density. Terms and definitions for specific measuring equipment and measurement methods are not the subject of this document but are included in informative Annex B for completeness.

4.2.2 Composite measuring equipment

Process measuring equipment may comprise one or more modules combined in different ways: for example, for temperature it may comprise a sensing element (thermocouple or RTD) and a temperature transmitter. Such modular measuring equipment can be described using the features for the corresponding equipment class, either for the equipment as a whole or for each separate module, according to the manufacturer's preference. The equipment architecture and the way in which the modules work together shall always be described under Clause 3 of the metadocument, Function and System Design.

4.2.3 Measuring equipment with a digital communication interface

Where measuring equipment offers a digital communication interface the user can choose to follow the structure in Edition 1 (2006) of this document and describe the corresponding features in Clause 5 Output or list them separately in Clause 6. The latter option is to be preferred when bidirectional properties, i.e., both input and output functions, are to be described.

4.3 Nomenclature

The nomenclature adopted in the metadocument defined in Clause 5 is based on terms and concepts drawn from international standards.

The metadocument also includes so-called synonymous names. A synonymous name is a related designation or concept. It is intended for electronic searches only and should not be substituted for the preferred term.

Each term in the metadocument is accompanied by an explanation of what is to be entered in the data element. These explanations are informative only, and do not constitute normative definitions.

5 Metadocument for process measuring equipment

5.1 Identification

5.1.1 General

The information necessary for unambiguous identification of the measurement equipment shall be specified here. This information may be supplemented by illustrations, for example drawings or photographs.

5.1.2 Document identification

Type, code number and version and if appropriate, the revision number of the document.

5.1.3 Date of issue

Date of issue of the document in the form: year, month and, if appropriate, day.

NOTE The manufacturer is encouraged to supplement this information with a "valid until" date.

5.1.4 Product type

Type of product, for example capacitance level transmitter, differential pressure transmitter, Pt100 resistance thermometer, variable area flowmeter, see also Figure 1.

5.1.5 Product name

Product name under which the measuring equipment is marketed.

NOTE There is no conformity under manufacturers regarding the naming of their products. The name can comprise a product name, a product model number or a combination of both. If necessary, the manufacturer can add a separate feature for the product model number.

5.1.6 Version

Hardware, firmware and software version of the measuring equipment.

5.1.7 Manufacturer

Name of the manufacturer of the measurement equipment, optionally with address.

NOTE For OEM products, the vendor's name can be entered here.

5.2 Application

Application for which the measurement equipment is designed, together with the reasons for its use, shall be specified here.

5.3 Function and system design

5.3.1 General

Method by which the physical quantity is acquired, processed and output as a signal by the measurement equipment shall be specified here. The measuring principle and the components comprising the measurement equipment shall be specified. Terms such as those listed in IEC 61987-11 shall be used (transmitter, gauge, switch, indicator and sensing element). If appropriate, the signal processing, including any diagnostic functions, shall be described.

NOTE 1 The term "flowmeter" can be used as an alternative to "flow transmitter".

NOTE 2 If a device has no standardised signal output, the term "transducer" can be used.

5.3.2 Measuring principle

Principle used to measure a physical quantity in order to determine the value of a measured variable.

5.3.3 Equipment architecture

Components, devices, assemblies or systems used to perform the measuring activity.

5.3.4 Communication and data processing

Components, hardware and software necessary for communication with external systems and execution of complex functions.

5.3.5 Dependability

5.3.5.1 General

Information on the dependability of the equipment as defined in IEC 61069. The scheme as per IEC 61069-5 shall be followed.

5.3.5.2 Reliability

Where appropriate, the Mean Time Between Faults (MTBF), fault tolerance, internal redundancy etc. shall be entered here.

5.3.5.3 Maintainability

Where appropriate, any special tools, the smallest replaceable units, any consumables required for the correct operation and maintenance of the equipment shall be entered here.

5.3.5.4 Integrity

Where appropriate, any mechanism which ensures the integrity of the equipment output on the discovery of a fault shall be described here.

5.3.5.5 Security

Where appropriate, any measures or conformance to recognised standards or regulatory guidelines regarding access authorisation to and protection of device data shall be entered here.

5.4 Input

5.4.1 General

Information on the measured variable shall be entered here, i.e., the physical, physicochemical or chemical quantity, the size of which is to be acquired and indicated by the measurement.

5.4.2 Measured variable

Variable(s) measured by the equipment.

For multivariable instruments, all measured variables shall be listed. Where supporting measurements are necessary, it shall be specified whether these are made internally or externally. In the case of external measurements, the properties of any auxiliary input interface shall be described.

5.4.3 Measuring range

Range of values of the measured variable that the equipment has been designed to measure.

The measuring range is defined by a lower range-limit (LRL) and an upper range-limit (URL). Within this range, measurements are made within the accuracies specified in 5.7. In addition, depending upon the physical quantity being measured, adjustment ranges for the lower and upper range-limits or a turndown ratio can also be specified. These can be expressed as a percentage of the maximum span, as absolute values or as a ratio.

- The way in which the measuring range is expressed is a matter of convention and can differ according to the physical quantity measured and type of instrument.
- For some measurement methods, additional information on the physical starting point of the measuring range should be specified, for example for ultrasonic level measurement.
- The accuracies specified in 5.7 shall also apply after any permitted adjustments to the measuring range have been made, otherwise the associated accuracies shall be stated.

Where a device provides a means of zero and span adjustment, this should be described.

5.5 Output

5.5.1 General

The information signal (output) after the processing of measured variable(s) shall be specified here. The size of output signal indicates unequivocally the size of the measured variable.

Where the measuring equipment has more than one output, all shall be described.

5.5.2 Output signal

Type and characterising quantities of the output signal.

The output signal might be electrical, mechanical, hydraulic, pneumatic, optical, digital etc. It may be variable over a specified range or assume specific values only. If the output is configurable, the possible operating modes should be described.

EXAMPLE: 4 mA to 20 mA analogue signal, configurable as binary signal 8/16 mA.

In the case of a digital signal, the user has the option entering the type of communication interface in Clause 5 or describing it in detail in Clause 6, Digital communication.

5.5.3 Signal on alarm

Value(s) or status assumed by the output signal when there is a fault in the process measuring equipment.

5.5.4 Load

For analogue outputs, the electrical, optical, pneumatic, hydraulic or mechanical load presented to the output of a device, element or system by the external devices connected to it.

5.6 Digital Communication

5.6.1 General

If the measuring equipment possesses a digital communication interface, its properties can be described here. Properties in addition to the ones listed in 5.6.2 to 5.6.4 can also be added under an appropriate clause heading.

Where the measuring equipment has more than one digital communication interface, all shall be described.

5.6.2 Communication protocol

The name, type and supported version of the communication interface shall be entered here. Should particular device profiles be supported, the names and versions shall be entered. Similarly, any roles the equipment can adopt and any special functionality it can support shall also be described.

5.6.3 Communication variable

The designation of all communication channels, the variables assigned by default to them and the type of variable shall be entered here.

Example: Communication channel 1, mass flow, analog input
...
Communication channel 6, accumulated mass flow, totalizer output

Where the measuring equipment possesses a totalizer output, the means of resetting together with the reset value and function shall be described.

5.6.4 Physical layer

The physical layer used by the communication interface shall be described here. This shall include the possible baud rate settings, the default baud rate settings, the assigned address and the means of setting the address.

For wired communication interfaces the means of connection together with the cable specification shall be described. If appropriate, the fieldbus explosion protection concept supported by the interface shall be specified.

For optical communication interfaces, the marking, designation and type of optical connection shall be described together with the operating wavelength and mode.

For wireless communication interfaces, the transmission standard shall be specified together with the type of antenna used.

5.7 Performance characteristics

5.7.1 General

Specifications regarding for example the accuracy and dynamic behaviour of the measurement equipment under normal operating conditions and reference operating conditions shall be made here.

For measurement equipment with a span setting and analogue output, the performance characteristics concerning accuracy shall be expressed in relation to the span. If one value only is stated, it shall be applicable to all permitted span settings.

For digital output equipment, characteristics shall be expressed in relation to the reading or upper range-limit.

NOTE 1 For reference conditions, refer to IEC 61298-1.

NOTE 2 For details on performance testing and presentation of the results, see in particular IEC 61298 (all parts) and IEC 62828 (all parts) as well as the test standards quoted in the normative references and bibliography.

5.7.2 Accuracy

Inaccuracy, as determined for example by the method described in IEC 61298-2.

Where an accuracy class exists for the type of instrument under consideration, this can be specified as an alternative.

NOTE According to IEC 61298-2, the accuracy of the equipment is adequately expressed by the three quantities specified in 5.7.2, 5.7.3 and 5.7.4. If desired, accuracy can also be expressed in terms of inaccuracy and hysteresis, or non-linearity/non-conformity, hysteresis and dead band. These alternatives are not included at this level of the structure.

5.7.3 Measured error

Measured error, as determined for example by the method described in IEC 61298-2.

5.7.4 Hysteresis

Hysteresis, as determined for example by the method described in IEC 61298-2.

5.7.5 Non-repeatability

Non-repeatability, as determined for example by the method described in IEC 61298-2. The non-repeatability is synonymous with repeatability error.

5.7.6 Start-up drift

Start-up drift as determined by for example the method described in IEC 61298-2.

5.7.7 Long-term drift

Long-term drift as determined by for example the method described in IEC 61298-2.

5.7.8 Influence of ambient temperature

Effect of temperature changes on the output signal as determined by for example the method described in IEC 61298-3.

NOTE IEC 61298-3 expresses the influence as the average error over the entire ambient temperature range. It can also be expressed as a percentage of span over a given temperature span.

5.7.9 Influence of medium temperature

Effect of changes in medium temperature on the output signal determined and expressed in a similar manner to the influence of ambient temperature, see 5.7.8.

Where appropriate, for equipment not in direct contact with the process medium, this information can be given in the form of a derating curve of ambient temperature versus process temperature.

5.7.10 Settling time

Settling time, as determined by for example the method described in IEC 61298-2.

Synonymous names: rise time; response time.

5.8 Operating conditions

5.8.1 General

The nominal range of use, i.e. the conditions under which the measuring equipment can be operated within its specified accuracy limits and without permanent impairment of its operating characteristics, shall be specified here. A distinction is made between normal operating conditions, operating limits and storage and transport conditions, see Clause 3.

5.8.2 Installation

5.8.2.1 General

Installation conditions, in particular any special precautions necessary to obtain the specified performance of the measuring equipment, shall be specified here.

5.8.2.2 Climate class/Environmental condition class

General indication of the climatic conditions, to which the measuring equipment can be subjected during operation (including shutdown), for example expressed by a location or climate class according to IEC 60654-1.

Alternatively, or in addition, a climate condition class and other environmental condition classes expressed according to IEC 60721-3-x shall be used.

5.8.2.3 Installation instructions

Brief instructions, and if appropriate warnings, on the mounting of measuring equipment, so as to obtain the best performance from it. These might include orientation, cable length, inlet and outlet run (for flow), emitting angle (microwave and ultrasonics) etc.

5.8.2.4 Start-up conditions

Conditions to be upheld at the measuring point to ensure correct start-up of the measurement equipment. If special precautions must be taken to avoid for example pressure or thermal overload, these should be stated.

5.8.2.5 Warm-up time

Time required after energising the measuring equipment before its performance characteristics apply.

NOTE Although many modern instruments warm up in a matter of seconds, some systems take considerably longer, for example radiometric level and density measurement or temperature measurement (where the warm-up time is dependent upon the response time of the complete temperature measuring device including the inset and thermowell).

5.8.3 Environment

5.8.3.1 General

Environmental conditions under which the measuring equipment can be stored and operated within its specified accuracy limits and without permanent impairment of its operating characteristics shall be specified here.

5.8.3.2 Ambient temperature range

Range of ambient temperatures, within which the measuring equipment is designed to operate within the specified accuracy limits.

Synonymous names: normal operating temperature, operating temperature, nominal temperature range, working temperature.

5.8.3.3 Ambient temperature limits

Extreme values of ambient temperature, to which the measuring equipment may be subjected during operation without permanent impairment of operating characteristics.

Synonymous names: Limiting temperature range.

5.8.3.4 Storage and transportation conditions

Conditions under which the measuring equipment may be safely transported and stored.

NOTE Typical values are storage temperature, transportation temperature as well as any special conditions regarding air pressure and humidity.

5.8.3.5 Relative humidity

Range of relative humidity, within which the measuring equipment is designed to operate within the specified accuracy limits.

5.8.3.6 Immunity to temperature change

Ability of the measuring equipment to withstand given changes in ambient temperature.

NOTE IEC 60068-2-14 describes tests to simulate both sudden changes (Test Na) and gradual changes (Nb) in ambient temperature. IEC 60068-2-14 also specifies how the test(s), together with the conditions, are to be presented.

Synonymous name: thermal cycling; temperature cycling, resistance to thermal shock.

5.8.3.7 Shock resistance

Ability of the measuring equipment to withstand sudden mechanical loading without permanent impairment of operating characteristics as for example described in IEC 61298-3.

5.8.3.8 Vibration resistance

Ability of the measuring equipment to withstand sinusoidal vibrations without permanent impairment of operating characteristics as for example described in IEC 61298-3.

5.8.3.9 Electromagnetic compatibility

Electromagnetic compatibility of the measuring equipment expressed as either the results of the individual tests for example IEC 61000-4 series or conformance to a particular standard, for example IEC 61326, which incorporates these tests.

Synonymous names: electromagnetic interference, electromagnetic immunity, RFI.

5.8.4 Process

5.8.4.1 General

Allowable process conditions under which the measurement equipment can be operated within its specified accuracy limits and/or without permanent impairment of its operating characteristics shall be specified here.

NOTE For the purposes of this document, the term wetted part refers not only to parts directly in contact with the process medium, but also to those parts of non-contact measuring equipment that intrude into the process vessel.

5.8.4.2 Process temperature range

Permissible range of temperatures for the wetted parts if the measuring equipment is to operate within the specified accuracy limits.

5.8.4.3 Process temperature limits

Extreme values of temperature, to which the wetted parts of the measuring equipment may be subjected without permanent impairment of operating characteristics.

- If higher temperatures are allowed for short periods, for example for cleaning in process, then these, together with the permissible length of time, shall be stated.

5.8.4.4 Process pressure range

Permissible range of pressures for the wetted parts, if the measuring equipment is to operate within specified accuracy limits.

5.8.4.5 Process pressure limits

Extreme values of pressure, to which the wetted parts of the measuring equipment may be subjected without permanent impairment of operating characteristics.

NOTE For temperature measurement, this is not a fixed value. The maximum pressure is dependent for example on the immersion depth of the thermometer, the process temperature, the viscosity of the medium and the flowrate. Guidelines for water and air are sufficient.

5.9 Mechanical and electrical construction

5.9.1 General

The mechanical construction of the measuring equipment shall be specified here. Details shall be given of all parts of direct relevance to its use, for example process connections, seals, wetted parts, electrical connections, special cases (special materials, special versions) and accessories.

5.9.2 Design

Design of the measuring equipment with respect to the manner in which it is installed at the measuring point. For example, head transmitter or rail-mounted transmitter or 19" plug-in card; compact transmitter or separated transmitter, etc.

5.9.3 Dimensions

Principal dimensions of the measuring equipment.

- Dimensions should be expressed at least as "length x breadth x height", and where appropriate be supported by a dimensional drawing.
- Clearances required for the mounting of the instrument should also be indicated.
- Where several equipment versions are available, dimensions and weight may be presented together or under 5.9.9, process connection, as appropriate. If necessary, a note to this effect should be added to 5.9.3, 5.9.4 or 5.9.5.

5.9.4 Weight

Weight of the measuring equipment or its component parts.

5.9.5 Material

Materials used in the construction of the equipment, in particular for parts which come into contact with the process or environment.

5.9.6 Electrical connection

Information regarding the provisions for electrical connection(s) of the measuring equipment.

NOTE In addition to the degree and type of protection afforded by the device enclosure, this might include, for example, type of terminal, type of cable, cable cross-section, cable gland, galvanic isolation etc. for both signal and power circuits.

5.9.7 Degree of protection

The degree of ingress protection of the enclosure expressed as an IP rating as per IEC 60529 or other internationally recognised enclosure classification.

Synonymous names: ingress protection; enclosure classification.

5.9.8 Type of protection

The type of protection offered by the enclosure against the ignition of a surrounding explosive atmosphere, for example EEx ia, Ex d.

5.9.9 Process connection

Where appropriate, the type of process connection(s) used by the measuring equipment, indicating nominal diameters, rated pressures and standards.

5.10 Operability

Details of the design, operating concept, structure and functionality of the human interface shall be specified here. Operating elements, displays, foreign system interfaces (when allowing human operation), testing and configuration elements, for example solder bridges, DIP-switches, re-ranging elements, handheld terminals, auxiliary stations shall be described here.

Where software can be used for configuration and/or operation, the required version shall be specified.

NOTE The operability of a device can be assessed and documented as described in IEC 61069-6:1998.

5.11 Power supply

The permanent or temporary power to be supplied to the measurement equipment in order to maintain its function, which cannot be taken from the input signal, together with the permissible tolerances for the power supply, shall be specified here.

Examples:

Electrical power supply:

- Voltage
- Frequency
- Harmonic distortion level (for AC supply)
- Residual ripple (for DC supply)
- Power consumption

Pneumatic power supply:

- Pressure
- Oil and dust content
- Dew point of air supply
- Air consumption

Hydraulic power supply

5.12 Certificates and approvals

Certificates, approvals and other formal documentation concerning the measurement equipment shall be specified here, for example legal requirements, regulations, technical guidelines, approvals and test certificates.

Examples are electrical area classification, marine approvals, sanitary approvals, CE mark, etc.

5.13 Ordering information

The information required for the procurement of the measurement equipment shall be specified here.

The information can be given in the form of an ordering table or as a link or QR code®[1] that leads to an on-line sizing or ordering process. In all cases, the user shall have, at the minimum, information on the equipment type that has been ordered as well as the associated ordering code.

5.14 Documentation

A bibliography of documentation relevant to the measuring equipment shall be specified here, for example operating manuals, specifications of components and auxiliary equipment etc.

[1] QR code is the trade name of a product supplied by Denso Wave Incorporated. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Annex A
(normative)

Classification of features as a function of measuring equipment

Table A.1 shows how the document structure defined in Clause 5 for measuring equipment in general applies to equipment designed to measure a particular process variable.

A shaded cell indicates that the feature defined for measuring equipment also applies to the measurement principle concerned.

A hatched cell indicates that the feature defined for measuring equipment is dependent upon output or equipment construction.

Table A.1 – Classification and documentation structure of measuring equipment

		Measuring equipment	Flow	Level	Pressure	Temperature	Density
1	**Identification**						
	Document identification						
	Date of issue						
	Product type						
	Product name						
	Version						
	Vendor/Manufacturer						
2	**Application**						
3	**Function and System Design**						
	Measuring principle						
	Equipment architecture						
	Communication and data processing						
	Dependability						
	Reliability						
	Maintainability						
	Integrity						
	Security						
4	**Input**						
	Measured variable						
	Measuring range						
5	**Output**						
	Output signal						
	Signal on alarm						
	Load						

		Measuring equipment	Flow	Level	Pressure	Temperature	Density
6	**Digital Communication**						
7	**Performance Characteristics**						
	Accuracy						
	Measured error						
	Hysteresis						
	Non-repeatability						
	Start-up drift						
	Long-term drift						
	Influence of ambient temperature						
	Influence of medium temperature						
	Settling time						
8	**Operating Conditions**						
8.1	**Installation**						
	Climate class/Environmental condition class						
	Installation instructions						
	Start-up conditions						
	Warm-up time						
8.2	**Environment**						
	Ambient temperature range						
	Ambient temperature limits						
	Storage temperature						
	Relative humidity						
	Immunity to temperature change						
	Shock resistance						
	Vibration resistance						
	Electromagnetic compatibility						
8.3	**Process**						
	Process temperature range						
	Process temperature limits						
	Process pressure range						
	Process pressure limits						

		Measuring equipment	Flow	Level	Pressure	Temperature	Density
9	**Mechanical and Electrical Construction**						
	Design						
	Dimensions (length x breadth x height)						
	Weight						
	Material						
	Electrical connection						
	Degree of protection						
	Type of protection						
	Process connection						
10	**Operability**						
11	**Power Supply**						
12	**Certificates and Approvals**						
13	**Ordering Information**						
14	**Documentation**						

For analog signals only

Dependent upon equipment construction

Annex B
(informative)

Classification of features as a function of measurement principle

B.1 Additional features proposed for flow measurement principles

B.1.1 Overview

Table B.1 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Flow equipment". This property applies to all flow measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Flow equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.1.

Table B.1 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.1 – Classification and documentation structure of flow measuring equipment

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
1	**Identification**										
	Document identification										
	Date of issue										
	Product type										
	Product name										
	Version										
	Vendor/Manufacturer										
2	**Application**										

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
3	**Function and System Design**										
	Measuring principle	■									
	Equipment architecture	■									
	Communication and data processing	■									
	Dependability	■									
	Reliability	■									
	Maintainability	■									
	Integrity	■									
	Security	■									
4	**Input**										
	Measured variable	■									
	Measuring range	■									
5	**Output**										
	Output signal	■									
	Signal on alarm	■									
	Load	■									
	Signal resolution					■	■			■	
	Low-flow cut-off		■	■	■		■	■	■	■	■
6	**Digital Communication**										
7	**Performance Characteristics**										
	Accuracy	■									
	Measured error	■									
	Hysteresis	■									
	Non-repeatability	■									
	Start-up drift	■									
	Long-term drift	■									
	Influence of ambient temperature	■									
	Influence of medium temperature	■									
	Influence of Reynolds number					■	■	■	■		
	Influence of medium pressure			■							■
	Settling time	■									

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
8	**Operating Conditions**										
8.1	**Installation**										
	Climate class/Environmental condition class	■									
	Installation instructions	■									
	Start-up conditions	■									
	Warm-up time	■									
	Inlet and outlet run		■	■	■	■		■	■	■	■
	Cable length		■	■	■	■	■	■	■	■	■
8.2	**Environment**										
	Ambient temperature range	■									
	Ambient temperature limits	■									
	Storage temperature	■									
	Relative humidity	■									
	Immunity to temperature change	■									
	Shock resistance	■									
	Vibration resistance	■									
	Electromagnetic compatibility	■									
8.3	**Process**										
	Process temperature range	■									
	Process temperature limits	■									
	Process pressure range	■									
	Process pressure limits	■									
	State of aggregation		■								
	Density		■								
	Viscosity		■								
	Conductivity			■							
	Reynolds number				■	■					
	Gas content			■	■			■			
	Limiting flow					■	■			■	■
	Pressure loss		■	■	■	■	■	■	■	■	■
	Downstream pressure		■			■	■	■			

		Inherited features for all flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
9	**Mechanical and Electrical Construction**										
	Design										
	Dimensions (length x breadth x height)										
	Weight										
	Material										
	Electrical connection										
	Degree of protection										
	Type of protection										
	Field coil isolation class										
	Process connection										
10	**Operability**										
11	**Power Supply**										
12	**Certificates and Approvals**										
13	**Ordering Information**										
14	**Documentation**										

For analog signals only

B.1.2 Output

B.1.2.1 Signal resolution

Resolution of the output signal.

B.1.2.2 Low flow cut off

Section of the measurement range, starting at the lower range value, where the output signal will be equal to the lower range value (zero).

B.1.3 Performance characteristics

B.1.3.1 Influence of Reynolds number

Change in lower range value (zero) and/or span caused by a change in the Reynolds number of the flow.

B.1.3.2 Rise time

Rise time for 10 % to 90 % as defined in IEC 61298-2.

B.1.3.3 Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change in the static pressure of the fluid.

B.1.4 Installation

B.1.4.1 Inlet and outlet run

Portion of the conduit upstream and downstream of the primary, whose axis is straight and in which the cross-sectional area and shape are constant.

B.1.4.2 Cable length

Maximum length of the electrical cable between the primary and secondary device.

B.1.5 Process

B.1.5.1 State of aggregation

Permissible state of aggregation of the fluid (for example liquid, gas, steam).

B.1.5.2 Density

Range of the density of the medium, within which a device will operate within specified accuracy limits.

B.1.5.3 Viscosity

Range of the viscosity of the medium, within which a device will operate within specified accuracy limits.

B.1.5.4 Conductivity

Minimum conductivity of the medium, above which a device will operate within specified accuracy limits.

B.1.5.5 Reynolds number

Range of the Reynolds number of the flow, within which a device will operate within specified accuracy limits.

B.1.5.6 Gas content

Maximum gas content of a liquid, below which a device will operate within specified accuracy limits.

B.1.5.7 Limiting flow

Maximum flowrate of the flowmeter, below which no damage to the primary device is to be expected.

B.1.5.8 Pressure loss

Irrecoverable pressure loss caused by the presence of a primary device in the conduit.

B.1.5.9 Downstream pressure

Minimum downstream static pressure, above which no damage to the primary device shall be expected (cavitation).

B.1.6 Mechanical construction – Field coil isolation class

Isolation class of the field coils of the primary device.

B.2 Additional features proposed for level measurement principles

B.2.1 Overview

Table B.2 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Level equipment". This property applies to all level measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Level equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.2.

Table B.2 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.2 – Classification and documentation structure of level measuring equipment

		Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
1	**Identification**							
	Document identification							
	Date of issue							
	Product type							
	Product name							
	Version							
	Vendor/Manufacturer							
2	**Application**							

		Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
3	**Function and System Design**							
	Measuring principle	■						
	Equipment architecture	■						
	Communication and data processing	■						
	Dependability	■						
	Reliability	■						
	Maintainability	■						
	Integrity	■						
	Security	■						
4	**Input**							
	Measured variable	■						
	Measuring range	■						
	Blocking distance			■	■			
	Operating frequency			■	■			■
5	**Output**							
	Output signal	■						
	Signal on alarm	■						
	Load	▒						
	Signal resolution			■	■			
6	**Digital Communication**							
7	**Performance Characteristics**							
	Accuracy	■						
	Measured error	■						
	Hysteresis	■						
	Non-repeatability	■						
	Start-up drift	■						
	Long-term drift	■						
	Influence of ambient temperature	■						
	Influence of medium temperature	■						
	Settling time	■						

		Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
8	**Operating Conditions**							
8.1	**Installation**							
	Climate class/Environmental condition class	■						
	Installation instructions	■						
	Start-up conditions	■						
	Warm-up time	■						
	Emission angle			■	■		■	
8.2	**Environment**							
	Ambient temperature range	■						
	Ambient temperature limits	■						
	Storage temperature	■						
	Relative humidity	■						
	Immunity to temperature change	■						
	Shock resistance	■						
	Vibration resistance	■						
	Electromagnetic compatibility	■						
8.3	**Process**							
	Process temperature range	■						
	Process temperature limits	■						
	Thermal shock resistance		■					
	Process pressure range	■						
	Process pressure limits	■						
	Viscosity			▒				■
	Conductivity				▒			
	Dielectric constant				■	■		
9	**Mechanical and Electrical Construction**							
	Design	■						
	Dimensions (length x breadth x height)	■						
	Weight	■						
	Material	■						
	Electrical connection	■						
	Degree of protection	■						
	Type of protection	■						
	Field coil isolation class			■				
	Process connection	■						

	Inherited features for all level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
10 Operability							
11 Power Supply							
12 Certificates and Approvals							
13 Ordering Information							
14 Documentation							
For analog signals only							
Dependent upon mode of operation							

B.2.2 Input

B.2.2.1 Blocking distance

Distance immediately below an ultrasonic or radar sensor, within which measurements are technically impossible.

B.2.2.2 Operating frequency

Frequency at which the measuring equipment operates.

B.2.3 Output – Signal resolution

Resolution of the output signal.

B.2.4 Performance characteristics – Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change in the static pressure of the fluid.

B.2.5 Installation – Emitting angle

Solid angle at which radiation is emitted from the source of radiation.

B.2.6 Process

B.2.6.1 Thermal shock resistance

Ability of the measuring equipment to withstand an abrupt change in process medium temperature.

NOTE Test Nc of IEC 60068-2-14 simulates sudden changes in process medium temperature. IEC 60068-2-14 also specifies how test conditions are to be presented.

B.2.6.2 Viscosity

Range of the viscosity of the medium, within which a device will operate within specified accuracy limits.

B.2.6.3 Conductivity

Minimum conductivity of the medium, above which a device will operate within specified accuracy limits.

B.2.6.4 Dielectric constant

Range of the dielectric constant of the medium, within which a device will operate within specified accuracy limits.

B.3 Additional features proposed for pressure measurement principles

B.3.1 Overview

Table B.3 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Pressure equipment". This property applies to all pressure measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Pressure equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.3.

Table B.3 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.3 – Classification and documentation structure of pressure measuring equipment

		Inherited features for all pressure equipment	Relative/absolute	Differential
1	**Identification**			
	Document identification			
	Date of issue			
	Product type			
	Product name			
	Version			
	Vendor/Manufacturer			

		Inherited features for all pressure equipment	Relative/absolute	Differential
2	**Application**			
3	**Function and System Design**			
	Measuring principle			
	Measurement type			
	Equipment architecture			
	Communication and data processing			
	Dependability			
	Reliability			
	Maintainability			
	Integrity			
	Security			
4	**Input**			
	Measured variable			
	Measuring range			
	Maximum span			
	Turndown ratio			
5	**Output**			
	Output signal			
	Signal on alarm			
	Signal on overload			
	Load			
	Output damping			
6	**Digital Communication**			
7	**Performance Characteristics**			
	Accuracy			
	Measured error			
	Dead time			
	Rise time			
	Step response time			
	Time constant			
	Hysteresis			
	Non-repeatability			
	Start-up drift			

		Inherited features for all pressure equipment	Relative/absolute	Differential
	Long-term drift			
	Influence of ambient temperature			
	Influence of medium temperature			
	Influence of medium pressure			
	Influence of mounting position			
	Influence of supply voltage			
	Influence of load			
	Settling time			
8	**Operating Conditions**			
8.1	**Installation**			
	Climate class/Climatic condition class			
	Installation instructions			
	Start-up conditions			
	Warm-up time			
	Emission angle			
8.2	**Environment**			
	Ambient temperature range			
	Ambient temperature limits			
	Storage temperature			
	Relative humidity			
	Immunity to temperature change			
	Shock resistance			
	Vibration resistance			
	Electromagnetic compatibility			
8.3	**Process**			
	Process temperature range			
	Process temperature limits			
	Thermal shock resistance			
	Process pressure range			
	Static pressure range			
	Process pressure limits			
	Static pressure limits			
	Overpressure limits			

		Inherited features for all pressure equipment	Relative/absolute	Differential
9	**Mechanical Construction**			
	Design			
	Proof pressure			
	Burst pressure			
	Dimensions (length x breadth x height)			
	Weight			
	Material			
	Sensor fill fluid			
	Diaphragm material			
	Electrical connection			
	Degree of protection			
	Type of protection			
	Process connection			
10	**Operability**			
11	**Power Supply**			
12	**Certificates and Approvals**			
13	**Ordering Information**			
14	**Documentation**			
	For analog signals only			
	Dependent upon process connection			

B.3.2 Function and system design – Measurement type

Type of measurement performed by the measuring equipment, defined as differential, gauge (relative) and absolute.

B.3.3 Input

B.3.3.1 Maximum span

Maximum span of the transmitter, specified as a value with associated unit.

NOTE The maximum span defines the maximum calibration range, whereby the calibration range is defined by a lower range-value (LRV) and upper range-value (URV). The value LRV is greater than or equal to the lower range-limit (LRL) and the value URV is less than or equal to the upper range-limit (URL) as specified by the measuring range.

In this case, the maximum span might be considered as the normal value and other possible larger spans might be allowed but as extended values (see examples). The maximum span could be used to define the reference calibration range.

Examples:

– Differential pressure transmitter

Max. span:	1 000 kPa
Reference range:	0 bar to 1 000 kPa
Extended span:	2 000 kPa (Range ±1 000 kPa)

– Gauge pressure transmitter

Max. span:	1 000 kPa
Reference range:	0 bar to 1 000 kPa
Extended span:	1 100 kPa (Range: –100 kPa to 1 000 kPa) with the lower range limit at 15 Pa abs

– Absolute pressure transmitter

Max. span:	1 000 kPa abs
Reference range:	0 kPa abs to 900 kPa abs
Extended range:	not applicable with the lower range limit at 0,1 Pa abs

B.3.3.2 Turndown ratio

Turndown is the ratio of the max. span to the calibrated span.

The turndown (TD) can be specified as:

- reference value;
- normal range;
- extended value range(s).

If no other limitation is implied, the TD values define all allowed calibrations of the transmitter, always considering that for any range the URV and LRV shall not exceed URL and/or LRL.

The TD may be adjusted continuously or in discrete steps. In this case, the step changes should be specified.

Example:	Differential pressure transmitter
Reference TD:	1
Normal range:	1 to 10
Extended range:	0,5 to 1; 10 to 30

B.3.4 Output

B.3.4.1 Signal on overload (overrange)

Value assumed by the output signal when the input pressure exceeds the upper and lower range-limits of the transmitter.

B.3.4.2 Output damping

Range of time parameters, in seconds, which can be set to influence the output response to a sudden change in input value (63,2 % of final steady-state value).

B.3.5 Performance characteristics

B.3.5.1 Dead time

Dead time as defined in IEC 61298-2.

B.3.5.2 Rise time

Rise time for 10 % to 90 % as defined in IEC 61298-2.

B.3.5.3 Step response time

Step response time as defined in IEC 61298-2.

B.3.5.4 Time constant

Time constant as defined in IEC 61298-2.

B.3.5.5 Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change of the static pressure of the fluid.

B.3.5.6 Influence of mounting position

Effect of change in mounting position on the measurement as defined for example in IEC 61298-3.

B.3.5.7 Influence of supply voltage

Effect of a change in supply voltage on the measurement as defined for example in IEC 61298-3.

B.3.5.8 Influence of load

For devices with analogue output signal, effect of a change in output load on the measurement as defined for example in IEC 61298-3.

B.3.6 Operating conditions/process

B.3.6.1 Static pressure range

Range of static pressures, within which a differential pressure transmitter is designed to operate within its specified accuracy limits.

B.3.6.2 Static pressure limits

Extreme values of static pressure to which a differential pressure transmitter may be subjected, without permanent impairment of operating characteristics.

B.3.6.3 Overpressure limits

Peak pressure to which a pressure transmitter may be subjected, without permanent impairment of operating characteristics.

B.3.7 Mechanical and electrical construction

B.3.7.1 Proof pressure

Design pressure applied to the transmitter to verify structural integrity. No deformation or leakage is permitted at this pressure and the transmitter shall function normally subsequent to this test. The exact testing conditions should be stated.

B.3.7.2 Burst pressure

Design test pressure that allows for permanent deformation and leakage, but parts shall remain assembled.

B.3.7.3 Sensor fill fluid

Fill fluid used to transmit the process pressure, working on the diaphragm, to the measuring sensor.

B.3.7.4 Diaphragm material

Material of the separation element, between the process fluid and fill fluid.

B.4 Additional features proposed for temperature measurement principles

B.4.1 Overview

Table B.4 indicates the additional features for flow measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Flow equipment". This property applies to all temperature measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Temperature equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.4.

Table B.4 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.4 – Classification and documentation structure of temperature measuring equipment

		Inherited features for all temperature equipment	RTD	Thermocouple
1	**Identification**			
	Document identification	■		
	Date of issue	■		
	Product type	■		
	Product name	■		
	Version	■		
	Vendor/Manufacturer	■		
2	**Application**	■		
3	**Function and System Design**			
	Measuring principle	■		
	Equipment architecture	■		
	Communication and data processing	■		
	Dependability	■		
	Reliability	■		
	Maintainability	■		
	Integrity	■		
	Security	■		
4	**Input**			
	Measured variable	■		
	Measuring range	■		
	Sensor type		■	■
	Sensor connection		■	■
	Insulation resistance		■	■
5	**Output**			
	Output signal	■		
	Signal on alarm	■		
	Load	▒		
	Linearisation		■	■
			■	■
6	**Digital Communication**		■	■

		Inherited features for all temperature equipment	RTD	Thermocouple
7	**Performance Characteristics**			
	Accuracy	■		
	Measured error	■		
	Hysteresis	■		
	Non-repeatability	■		
	Start-up drift	■		
	Long-term drift	■		
	Influence of ambient temperature	■		
	Influence of medium temperature	■		
	Settling time	■		
	Rise time		■	■
	Thermal response time		■	■
8	**Operating Conditions**			
8.1	**Installation**			
	Climate class	■		
	Installation instructions	■		
	Start-up conditions	■		
	Warm-up time	■		
	Emission angle			
8.2	**Environment**			
	Ambient temperature range	■		
	Ambient temperature limits	■		
	Storage temperature	■		
	Relative humidity	■		
	Immunity to temperature change	■		
	Shock resistance	■		
	Vibration resistance	■		
	Electromagnetic compatibility	■		
8.3	**Process**			
	Process temperature range	■		
	Process temperature limits	■		
	Process pressure range	■		
	Process pressure limits	■		

		Inherited features for all temperature equipment	RTD	Thermocouple
9	**Mechanical and Electrical Construction**			
	Design	▒		
	Dimensions (length x breadth x height)	▒		
	Weight	▒		
	Material	▒		
	Electrical connection	▒		
	Degree of protection	▒		
	Type of protection	▒		
	Process connection	▒		
10	**Operability**	▒		
11	**Power Supply**	▒		
12	**Certificates and Approvals**	▒		
13	**Ordering Information**	▒		
14	**Documentation**	▒		
▒	For analog signals only			

B.4.2 Input

B.4.2.1 Sensor type

Type of resistance temperature detector according to IEC 60751 or thermocouple according to IEC 60584.

B.4.2.2 Sensor connection

Type of sensor connection, for example 2-wire, 3-wire or 4-wire for RTD or jack-plug etc for thermocouple.

B.4.2.3 Insulation resistance

Resistance value measured between all parts of the electric circuit and the sheath at ambient or elevated temperatures and with a specified measuring voltage.

B.4.3 Output – Linearization

Means used to linearize the input of a resistance temperature detector or thermocouple to obtain a linear temperature (or temperature-proportional electrical) output.

B.4.4 Performance characteristics

B.4.4.1 Rise time

Rise time for 10 % to 90 % as defined in IEC 61298-2.

B.4.4.2 Thermal response time

Thermal response time, t_{05}, in flowing water with a flowrate of 0,4 m/s and in flowing air with a flowrate of 3 m/s.

B.5 Additional features proposed for density measurement principles

B.5.1 Overview

Table B.5 indicates the additional features for density measurement devices. Each measurement principle considered to date is assigned to a column. The document structure and features are assigned to the rows.

Properties inherited from the process equipment level are indicated by a shaded cell in the column "Density equipment". This property applies to all density measurement principles.

Properties that have not been inherited are indicated by a white cell in the column "Density equipment". The measurement principles to which they apply are indicated by a shaded cell in the appropriate measurement principle column.

Hatched cells indicate a dependency that is explained at the bottom of Table B.5.

Table B.5 is followed by a list of features that have been added to those inherited from the measuring equipment level together with instructions on what to enter at this point.

Table B.5 – Classification and documentation structure of density measuring equipment

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
1	**Identification**					
	Document identification					
	Date of issue					
	Product type					
	Product name					
	Version					
	Vendor/Manufacturer					
2	**Application**					

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
3	**Function and System Design**					
	Measuring principle	■				
	Equipment architecture	■				
	Communication and data processing	■				
	Dependability	■				
	Reliability	■				
	Maintainability	■				
	Integrity	■				
	Security	■				
4	**Input**					
	Measured variable	■				
	Measuring range	■				
5	**Output**					
	Output signal	■				
	Signal on alarm	■				
	Load	▒				
6	**Digital Communication**					
7	**Performance Characteristics**					
	Accuracy	■				
	Measured error	■				
	Hysteresis	■				
	Non-repeatability	■				
	Start-up drift	■				
	Long-term drift	■				
	Influence of ambient temperature	■				
	Influence of medium temperature	■				
	Influence of medium pressure		■			
	Settling time	■				

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
8	**Operating Conditions**					
8.1	**Installation**					
	Climate class	■				
	Installation instructions	■				
	Start-up conditions	■				
	Warm-up time	■				
	Cable length		■			
8.2	**Environment**					
	Ambient temperature range	■				
	Ambient temperature limits	■				
	Storage temperature	■				
	Relative humidity	■				
	Immunity to temperature change	■				
	Shock resistance	■				
	Vibration resistance	■				
	Electromagnetic compatibility	■				
8.3	**Process**					
	Process temperature range	■				
	Process temperature limits	■				
	Process pressure range	■				
	Process pressure limits	■				
	State of aggregation		■			
	Density		■			
	Viscosity		■			
	Gas content		■			
9	**Mechanical Construction**					
	Design	■				
	Dimensions (length x breadth x height)	■				
	Weight	■				
	Material	■				
	Electrical connection	■				
	Degree of protection	■				
	Type of protection	■				
	Process connection	■				

		Inherited features for all density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
10	Operability					
11	Power Supply					
12	Certificates and Approvals					
13	Ordering Information					
14	Documentation					
	For analog signals only					

B.5.2 Performance characteristics – Influence of medium pressure

Change in lower range value (zero) and/or span caused by a change of the static pressure of the fluid.

B.5.3 Installation conditions – Cable length

The maximal length of the electrical cable between the primary and secondary device.

B.5.4 Process conditions

B.5.4.1 State of aggregation

Permissible state of aggregation of the fluid (for example liquid, gas, steam).

B.5.4.2 Density

Range of the density of the medium, within which a device will operate within specified accuracy limits.

B.5.4.3 Viscosity

The range of the viscosity of the medium, within which a device will operate within specified accuracy limits.

B.5.4.4 Gas content

Maximum gas content of a liquid, below which a device will operate within specified accuracy limits.

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IEC 60050-351:2013, *International Electrotechnical Vocabulary (IEV) – Part 351: Control technology*

IEC 60050-426:2020, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres*

IEC 60068 (all parts), *Environmental testing*

ISO/IEC 60559:2020 , *Floating-point arithmetic*

IEC 60873-1:2003, *Electrical and pneumatic analogue chart recorders for use in industrial-process systems – Part 1: Methods for performance evaluation*

IEC 61082-1:2014, *Preparation of documents used in electrotechnology – Part 1: Rules*

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

IEC 61987-10:2009, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 10: List of Properties (LOPs) for Industrial-Process Measurement and Control for Electronic Data Exchange – Fundamentals*

IEC 62828 (all parts), *Reference conditions and procedures for testing industrial and process measurement transmitters*

IEC 82045-1:2001, *Document management – Part 1: Principles and methods*

ISO IEC GUIDE 99:2007, *International vocabulary of metrology -- Basic and general concepts and associated terms (VIM)*

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[2] Under consideration. Stage at the time of publication: IEC/ACD 60050-311:2024.

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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MESURE ET COMMANDE DANS LES PROCESSUS INDUSTRIELS – ÉLÉMENTS ET STRUCTURES DE DONNÉES DANS LES CATALOGUES D'ÉQUIPEMENTS DE PROCESSUS –

Partie 1: Structures génériques pour équipements de mesure

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8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
9) L'attention est attirée sur le fait que certains des éléments du présent document de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne prend pas position quant à la preuve, à la validité ou à l'applicabilité de tout droit de brevet revendiqué à cet égard. À la date de publication du présent document, l'IEC n'avait pas reçu notification qu'un ou plusieurs brevets pouvaient être nécessaires à sa mise en application. Toutefois, il y a lieu d'avertir les responsables de la mise en application du présent document que des informations plus récentes sont susceptibles de figurer dans la base de données de brevets, disponible à l'adresse https://patents.iec.ch. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevet.

L'IEC 61987-1 a été établie par le sous-comité 65E: Les dispositifs et leur intégration dans les systèmes de l'entreprise, du comité d'études 65 de l'IEC: Mesure et commande dans les processus industriels. Il s'agit d'une Norme internationale.

Cette seconde édition annule et remplace la première édition parue en 2006. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) Ajout d'un paragraphe "Communication numérique" à l'Article 5, afin de permettre une description plus détaillée des propriétés d'une telle interface;

b) Alignement des en-têtes d'articles sur ceux du dictionnaire de données communes (CDD – Common Data Dictionary) de l'IEC, comme cela est décrit dans l'introduction.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
65E/1113/FDIS	65E/1136/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

La version française de la norme n'a pas été soumise au vote.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

Une liste de toutes les parties de la série IEC 61987, publiées sous le titre général *Mesure et commande dans les processus industriels – Éléments et structures de données dans les catalogues d'équipements de processus*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

INTRODUCTION

Ces dernières années, l'industrie a pris conscience du fait que la transposition d'une forme à l'autre des données relatives aux équipements de mesure entraîne une perte de temps et d'efforts considérable. Les données techniques d'un instrument peuvent, par exemple, exister chez le fabricant sous forme de deux ensembles de données distincts pour une présentation sur papier et une présentation électronique: l'utilisateur final exige à peu près les mêmes données pour les normes de travaux, les bases de données d'ingénierie ou les bases de données commerciales. Dans la plupart des cas, les données ne peuvent toutefois pas être réutilisées automatiquement, car chaque application a son propre format de stockage particulier de données.

Le contenu des descriptions de produit elles-mêmes constitue un second problème qui empêche la réutilisation des données techniques. Les fabricants ne s'accordent guère sur les informations qu'il convient qu'une fiche de données techniques contienne, la manière dont il convient de l'organiser ou comment il convient de présenter les résultats, par exemple ceux d'essais de qualités de fonctionnement particuliers. Un utilisateur final qui transfère ces informations dans une base de données identifie toujours des lacunes et des interprétations exclusives qui rendent la tâche plus difficile.

La présente partie de l'IEC 61987 vise à résoudre ces problèmes en définissant une structure générique et son contenu pour les équipements de mesure et de commande dans les processus industriels. Elle s'appuie sur l'hypothèse selon laquelle, pour une classe donnée d'équipements de mesure (par exemple: les équipements de mesure de la pression, de la température ou du débit électromagnétique), un ensemble de structures et de caractéristiques de produit non exclusives peut être spécifié. Les documents qui en résultent peuvent non seulement être échangés de manière électronique, mais également être présentés sous une forme facilement compréhensible pour une utilisation humaine.

La présente partie de l'IEC 61987 est applicable aux catalogues électroniques d'équipements de mesure de processus. La structure contient également un grand nombre de caractéristiques de produit qui sont communes aux équipements de mesure avec sortie binaire. De même, l'Annexe B a été établie en vue d'une normalisation future.

La présente partie de l'IEC 61987 n'est pas destinée à remplacer des normes existantes, mais plutôt à servir de document guide pour toutes les futures normes qui sont concernées par les spécifications des équipements de mesure de processus. Il convient que chaque révision d'une norme existante tienne compte des structures et des caractéristiques de produit définies à l'Article 5 ou qu'elle œuvre à une harmonisation.

L'Annexe A contient une vue d'ensemble sous la forme de tableaux de la classification et de la structure du catalogue des équipements de mesure de processus. L'Annexe B contient des tableaux avec une sous-classification supplémentaire pour des variables mesurées spécifiques.

Dans la mesure du possible, des termes existants issus de normes internationales ont été utilisés pour désigner les caractéristiques de produit dans les structures. Conformément à l'ISO 10241, l'Article 3 contient une liste de termes, de définitions et de sources.

Les documents créés conformément à la norme sont structurés. Un moyen possible d'échanger des informations structurées exemptes d'informations de mise en page est donné par le langage normalisé de balisage généralisé (SGML – standard generalized mark-up language, voir l'ISO 8879) ou par le langage extensible de balisage (XML – extensible mark-up language) qui en dérive.

La présente partie de l'IEC 61987 peut également servir de base à l'organisation des propriétés (types d'éléments de données) conformes à l'IEC 61360 ou à l'ISO 13584. Cette configuration exige que les caractéristiques qui, dans la présente partie de l'IEC 61987, peuvent être des unités textuelles, des représentations graphiques et des tableaux, etc., soient décomposées en propriétés (types d'éléments de données) conformes auxdites normes. Par exemple, une étendue serait exprimée par une limite inférieure d'étendue (LRL – lower range-limit) et une limite supérieure d'étendue (URL – upper range-limit), avec l'unité de mesure, les dimensions (L x B x H) sous la forme de trois éléments séparés, longueur, largeur et hauteur avec l'unité de mesure, ou une courbe de déclassement comme une série appropriée de paires d'éléments de données.

La présente partie de l'IEC 61987 est conforme à l'ISO 15926-1 et à l'ISO 15926-2 en ce qui concerne le modèle de données et la bibliothèque associée de données de référence (ISO 15926-4), par exemple, telle qu'utilisée pour la structure de classification limitée. Parallèlement, elle est également alignée sur la norme pour l'Échange des données de modèle de produit (STEP – standard for the exchange of product model data) Le modèle de données et les définitions de l'ISO 10303-221 utilisent la bibliothèque de données de référence de l'ISO 15926-4 TS en tant que "bibliothèque". La norme actuelle peut reproduire les champs de données selon l'ISO 10303-221, y compris, par exemple, les données de structure de produit, les données dimensionnelles, les données de connexion électrique et les propriétés de produit telles que l'étendue de mesure ou l'alimentation électrique.

Depuis la publication de l'Édition 1 (2006) du présent document, de nombreux travaux ont été réalisés dans le cadre de l'élaboration du CDD de l'IEC pour les équipements destinés à l'automatisation des processus industriels. Ces travaux, publiés en tant qu'autres parties de l'IEC 61987, couvrent non seulement les appareils de mesure qui comportent de nombreuses entrées et sorties, mais également les éléments de contrôle finaux, les dispositifs d'infrastructure et, à l'avenir, les analyseurs de processus.

Pour cette raison, le titre de la présente norme a été modifié et le domaine d'application a été révisé pour refléter le contenu actuel de l'ensemble de la série de normes IEC 61987.

L'élaboration du CDD de l'IEC a soulevé un certain nombre de questions concernant la structure proposée dans le présent document, en particulier l'attribution d'une interface de communication numérique à la sortie. Bien que cet élément ne soit pas strictement incorrect, il a été estimé que les propriétés d'une telle interface peuvent être mieux décrites séparément. Pour cette raison, un article "Communication numérique" a été ajouté à la présente Édition 2. En outre, l'article "Construction mécanique" a été renommé "Construction mécanique et électrique" afin de refléter son véritable contenu.

Le paragraphe "Informations de commande" ne constitue pas un bloc distinct dans le CDD de l'IEC, car les propriétés qui y figurent sont réputées décrire le type et l'instance particulière d'un dispositif déjà acheté. Pour un processus de commande qui utilise les propriétés du CDD de l'IEC, les informations nécessaires sont extraites de l'"Identification" qui comprend également les informations de commande.

Le paragraphe "Certificats et agréments" figure à la fois dans la liste des propriétés de l'appareil (0112/2///61987#ABC156) et en tant qu'aspect de l'appareil dans la rubrique "documents de l'appareil fournis" (0112/2///61987#ABH517). Les informations contenues dans la rubrique "Documentation" y figurent également.

Lors de l'élaboration de l'actuelle édition du présent document, tous les termes et définitions ont été vérifiés et, le cas échéant, les références ont été mises à jour. Depuis la publication de l'Édition 1 en 2006, plusieurs normes ont été annulées. Lorsqu'aucune source alternative appropriée n'a été identifiée, une note à cet effet a été ajoutée, mais le terme et la définition d'origine sont restés inchangés.

MESURE ET COMMANDE DANS LES PROCESSUS INDUSTRIELS – ÉLÉMENTS ET STRUCTURES DE DONNÉES DANS LES CATALOGUES D'ÉQUIPEMENTS DE PROCESSUS –

Partie 1: Structures génériques pour équipements de mesure

1 Domaine d'application

La présente partie de l'IEC 61987 définit une structure générique dans laquelle les caractéristiques de produit des appareils de mesure dans les processus industriels doivent être agencées, afin de faciliter la compréhension des descriptions de produit lors de leur transfert d'une partie à l'autre. Elle s'applique à la production des catalogues fournis par le fabricant de tels dispositifs et aide l'utilisateur à formuler ses exigences.

Le présent document sert également de document de référence à toutes les futures normes qui sont concernées par les équipements de mesure de processus.

En outre, le présent document fournit également une structure de base pour la production d'autres normes, qui énumère les propriétés des équipements de commande de processus, par exemple, pour les actionneurs et les dispositifs d'infrastructure.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60529:1989, *Degrés de protection procurés par les enveloppes (Code IP)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60654-1:1993, *Appareils de mesure et de contrôle des procédés – Conditions de fonctionnement – Partie 1: Conditions climatiques*

IEC 60721-3 (toutes les parties), *Classification des conditions d'environnement – Classification des groupes de paramètres environnementaux et de leurs sévérités*

IEC 60751:2022, *Thermomètres à résistance et capteurs de température en platine industriels*

IEC TR 61000-1-1:2023, *Electromagnetic compatibility (EMC) – Part 1: General – Section 1: Application and interpretation of fundamental definitions and terms* (disponible en anglais seulement)

IEC 61069 (toutes les parties), *Mesure, contrôle et automatisation des processus industriels – Évaluation des propriétés du système à des fins d'évaluation du système*

IEC 61298 (toutes les parties), *Dispositifs de mesure et de commande de processus – Méthodes et procédures générales d'évaluation des performances*

IEC 61326 (toutes les parties), *Équipements électriques de mesure, de contrôle et de laboratoire – Exigences CEM*

IEC 61987-11, *Mesure et contrôle des procédés industriels – Structures et éléments de données dans les catalogues d'équipements de traitement – Liste des propriétés (LOP) des équipements de mesure pour l'échange électronique de données – Structures génériques*

ISO 3511-1:1977, *Fonctions et instrumentation pour la mesure et la régulation des processus industriels – Représentation symbolique – Partie 1: Principes de base*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse https://www.electropedia.org/
- Plateforme de consultation en ligne ISO: disponible à l'adresse https://www.iso.org/obp

3.1
exactitude
imprécision
<d'un appareil de mesure> qualité qui caractérise l'aptitude d'un appareil de mesure à donner une valeur indiquée proche d'une valeur vraie de la valeur mesurée dans les conditions de référence

Note 1 à l'article: Ce terme est utilisé dans l'approche "valeur vraie".

Note 2 à l'article: L'exactitude est d'autant meilleure que la valeur indiquée est plus proche de la valeur vraie correspondante.

Note 3 à l'article: L'imprécision, telle que définie dans l'IEC 61298-2, inclut les erreurs de non-linéarité, de non-répétabilité et d'hystérésis.

Note 4 à l'article: L'exactitude peut être exprimée en pourcentage de la valeur lue, de l'étendue ou de l'étendue complète, etc. ou en valeur absolue.

[SOURCE IEC 60050-311:—, 311-06-08, modifié – "valeur mesurée" au lieu de "mesurande", "dans des conditions de référence" ajouté, Notes 3 et 4 ajoutées]

3.2
classe d'exactitude
catégorie d'appareils de mesure ou de composants de ces appareils, qui doivent tous satisfaire à un ensemble de spécifications concernant l'incertitude

[SOURCE IEC 60050-311:—, 311-06-09 modifié – "ou de composants de ces appareils" ajouté]

3.3
température ambiante
température mesurée en un point représentatif dans l'environnement local, y compris l'équipement de production de chaleur adjacent, dans lequel l'équipement de mesure et de commande fonctionne normalement, est stocké ou transporté

VOIR: 3.15

3.4
limites de température ambiante
valeurs extrêmes de la température ambiante auxquelles un dispositif peut être soumis sans dégradation permanente des caractéristiques de fonctionnement

Note 1 à l'article: Les caractéristiques des qualités de fonctionnement peuvent être dépassées dans la plage située entre les limites du fonctionnement normal et les limites de température de fonctionnement.

VOIR: 3.3, 3.33

3.5
plage de températures ambiantes
plage des températures ambiantes dans laquelle un dispositif est conçu pour fonctionner dans les limites d'exactitude indiquées

VOIR: 3.31, 3.33

3.6
signal analogique
signal dont chaque paramètre informationnel représente directement la grandeur variable respective

Note 1 à l'article: Un signal analogique peut être un signal continu ou discret ainsi qu'un signal à temps continu ou à temps discret. Exemples: la pression dans un élément de commande final pneumatique avec paramètre informationnel continu et à temps continu (valeur de la pression) ainsi qu'un signal impulsionnel modulé en position comme signal de sortie d'un régulateur informatisé.

[SOURCE: IEC 60050-351:2013, 351-41-24]

3.7
signal binaire
signal discret dont chaque paramètre informationnel peut prendre une de deux valeurs

[SOURCE: IEC 60050-351:2013, 351-41-21]

3.8
classe climatique
conditions climatiques, c'est-à-dire température, pression et humidité ambiantes, auxquelles l'équipement de mesure peut être soumis lors du fonctionnement (arrêt y compris), le transport et le stockage (sur terre ou sur mer)

3.9
degré de protection
niveau de protection procuré par une enveloppe contre l'accès aux parties dangereuses, contre la pénétration de corps solides étrangers et/ou contre la pénétration de l'eau et vérifié par des méthodes d'essai normalisées

[SOURCE: IEC 60529:1989, 3.3]

3.10
sûreté de fonctionnement
mesure dans laquelle un système est censé exécuter une fonction exigée dans des conditions données, à un instant donné ou pendant un intervalle de temps donné, lorsque les ressources externes exigées sont fournies

[SOURCE: IEC 61069-1:2016, 3.1.22]

3.11
dispositif
élément matériel ou assemblage d'éléments matériels destiné à remplir une fonction déterminée

Note 1 à l'article: Un dispositif peut faire partie d'un dispositif plus important.

[SOURCE: IEC 60050-151: 2001, 151-11-20]

3.12
signal numérique
signal dont le paramètre informationnel représente la grandeur variable respective de manière codée sous forme de symbole d'un ensemble de caractères

Note 1 à l'article: Dans la plupart des cas techniques, un signal numérique est discret et à temps discret.

Note 2 à l'article: Un signal numérique nécessite un accord sur le code entre l'émetteur et le récepteur du signal.

Note 3 à l'article: Dans de nombreux cas techniques, les symboles peuvent être interprétés comme des nombres.

[SOURCE: IEC 60050-351:2013, 351-41-25]

3.13
dérive
changement de l'indication d'un système de mesure, généralement lent, continu, pas nécessairement dans le même sens et non lié à un changement de la grandeur mesurée

[SOURCE: IEC 60050-311:—, 311-06-13, modifié – "mesurande" remplacé par "grandeur mesurée"]

3.14
compatibilité électromagnétique
aptitude d'un équipement ou d'un système à fonctionner dans son environnement électromagnétique de façon satisfaisante et sans produire lui-même des perturbations électromagnétiques intolérables pour tout ce qui se trouve dans cet environnement

[SOURCE: IEC 60050-161:1990, 161-01-07]

3.15
condition d'environnement
caractéristique de l'environnement qui peut influer sur le fonctionnement d'un dispositif ou d'un système

Note 1 à l'article: Des exemples de conditions d'environnement sont la pression, la température, l'humidité, les rayonnements, les vibrations.

[SOURCE: IEC 60050-151:2001, 151-16-03, modifié]

3.16
classe de condition d'environnement
séquence de caractères alphanumériques désignant un ensemble de conditions d'environnement auxquelles l'équipement est ou peut être soumis pendant son fonctionnement

Note 1 à l'article: La série IEC 60721 définit des classes pour les influences climatiques, mécaniques et autres influences environnementales.

3.17
influence environnementale
variation de la sortie d'un instrument provoquée uniquement par l'écart d'une des conditions d'environnement spécifiées par rapport à sa valeur de référence, toutes les autres conditions étant maintenues constantes

VOIR: 3.21, 3.39

3.18
équipement
matériel
appareil unique ou ensemble de dispositifs ou d'appareils, ou ensemble des dispositifs principaux d'une installation, ou ensemble des dispositifs nécessaires à l'accomplissement d'une tâche particulière

Note 1 à l'article: Des exemples d'équipement ou de matériel sont un transformateur de puissance, l'équipement d'une sous-station, un équipement de mesure.

[SOURCE: IEC 60050-151:2001, 151-11-25]

3.19
hystérésis
propriété qu'a un instrument ou un appareil de mesurage de donner différentes valeurs de sortie pour les mêmes valeurs d'entrée selon le sens dans lequel ces dernières ont été appliquées successivement

[SOURCE: IEC 61298-2:2008, 3.11]

3.20
influence de la température ambiante
variation du zéro (valeur inférieure de la plage) et/ou de l'étendue provoquée par une variation de la température ambiante par rapport à la température de référence jusqu'aux limites de la plage de températures ambiantes indiquée dans les spécifications de qualités de fonctionnement

VOIR: 3.17

3.21
grandeur d'influence
grandeur qui n'est pas l'objet de la mesure et dont la variation affecte la relation entre l'indication et la mesure

[SOURCE: IEC 60050-311:—, 311-06-01]

3.22
intégrité
garantie fournie par le système que les tâches sont exécutées correctement, sauf mention d'un quelconque état dans le système susceptible d'entraver cette exécution

[SOURCE: IEC 61069-1:2016, 3.1.37]

3.23
dérive à long terme
dérive de la sortie surveillée pendant 30 jours, à 90 % de l'intervalle

[SOURCE: IEC 61298-2:2008, 7.2, modifié – paragraphe condensé]

3.24
maintenabilité
aptitude d'une entité, dans des conditions données d'utilisation, à être maintenue ou rétablie dans un état dans lequel elle peut exécuter une fonction exigée, lorsque la maintenance est réalisée dans des conditions données et au moyen de procédures et de ressources déclarées

[SOURCE: IEC 61069-1, 3.1.39]

3.25
erreur mesurée
valeur positive ou négative la plus élevée de l'erreur de la valeur moyenne, mesurée en montant ou en descendant, à chaque point de mesure

[SOURCE: IEC 61298-2:2008, 3.7, modifié – "s" supprimé dans "erreur" et "valeur"]

3.26
variable mesurée
grandeur que l'on veut mesurer

[SOURCE: ISO/IEC Guide 99:2007, 2.3 – modifié – terme modifié pour refléter l'usage dans la technologie de commande, notes à l'article supprimées]

3.27
appareil de mesure
instrument de mesure
dispositif destiné à être utilisé pour faire des mesures, seul ou associé à des dispositifs annexes

[SOURCE: IEC 60050-311:—, 311-03-01]

3.28
étendue de mesure
plage des valeurs définie par les deux valeurs extrêmes entre lesquelles une variable peut être mesurée avec la précision spécifiée

Note 1 à l'article: Les valeurs extrêmes sont habituellement appelées la limite supérieure d'étendue et la limite inférieure d'étendue.

[SOURCE: IEC 60050-351:2013, 351-48-11]

3.29
principe de mesure
phénomène ou processus servant de base à un mesurage

Note 1 à l'article: Le principe de mesure peut être un phénomène physique, chimique ou biologique.

[SOURCE: ISO/IEC Guide 99:2007, 2.4, note de l'ISO/IEC Guide 99:2007, 2.3 retenue de préférence aux notes actuelles]

3.30
non-répétabilité
erreur de répétabilité
différence algébrique entre les valeurs extrêmes obtenues en effectuant un certain nombre de mesures consécutives de la valeur de sortie pendant une courte période, pour la même valeur d'entrée dans les mêmes conditions de fonctionnement, en allant dans le même sens, pour des balayages de toute l'étendue

Note 1 à l'article: Elle s'exprime généralement en pourcentage de l'intervalle et ne comprend ni l'hystérésis ni la dérive.

3.31
domaine nominal d'utilisation
domaine des valeurs spécifiées qu'une grandeur d'influence peut prendre sans que la variation dépasse des limites spécifiées

[SOURCE: IEC 60050-311:—, 311-07-05]

3.32
conditions normales de fonctionnement
ensemble des conditions de fonctionnement dans lesquelles un dispositif est conçu pour fonctionner dans les limites de qualités de fonctionnement spécifiées

3.33
conditions de fonctionnement
conditions auxquelles est soumis un dispositif, à l'exclusion des variables traitées par le dispositif

Note 1 à l'article: Les exemples des conditions de fonctionnement incluent la pression ambiante, la température ambiante, les champs électromagnétiques, la gravité, l'inclinaison, les variations de l'alimentation électrique (tension, fréquence, harmoniques), le rayonnement, le choc et la vibration. Il convient de prendre en considération les variations statiques et dynamiques dans ces conditions. (Voir l'IEC 60654 (toutes les parties)).

[SOURCE: IEC 60050-351:1998, 351-18-33, modifié – Note à l'article ajoutée]

3.34
limites d'utilisation
ensemble des conditions de fonctionnement auxquelles un dispositif peut être soumis sans dégradation permanente des caractéristiques de fonctionnement

Note 1 à l'article: En général, les caractéristiques des qualités de fonctionnement ne sont pas énoncées pour la région située entre les limites des conditions normales de fonctionnement et les limites d'utilisation.

Note 2 à l'article: Lorsqu'il retourne dans les limites des conditions normales de fonctionnement, un dispositif peut exiger des ajustements qui rétablissent des qualités de fonctionnement normales.

Note 3 à l'article: Les conditions limites peuvent être différentes pour le stockage, le transport et le fonctionnement.

3.35
variable de sortie
grandeur variable enregistrable d'un système, influencée seulement par le système et ses variables d'entrée

[SOURCE: IEC 60050-351:2013, 351-41-07]

3.36
qualités de fonctionnement
caractéristiques définissant l'aptitude d'un appareil de mesure à assurer les fonctions voulues

[SOURCE: IEC 60050-311:—, 311-06-11]

3.37
source d'alimentation
source primaire, habituellement le secteur alternatif, dont l'énergie du système est dérivée

3.38
alimentation électrique
unité séparée qui peut convertir, redresser, réguler ou modifier autrement la forme d'énergie de la source d'alimentation pour fournir l'énergie appropriée pour un système ou pour des éléments d'un système pour le mesurage et la commande

3.39
condition assignée de fonctionnement
condition de fonctionnement qui doit être satisfaite pour qu'un instrument de mesure ou un système de mesure fonctionne conformément à sa conception

Note 1 à l'article: Les conditions assignées de fonctionnement spécifient généralement des intervalles de valeurs pour la grandeur mesurée et pour les grandeurs d'influence.

[SOURCE: ISO/IEC Guide 99:2007, 4.9]

3.40
condition de fonctionnement de référence
condition de référence
condition d'utilisation prescrite pour évaluer les performances d'un système de mesure ou pour comparer des résultats de mesure

Note 1 à l'article: Les conditions de fonctionnement de référence spécifient des intervalles de valeurs du mesurande et des grandeurs d'influence.

Note 2 à l'article: Dans l'IEC 60050-300, Vocabulaire électrotechnique international – Mesures et appareils de mesure électriques et électroniques, définition 311-06-02, le terme "condition de référence" désigne une condition de fonctionnement dans laquelle l'incertitude de mesure instrumentale spécifiée est la plus petite possible.

[SOURCE: ISO/IEC Guide 99:2007, 4.11, modifié – "appareil de mesure" supprimé de la définition]

3.41
fiabilité
aptitude d'une entité à effectuer une fonction requise pendant une durée donnée dans des conditions de fonctionnement spécifiées

[SOURCE: IEC 61069-1:2016, 3.1.50]

3.42
temps de montée
pour une réponse à un échelon, durée de l'intervalle de temps compris entre l'instant où la variable de sortie atteint un pourcentage spécifié et faible de la différence entre la valeur finale et la valeur initiale en régime établi et l'instant où cette même variable atteint pour la première fois un pourcentage spécifié et fort de cette même différence de régime établi

Note 1 à l'article: Les valeurs conventionnelles sont comprises entre 5 % et 95 % ou entre 10 % et 90 %.

[SOURCE: IEC 61298-2:2008, 3.14, modifié – définition modifiée et Note 1 à l'article ajoutée]

3.43
sûreté
assurance fournie par un système de sa capacité de refuser toute entrée incorrecte ou tout accès non autorisé

[SOURCE: IEC 61069-1:2016, 3.1.57]

3.44
durée d'établissement
intervalle de temps entre la variation progressive de la variable d'entrée et l'instant où la différence entre la réponse à un échelon et sa valeur en régime établi est plus petite que la tolérance de la valeur transitoire

[SOURCE: IEC 60050-351:2013, 351-45-37, modifié – définition modifiée]

3.45
choc
mouvement non périodique soudain provoqué par un coup, un impact, une collision, une percussion ou un ébranlement violent ou une secousse

Note 1 à l'article: Il existe deux méthodes pour mesurer le choc

a) la première consiste à spécifier une valeur de l'accélération ou de la décélération, ainsi que sa durée;

b) la seconde consiste à spécifier une hauteur de chute libre sur une surface plate spécifiée.

3.46
signal
grandeur physique variable dont un ou plusieurs paramètres sont porteurs d'informations concernant une ou plusieurs grandeurs variables

Note 1 à l'article: Ces paramètres sont appelés "paramètres informationnels".

[SOURCE: IEC 60050-351:2013, 351-41-17]

3.47
intervalle (de mesure)
différence algébrique entre les valeurs de la limite supérieure et de la limite inférieure de l'étendue de mesure

[SOURCE: IEC 60050-311:—, 311-03-13]

3.48
signal normalisé
signal dont la valeur inférieure et la valeur supérieure de la plage sont normalisées

Exemples: 4 mA en courant continu à 20 mA en courant continu; 20 kPa à 100 kPa.

3.49
dérive au démarrage
dérive de la sortie surveillée pendant 4 h après la mise sous tension

[SOURCE: IEC 61298-2:2008, 7.1, modifié – paragraphe condensé]

3.50
conditions de stockage et de transport
conditions spécifiées auxquelles un dispositif peut être soumis entre le moment de la construction et le moment de l'exploitation

VOIR: 3.14

Note 1 à l'article: Pendant le stockage et le transport, le dispositif est inopérant et convenablement protégé et/ou emballé pour satisfaire aux limites de condition spécifiées, de sorte que le dispositif ne soit pas endommagé ou ne subisse pas de dégradation de ses qualités de fonctionnement.

3.51
température de stockage
température ambiante à laquelle un dispositif peut être soumis entre le moment de la construction et le moment de l'exploitation

VOIR: 3.1

3.52
temps de réponse thermique
temps nécessaire pour qu'un thermomètre atteigne un pourcentage spécifié d'une variation échelonnée en température

Note 1 à l'article: Pour spécifier le temps de réponse, il est nécessaire de déclarer les éléments suivants:

a) le pourcentage de la réponse, généralement t0.9, t0.5, ou t0.1, qui indique le temps pour 90 %, 50 % ou 10 % de la réponse.

b) le milieu d'essai et ses conditions de débit doivent être spécifiés (généralement de l'eau en circulation et/ou un flux d'air).

[SOURCE: IEC 60751:2022, 3.12, modifié – Notes à l'article ajoutées]

3.53
mode de protection
ensemble de mesures particulières appliquées à un matériel pour empêcher l'inflammation d'une atmosphère explosive environnante

[SOURCE: IEC 60050-426:2020, 426-01-02]

3.54
vibration
mouvement périodique, alternatif et/ou de rotation, habituellement avec une fréquence fondamentale bien définie

Note 1 à l'article: Un exemple typique est la vibration des machines tournantes.

3.55
résistance aux vibrations
plage de vibrations sinusoïdales d'une sévérité donnée que l'appareil de mesure peut supporter sans altération permanente de ses caractéristiques de fonctionnement

Note 1 à l'article: La sévérité est déterminée par quatre paramètres: la fréquence, la portée, l'amplitude de la vibration et la durée de la charge.

Note 2 à l'article: Le terme est dérivé du contenu de l'IEC 60068-2-6.

3.56
durée de préchauffage
durée comprise entre l'instant où l'alimentation est mise sous tension, et l'instant où l'appareil de mesure est en état d'être utilisé, comme spécifié par le constructeur

[SOURCE: IEC 60050-311:—, 311-03-18]

3.57
réglage du zéro
moyens prévus dans un appareil donné pour générer un décalage parallèle de la relation entre entrée/sortie

[SOURCE: IEC 60873-1:2003, 3.9]

4 Métadocuments

4.1 Généralités

Un métadocument est un document qui décrit comment d'autres documents doivent être créés et structurés pour un but particulier, en l'occurrence pour l'échange des données de catalogue de produits.

Les métadocuments dans la présente partie de l'IEC 61987 décrivent les structures (articles) et les caractéristiques non inclusives des produits (descriptions textuelles, tableaux, diagrammes, photographies, ou propriétés simples) d'une classe d'équipement de mesure de processus. Ces métadocuments servent de modèles et d'instructions de procédure pour la production de catalogues d'équipements de processus par le fabricant d'équipements.

Les métadocuments forment une hiérarchie de documents qui correspond à la classification hiérarchique des équipements de mesure de processus. Un métadocument peut exister à chaque niveau de la hiérarchie qui décrit des structures et des caractéristiques communes à tous les équipements à ce niveau hiérarchique. Les métadocuments à des niveaux hiérarchiques inférieurs héritent de la structure et des caractéristiques des métadocuments aux niveaux supérieurs.

La Figure 1 représente le schéma de classification des équipements de mesure de processus utilisés dans le présent document. Ce schéma est fondé sur le tableau de lettres codes pour l'identification de fonctions d'instrument consultables dans l'ISO 3511-1. Les équipements de mesure de processus peuvent être par ailleurs subdivisés en équipements de mesure continue, dont la valeur de mesure est exprimée sous forme d'une valeur quantitative par la sortie analogique ou numérique, et en équipements détecteurs de limite, dont la valeur de mesure est exprimée sous la forme d'un signal d'état binaire. Le métadocument défini à l'Article 5 définit les structures et les caractéristiques communes qui doivent être identifiées à ce niveau dans la hiérarchie.

Chaque équipement est conçu pour mesurer une ou plusieurs variables de processus, par exemple, le niveau, la pression, le débit ou la température. Pour définir complètement les données techniques d'un débitmètre, par exemple, des caractéristiques supplémentaires, telles que les canalisations d'entrée et de sortie, doivent être ajoutées à celles héritées du niveau supérieur.

Les méthodes utilisées pour mesurer une variable de processus particulière constituent un niveau supplémentaire dans la hiérarchie. Ainsi, le débit peut être mesuré par un transmetteur de pression différentielle qui détecte la chute de pression dans un élément primaire, un débitmètre à section variable, un débitmètre électromagnétique, etc.

Selon la méthode de mesure utilisée, des caractéristiques supplémentaires peuvent être ajoutées à la structure pour caractériser l'équipement de manière adéquate. De telles caractéristiques supplémentaires ont déjà été définies pour les méthodes de mesure grisées à la Figure 1 (voir l'Annexe B).

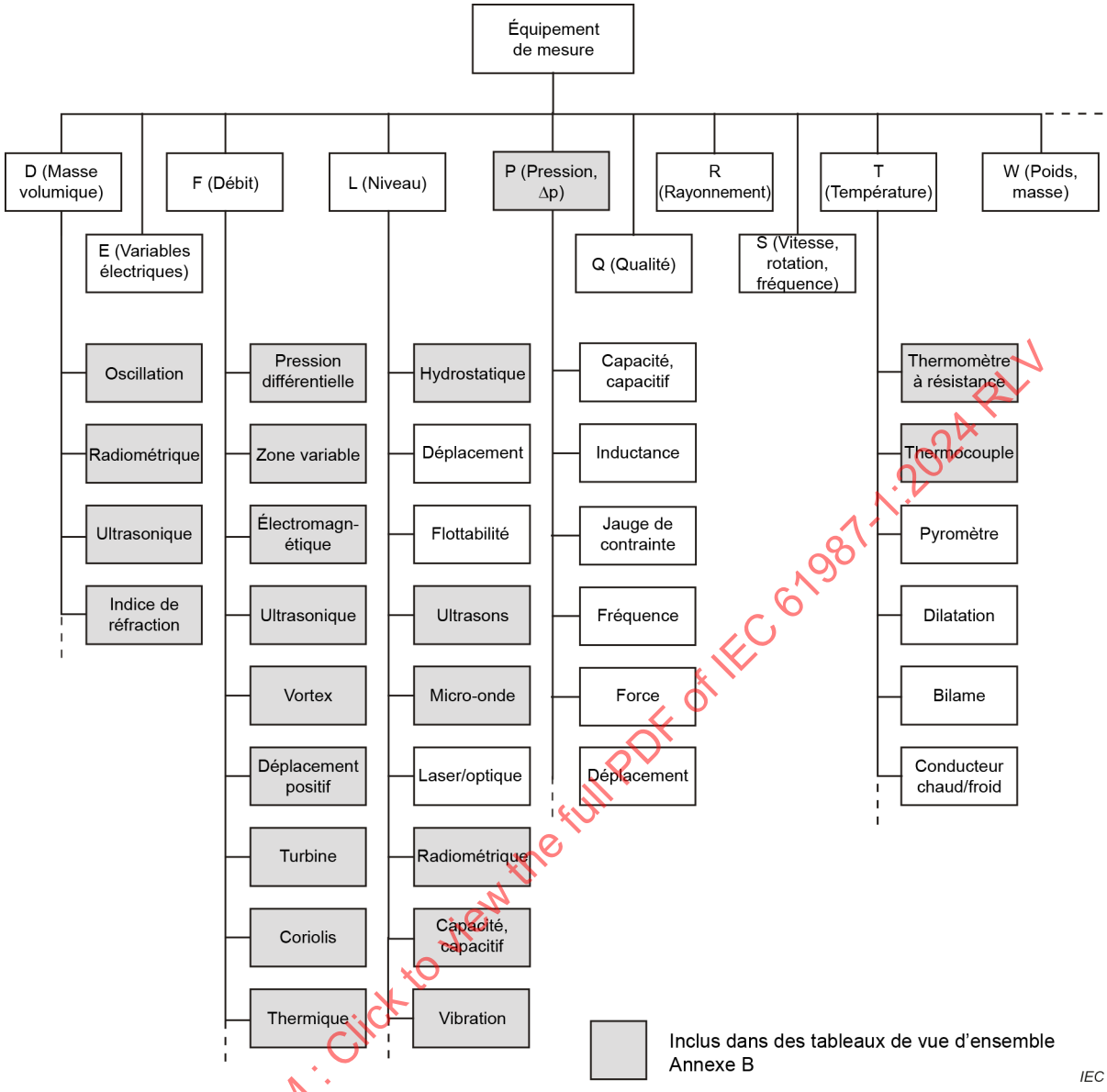

Figure 1 – Schéma de classification des équipements de mesure de processus (lettres codes *D*, *F*, *L*, etc., d'identification de la fonction des équipements de mesure issues de l'ISO 3511-1)

4.2 Articles et caractéristiques du métadocument

4.2.1 Généralités

Le métadocument doit être structuré pour tous les équipements de mesure de processus comme suit.

1 Identification
2 Application
3 Fonction et conception du système
4 Entrée
5 Sortie
6 Communication numérique
7 Caractéristiques des qualités de fonctionnement

NOTE 1 Si l'équipement de mesure de processus n'a pas d'interface de communication numérique, l'Article 6 peut être omis.

La présente partie de l'IEC 61987 doit être utilisée par le fabricant de l'équipement en ce sens qu'il prend les métadocuments et organise les données techniques pour son équipement de mesure selon la structure et les caractéristiques définies pour chaque article. Le document peut également contenir des photographies, des dessins et des tableaux.

NOTE 2 Pour l'établissement des données de métadocument, voir aussi l'IEC 82045. Pour l'établissement de diagrammes, de tableaux et de listes, voir aussi l'IEC 61082.

Les caractéristiques communes à tous les équipements de mesure de processus sont compilées à l'Article 5. Au début de chaque paragraphe, par exemple 5.1, il est indiqué quelles informations sont censées être saisies à ce stade du métadocument. Les informations elles-mêmes sont alors saisies sous la caractéristique appropriée. Le cas échéant, le fournisseur/fabricant est libre de spécifier les caractéristiques supplémentaires non normalisées à chaque point dans la structure.

Si aucune caractéristique n'est spécifiée pour une partie de la structure, le fournisseur/fabricant est libre de présenter ses informations comme il l'entend, sous l'en-tête de structure, par exemple, par l'utilisation de caractéristiques non normalisées.

NOTE 3 La nomenclature adoptée dans le métadocument défini à l'Article 5 est fondée sur des termes et des concepts issus de normes internationales.

NOTE 4 L'Article 5 inclut également les noms dits "noms synonymes". Un nom synonyme est une désignation ou un concept connexe. Il est destiné à la recherche électronique uniquement et ne se substitue pas au terme préférentiel.

NOTE 5 Chaque terme de l'Article 5 est accompagné d'une explication de ce qui doit être saisi dans l'élément de données. Ces explications sont données uniquement à titre informatif et ne constituent pas des définitions normatives.

Le métadocument de l'équipement de mesure pour des variables mesurées particulières est récapitulé dans le Tableau A.1.

L'Annexe B contient les tableaux de différentes méthodes de mesure. Les tableaux indiquent les spécifications générales à définir dans tous les documents et les spécifications particulières à définir pour les différents types d'équipements de mesure, c'est-à-dire pour le débit, le niveau, la pression, la température et la masse volumique. Les termes et les définitions relatifs à des équipements et méthodes de mesure spécifiques ne font pas l'objet du présent document, mais sont inclus dans l'Annexe B informative à des fins d'exhaustivité.

4.2.2 Équipements de mesure composites

Les équipements de mesure de processus peuvent comporter un ou plusieurs modules combinés de différentes manières: par exemple, pour la température, ils peuvent comporter un capteur (thermocouple ou RTD (resistor temperature detector)) et un transmetteur de température. De tels équipements de mesure modulaires peuvent être décrits en utilisant les caractéristiques de la classe d'équipement correspondante, soit pour l'équipement dans son ensemble, soit pour chaque module pris séparément, selon la préférence du fabricant. L'architecture de l'équipement et la manière dont les modules fonctionnent ensemble doivent toujours être décrites dans l'Article 3 du métadocument (fonction et conception du système).

4.2.3 Équipements de mesure avec interface de communication numérique

Lorsque les équipements de mesure présentent une interface de communication numérique, l'utilisateur peut choisir de suivre la structure de l'Édition 1 (2006) du présent document et de décrire les caractéristiques correspondantes dans l'Article 5 Sortie ou de les énumérer séparément dans l'Article 6. Cette dernière option doit être privilégiée lorsque des propriétés bidirectionnelles, c'est-à-dire des fonctions d'entrée et de sortie, doivent être décrites.

4.3 Nomenclature

La nomenclature adoptée dans le métadocument défini à l'Article 5 est fondée sur des termes et des concepts issus de normes internationales.

Le métadocument inclut également les noms dits "noms synonymes". Un nom synonyme est une désignation ou un concept connexe. Il est destiné à la recherche électronique uniquement et il convient de ne pas le substituer au terme préférentiel.

Chaque terme dans le métadocument est accompagné d'une explication de ce qui doit être saisi dans l'élément de données. Ces explications sont données uniquement à titre informatif et ne constituent pas des définitions normatives.

5 Métadocument pour les équipements de mesure de processus

5.1 Identification

5.1.1 Généralités

Les informations nécessaires pour l'identification non ambiguë des équipements de mesure doivent être spécifiées à ce stade. Ces informations peuvent être complétées par des illustrations, par exemple, des dessins ou des photographies.

5.1.2 Identification de document

Type, numéro de code et version et, le cas échéant, numéro de révision du document.

5.1.3 Date d'émission

Date d'émission du document sous la forme: année, mois et, le cas échéant, jour.

NOTE Le fabricant est invité à compléter cette information avec une date "valide jusqu'au".

5.1.4 Type de produit

Type de produit, par exemple, transmetteur de niveau à capacité, transmetteur de pression différentielle, thermomètre à résistance Pt100, débitmètre à section variable, voir aussi la Figure 1.

5.1.5 Nom de produit

Nom de produit sous lequel l'équipement de mesure est commercialisé.

NOTE Il n'y a pas de conformité entre les fabricants en ce qui concerne la dénomination de leurs produits. Le nom peut comporter un nom de produit, un numéro de modèle de produit ou une combinaison des deux. Si cela est nécessaire, le fabricant peut ajouter une caractéristique séparée pour le numéro de modèle de produit.

5.1.6 Version

Version du matériel, du micrologiciel et du logiciel de l'équipement de mesure.

5.1.7 Fabricant

Nom du fabricant de l'équipement de mesure, éventuellement avec l'adresse.

NOTE Pour les produits d'OEM, le nom du fournisseur peut être saisi à ce stade.

5.2 Application

L'application pour laquelle l'équipement de mesure est conçu, ainsi que les raisons de son utilisation doivent être spécifiées à ce stade.

5.3 Fonction et conception du système

5.3.1 Généralités

La méthode par laquelle la grandeur physique est acquise, traitée et émise sous forme de signal par l'équipement de mesure doit être spécifiée à ce stade. Le principe de mesure et les composants qui constituent l'équipement de mesure doivent être spécifiés. Les termes tels que ceux énumérés dans l'IEC 61987-11 (transmetteur, jauge, commutateur, indicateur et capteur) doivent être utilisés. Le cas échéant, le traitement de signal, y compris toutes les fonctions de diagnostic, doit être décrit.

NOTE 1 Le terme "débitmètre" peut être utilisé à la place du terme "transmetteur de débit".

NOTE 2 Le terme "transducteur" peut être utilisé lorsqu'un dispositif ne comporte pas de sortie de signal normalisée.

5.3.2 Principe de mesure

Principe utilisé pour mesurer une grandeur physique afin de déterminer la valeur d'une variable mesurée.

5.3.3 Architecture de l'équipement

Composants, dispositifs, ensembles ou systèmes utilisés pour accomplir l'activité de mesure.

5.3.4 Communication et traitement des données

Composants, matériel et logiciel nécessaires pour la communication avec les systèmes externes et l'exécution des fonctions complexes.

5.3.5 Sûreté de fonctionnement

5.3.5.1 Généralités

Informations sur la sûreté de fonctionnement de l'équipement comme cela est défini dans l'IEC 61069. Le schéma selon l'IEC 61069-5 doit être suivi.

5.3.5.2 Fiabilité

Le cas échéant, la moyenne des temps de bon fonctionnement entre les pannes (MTBF – mean time between faults), la tolérance aux pannes, la redondance interne, etc., doivent être saisies à ce stade.

5.3.5.3 Maintenabilité

Le cas échéant, tous les outils spéciaux, les plus petites unités remplaçables, tous les éventuels consommables exigés pour l'exploitation et la maintenance correctes de l'équipement doivent être saisis à ce stade.

5.3.5.4 Intégrité

Le cas échéant, tout mécanisme qui assure l'intégrité de la sortie de l'équipement lors de la découverte d'une panne doit être décrit à ce stade.

5.3.5.5 Sûreté

Le cas échéant, toute mesure ou toute conformité à des normes identifiées ou lignes directrices réglementaires concernant l'autorisation d'accès aux données de dispositif et leur protection doit être saisie à ce stade.

5.4 Entrée

5.4.1 Généralités

L'information relative à la variable mesurée doit être saisie à ce stade, c'est-à-dire, la grandeur physique, physico-chimique ou chimique, dont la taille doit être acquise et indiquée par le mesurage.

5.4.2 Variable mesurée

Variable(s) mesurée(s) par l'équipement.

Pour les instruments à variables multiples, toutes les variables mesurées doivent être énumérées. Lorsque des mesurages d'appui sont nécessaires, il doit être précisé s'ils sont réalisés à l'intérieur ou à l'extérieur. Dans le cas de mesurages externes, les propriétés de toute interface d'entrée auxiliaire doivent être décrites.

5.4.3 Étendue de mesure

Plage de valeurs de la variable mesurée pour le mesurage de laquelle l'équipement a été conçu.

L'étendue de mesure est définie par une limite inférieure d'étendue (LRL) et une limite supérieure d'étendue (URL). Dans cette étendue, les mesures sont réalisées avec les exactitudes spécifiées en 5.7. En outre, selon la grandeur physique mesurée, il est également possible de spécifier des plages de réglage pour les limites inférieure et supérieure d'étendue, ou un rapport de marge de réglage effective. Ces informations peuvent être exprimées en pourcentage de l'intervalle maximal, en tant que valeurs absolues ou sous forme de rapport.

- La manière dont l'étendue de mesure est exprimée est une question de convention et peut différer selon la grandeur physique mesurée et le type d'instrument.
- Pour certaines méthodes de mesure, il convient de spécifier les informations supplémentaires relatives au point de départ physique de l'étendue de mesure, par exemple, pour le mesurage du niveau ultrasonique.
- Les exactitudes spécifiées en 5.7 doivent également s'appliquer après tout réglage admis de l'étendue de mesure. Dans le cas contraire, les exactitudes associées doivent être indiquées.