

**Industrial-process measurement and control –
Data structures and elements in
process equipment catalogues –**

**Part 1:
Measuring equipment with analogue
and digital output**

PUBLICLY AVAILABLE SPECIFICATION



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

Reference number
IEC/PAS 61987-1

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Withdrawn

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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Metadocuments	7
4.1 General.....	7
4.2 Determination of structure and elements	9
5 Metadocument for process measuring equipment	10
Annex A (normative) Classification of terms as a function of measuring equipment	18
Annex B (informative) Classification of terms as a function of measurement principle.....	20
Annex C (informative) Alphabetical list of terms, definitions and sources.....	38
Annex D (normative) Document type definitions (DTD) and metadocument of the standard in SGML notation.....	44

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Without

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: Measuring equipment with analogue and digital output

FOREWORD

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 61987-1 has been prepared by subcommittee 65B: Devices, of IEC technical committee 65: Industrial-process measurement and control.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:

Draft PAS	Report on voting
65B/454/PAS	65B/457/RVD

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

The text of this PAS is based on a projected standard under development by SC65B/WG10.

Annexes A and D form an integral part of this PAS. Annexes B, C, and E are for information only.

This PAS shall remain valid for no longer than 3 years starting from 2002-09. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

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 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 data sets and elements themselves. There is little agreement between manufacturers on what information a technical data sheet should contain, how it should be structured, or how the results, e.g. 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 document aims to solve these problems by defining data structures, and their content for industrial process measuring and control equipment. It builds upon the assumption that, for a given class of measuring equipment, e.g., pressure measuring equipment, temperature measuring equipment or electromagnetic flow-measuring equipment, a set of non-proprietary structures and data elements (terms) can be specified.

Part 1 of the document 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 already contains a great many data elements that are common to measuring equipment with binary output.) Similarly the informative Annex B has been prepared with a view to future standardisation.

The document 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 account of the data structures and elements defined in Clause 5 of this document 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.

Where possible, existing terms from international standards have been used to name the data elements within the structures. In accordance with ISO 10 241, Annex C of the document contains an alphabetical list of terms, definitions and sources.

SGML (Standard Generalised Mark-Up Language) to ISO 8879 provides one possible standardised means of exchanging structured document data free of layout information. To this end, Annex D contains a Document Type Description and Metadocument of Clause 5 of the document. Since the drafting of this document, XML, a simplified subset of SGML, has been developed for Internet applications. As a result it is well supported and provides a viable alternative to SGML.

The present document conforms with STEP: Standard for the Exchange of Product Model Data. The data model of the STEP application protocol 212, 221 and 231 (Electrotechnical Design and Installation; Functional Data and 2D Representation and Process Design: Specs of Major Equipment) is described in ISO 10 303.212, .221 and .231 respectively and can reproduce the data field of the DTD as per this document. This includes, e.g. product structure data, dimensional data, electrical connection data, and product properties such as measuring range or power supply. The STEP application protocols 212, 221 and 231 define

the objects and their inter-relationships only. Descriptive attributes as described in the document can be assigned to an object as aggregative property lists.

In defining data elements to fill the proposed data structure for process equipment catalogues, the present document is also relevant to IEC 61360 (Data Element Type Definition). It was considered beyond the scope of the document, however, to classify the said elements according to this scheme, since the main objective lies in the structured presentation of data. In practice a number of elements have already been defined and appear in commercial databases structured according to the present document.

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

Part 1: Measuring equipment with analogue and digital output

1 Scope

This document defines data structures and elements for industrial process measurement and control equipment with analogue or digital output. It applies to the production of catalogues of process measuring equipment supplied by the manufacturer of the product.

The document shall 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, e.g., for other measuring equipment and actuators.

2 Normative references

This document contains provisions from other publications which are indicated by dated and undated references. These normative references are cited at the pertinent positions in the text and the appropriate publications are listed below. In the case of dated references, subsequent changes to or revisions of these publications belong to this document only if they have been integrated by changes to or revision of the present document. In the case of undated references, the latest edition of the cited publication is valid.

ISO 704:2000, *Terminology work – Principle and methods*

ISO 8879:1986 + A1: 1988, *Information Processing – Text and office systems – Standard Generalized Markup language (SGML)*

ISO 10241:1992, *Preparation and Presentation of Publications with Terminological Determinations; Standards*

ISO 10303-1:1994, *Industrial Automation Systems and Integration – Product Data Representation and Exchange – Part 1: Overview and fundamental principles*

ISO 10303-212, *Product Data Representation and Exchange – Part 212: Electrotechnical design and installation.*

ISO 10303-221, *Product Data Representation and Exchange – Part 221: Functional data and 2D representation.*

ISO 10303-231, *Product Data Representation and Exchange – Part 231: Process design/specs of major equipment.*

IEC 60050(351):1998, *International Electrotechnical Vocabulary – Chapter 351: Automatic control*

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

IEC 60529:1989, *Degree of Protection provided by Enclosures (IP Code)*

IEC 60654 (all parts) *Industrial-process measurement and control equipment; Operating conditions*

IEC 60751 (1983), *Industrial platinum resistance thermometer sensors*

IEC 60770-1:1998, *Methods of evaluating the performance of transmitters for use in industrial-process control systems*

IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

IEC 61069-5 (all parts), *Industrial-process measurement and control - Evaluation of system properties for the purpose of system assessment*

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

IEC 61298 Parts 1 to 4, *Process measurement and control devices: General methods and procedures for evaluating performance*

IEC 61326-1:2000, Ed. 1.2 Consolidated Edition, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

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

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

IEC 82045-1 (2001): *Document management – Part 1. Principles and methods*

3 Terms and definitions

The nomenclature adopted in the data structure defined in Clause 5 is based on terms and concepts drawn from international standards. In order to facilitate the use of the document, an alphabetical list of terms with definitions and normative references is to be found in the informative Annex C.

Clause 5 also includes so-called search terms. A search term is a related designation or concept, but is not necessarily a synonym. It is intended for electronic searches only, and must not be substituted for the preferred term. Search terms are not included in Annex C.

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.

4 Metadocuments

4.1 General

Metadocuments describe the non-proprietary structures and data elements (terms) 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 data elements (terms) common to all equipment at this hierarchical level. Metadocuments at lower hierarchical levels inherit the structure and data elements (terms) from the metadocuments at levels above them.

Figure 1 shows the classification scheme for process measuring equipment on which this document is based. Process measuring equipment may be subdivided into continuous measuring equipment (with analogue and digital output) and limit detecting equipment (with binary output). The metadocument defined in Clause 5 defines the common structures and data elements (terms) that are to be found at this level in the hierarchy.

Each piece of equipment is designed to measure one or more process variables, e.g. level, pressure, flow or temperature. To fully define the technical data of say, a flowmeter, additional data elements, e.g. inlet and outlet run, must be added to data structure 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, a variable area flowmeter, an electromagnetic flowmeter etc.. Depending on the measuring method used, additional elements must again be added to the structure to adequately characterise the equipment. Such additional elements have already been defined for the measurement methods shaded grey in Figure 1.

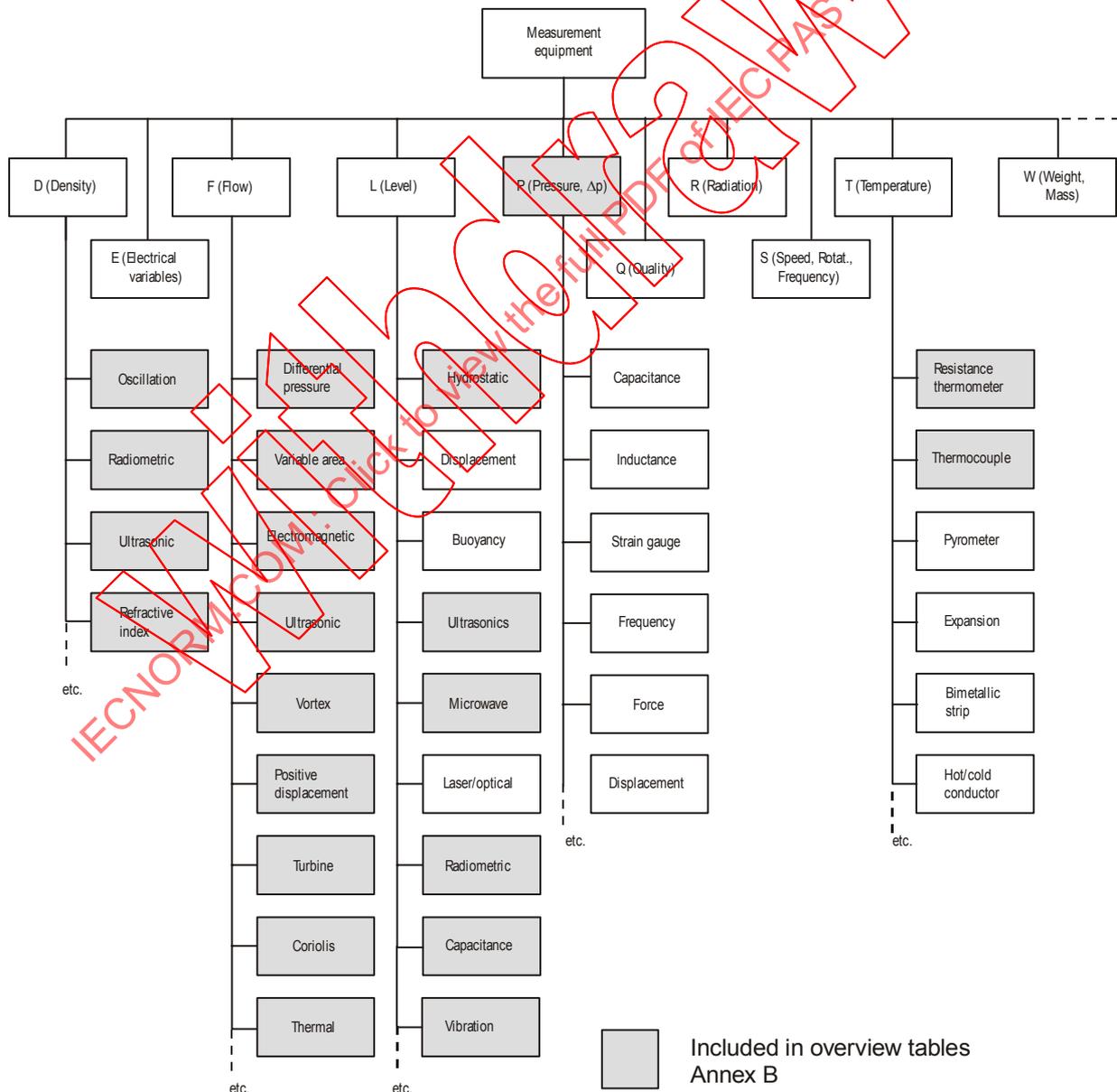


Figure 1 – Classification scheme for process measuring equipment

4.2 Determination of structure and elements

The chapters of the metadocument are to be structured for all process measuring equipment as follows:

1	Identification
2	Application
3	Function and System Design
4	Input
5	Output
6	Performance Characteristics
7	Operating Conditions
7.1	Installation
7.2	Environment
7.3	Process
8	Mechanical Construction
9	Operability
10	Power Supply
11	Certificates and Approvals
12	Ordering Information
13	Documentation

Fig. 2 – Chapter structure of the metadocument for process measuring equipment

Process measuring equipment may comprise one or more modules combined in different ways: e.g. for temperature it may comprise a sensor (thermocouple or resistance thermometer) and a temperature transmitter. Such modular measuring equipment can be described using the data structure 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 is always to be described under Chapter 3 of the metadocument, Function and System Design.

Data structures and elements (terms) common to all process measuring equipment are compiled in Clause 5 of this document. Document Type Definitions (DTD) necessary for electronic data exchange by SGML and computer supported processing of equipment documentation are to be found in Annex D.

The metadocument of the measuring equipment for particular measured variables is summarised in Table 1, Annex A. Annex B contains tables for the measurement methods which have so far been considered. 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.

This document shall be used by the equipment manufacturer, in that he takes the metadocuments and organises the technical data for his measuring equipment under the structure and data elements (terms) defined for each chapter. The document may also contain photographs and drawings.

5 Metadocument for process measuring equipment

NOTE 1 At the start of each clause, e.g. 5.1, it is stated what information is expected to be entered at that point in the structure. The information itself is then entered under the appropriate data element. Where necessary, the vendor/manufacturer is free to specify additional, non-standard data elements at each point in the structure.

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

NOTE 3 If no data element is specified for a part of the structure, the vendor/manufacturer is free to present his information as he likes under the structure heading, e.g. by the use of non-standard data elements.

NOTE 4 For SGML documents, information must be entered in each data element. If a data element does not
NOTE 5 Non-standard data elements within an SGML document cannot be searched for by name, but can be found indirectly under the structure heading.

5.1 identification

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

5.1.1 document identification

The type, code number, and if appropriate, the revision number of the document.

5.1.2 date of issue

The date of issue of the document.

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

5.1.3 product type

The type of product, e.g. capacitance level transmitter, differential pressure transmitter, Pt100 resistance thermometer, variable area flowmeter.

5.1.4 product name

The product name under which the measuring equipment is marketed and, where appropriate, its model number.

5.1.5 vendor/manufacturer

The name of the vendor/manufacturer responsible for the measurement equipment, optionally with address.

5.2 application

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

5.3 function and system design

The means 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.

5.3.1 measuring principle

The principle used and the physical quantity measured in order to determine the measured variable.

5.3.2 equipment architecture

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

Search terms: modularity

5.3.3 communication and data processing

The components, hardware and software for communication with external systems and execution of complex functions.

5.3.4 climate class

The climatic conditions, i.e. ambient temperature, pressure and humidity, to which the measuring equipment can be subjected during operation (including shutdown), transport and storage (over land or sea), e.g. as specified in IEC 60654-1.

5.3.4 dependability

Information on the dependability of the equipment as defined in IEC 61508. The scheme as per IEC 61069, Part 5 should be followed.

5.3.4.1 reliability

Where appropriate, the mean time between faults (MTBF), fault tolerance, internal redundancy etc. shall be entered here.

5.3.4.2 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.

5.3.4.3 integrity

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

5.3.4.4 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

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.

5.4.1 measured variable

The variable(s) measured by the equipment.

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

5.4.2 measuring range

The measuring range that the equipment has been designed to measure.

The measuring range is defined by a lower and an upper range-limit. Within this range, measurements are made within the accuracies specified in Clause 5.6.

In addition, depending upon the physical quantity being measured, adjustment ranges for the lower and upper range-limits or a turndown ratio may also be specified. These may 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 differ according to the physical quantity measured and type of instrument.

NOTE 2 For some measurements, additional information on the physical starting point of the measuring range must be specified, e.g. for ultrasonic level measurement.

NOTE 3 The accuracies specified in Clause 5.6 must also apply after any permitted adjustments to the measuring range have been made, or the associated accuracies must be stated.

5.5 output

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.

5.5.1 output signal

The 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 should also be specified.

EXAMPLE 1 — 4 mA - 20 mA analogue signal, configurable as binary signal 8/16 mA.

EXAMPLE 2 — Digital signal as floating point number to IEC 60754.

5.5.2 signal on alarm

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

5.5.3 load

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 performance characteristics

Specifications regarding e.g. the accuracy and dynamic behaviour of the measurement equipment under operating and reference 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 must 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, Parts 1 to 4 and IEC 60770 Part 1 as well as the test standards quoted in the normative references.

5.6.1

maximum measured error

The maximum measured error as determined e.g. by the method described in IEC 61298-2.

5.6.2

hysteresis

The hysteresis as determined e.g. by the method described in IEC 61298-2.

5.6.3

non-repeatability

The non-repeatability as determined e.g. 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 subclause 5.6.2, 5.6.3 and 5.6.4. 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 SGML structure.

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

5.6.4

start-up drift

The start-up drift as determined by e.g. the method described in IEC 61298-2.

5.6.5

long-term drift

The long-term drift as determined by e.g. the method described in IEC 61298-2.

5.6.6

influence of ambient temperature

The effect of temperature changes on the output signal as determined by e.g. the method described in IEC 61298-2.

NOTE IEC 61298-2 expresses the influence as the average error over the entire ambient temperature range. It may also be expressed as % of span over a given temperature span.

5.6.7

influence of medium temperature

The effect of changes in medium temperature on the output signal determined and expressed in a similar manner to the influence of ambient temperature, see Subclause 5.6.6.

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. Otherwise “not applicable” should be entered.

5.6.8

settling time

The settling time as determined by e.g. the method described in IEC 61298-2.

Search terms: rise time; response time

5.7 operating conditions

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.

5.7.1 installation

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

5.7.1.1 installation instructions

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

5.7.1.2 start-up conditions

The 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 e.g. pressure or thermal overload, these should be stated.

5.7.1.3 warm-up time

The 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, e.g. radiometric level and density measurement or temperature measurement (where the warm-up time is dependent upon the response time of the complete thermometer including the inset and thermowell).

5.7.2 environment

The 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.

5.7.2.1 ambient temperature range

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

Search terms: normal operating temperature, operating temperature, nominal temperature range, working temperature

5.7.2.2 ambient temperature limits

The range of ambient temperatures to which the measuring equipment may be subject when in operation without permanent impairment of operating characteristics.

Search terms: Limiting temperature range

5.7.2.3 storage temperature

The ambient temperature range within which the measuring equipment may be safely transported and stored.

Search terms: Transportation temperature

5.7.2.4 immunity to temperature change

The 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 the standard.

Search term: thermal cycling; temperature cycling

5.7.2.5 shock resistance

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

5.7.2.6 vibration resistance

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

5.7.2.7 electromagnetic compatibility

The electromagnetic compatibility of the measuring equipment expressed as either the results of the individual tests e.g. IEC 61000-4 series or conformance to a particular standard, e.g. IEC 61326-1, which incorporates these tests.

Search terms: electromagnetic interference, electromagnetic immunity, RFI

5.7.3 process

The 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 1 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.

NOTE 2 If a data element is not relevant to a particular piece of measuring equipment, "not applicable" shall be entered.

5.7.3.1 process temperature range

The range of temperatures within which the wetted parts of the measuring equipment are designed to operate within specified accuracy limits.

5.7.3.2 process temperature limits

The range of temperatures to which the wetted-parts of the measuring equipment may be subject without permanent impairment of operating characteristics.

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

5.7.3.3 process pressure range

The range of pressures within which the wetted parts of the measuring equipment are designed to operate within specified accuracy limits.

5.7.3.4 process pressure limits

The range of pressures to which the wetted-parts of the measuring equipment may be subject without permanent impairment of operating characteristics.

NOTE For temperature measurement this is not a fixed value. The maximum pressure is dependent e.g. 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.

5.8 mechanical construction

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

5.8.1 design

The design of the measuring equipment, e.g. compact instrument, head transmitter, 19" plug-in card etc.

5.8.2 dimensions

The principle dimensions of the measuring equipment.

NOTE 1 The dimensions should be expressed at least as "length x breadth x height", and where appropriate be supported by a dimensional drawing.

NOTE 2 The 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 Subclause 5.8.5, process connection, as appropriate. A note to this effect should then be entered in Subclauses 5.8.2 and 5.8.3.

5.8.3 weight

The weight of the measuring equipment or its component parts.

5.8.4 material

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

5.8.5 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, e.g., type of terminal, type of cable, cable cross-section, cable gland, galvanic isolation etc. for both signal and power circuits.

5.8.5.1 degree of protection

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

Search terms: ingress protection; enclosure classification

5.8.5.2 type of protection

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

5.8.6 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 Subclause 5.8.2.

5.9 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, e.g. solder bridges, DIP-switches, re-ranging elements, handheld terminals, auxiliary stations shall be described here.

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

5.10 power supply

The permanent or temporary power to be supplied to the measurement equipment in order to maintain its function, and 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 a.c. supply)
Residual ripple (for d.c. supply)
- Power consumption

Pneumatic power supply:

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

Hydraulic power supply

5.11 certificates and approvals

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

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

5.12 ordering information

The information required for the procurement of the measurement equipment shall be specified here. Normally, the information is summarised 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.

5.13 documentation

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

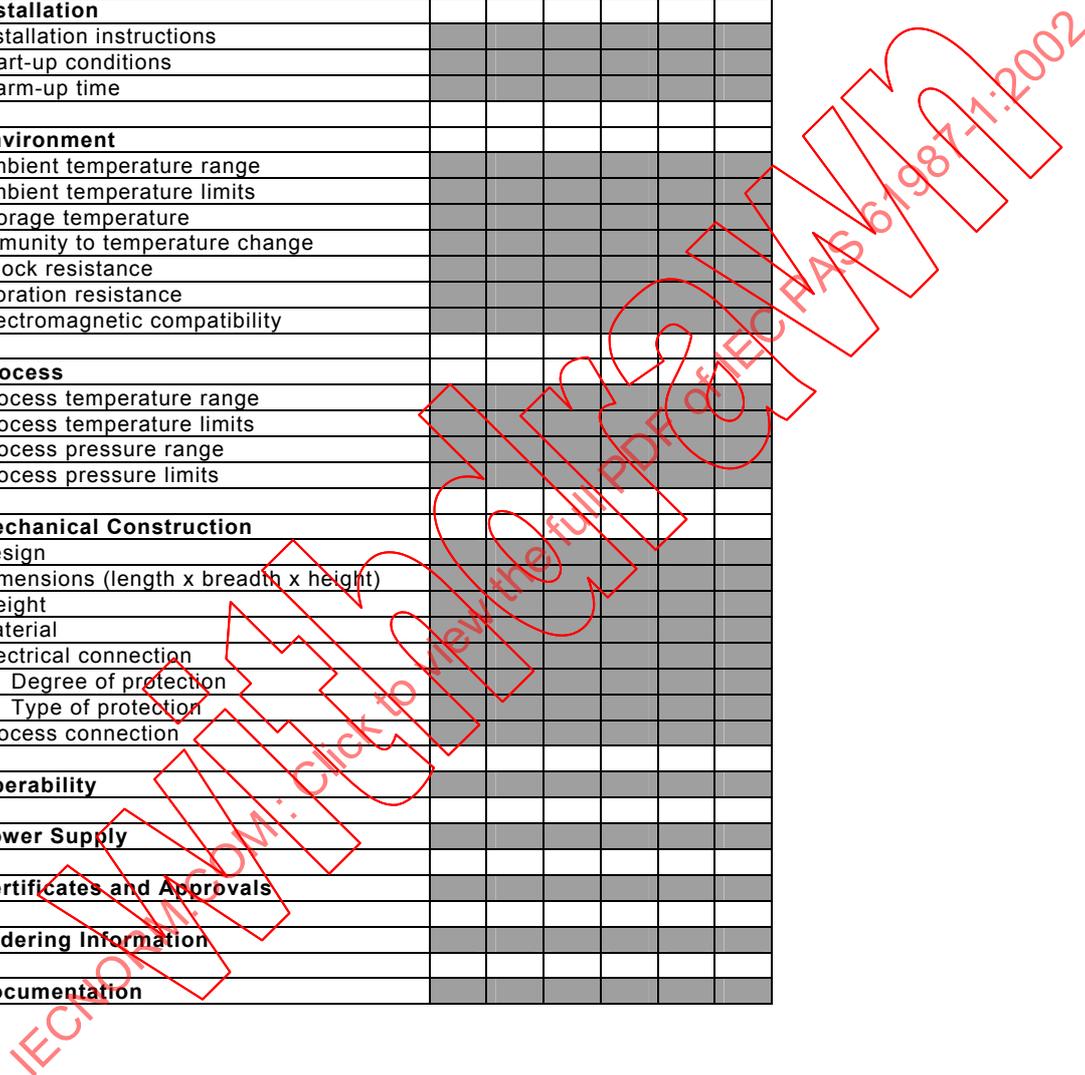
Annex A (normative)

Classification of terms as a function of measuring equipment

The table summarises the data structure defined in Chapter 5 as a function of process variable.

Classification and documentation structure of process equipment (measuring equipment) 02.11.2001		Measuring equipment					
			Flow	Level	Pressure	Temperature	Density
1	Identification						
	Document identification						
	Date of issue						
	Product type						
	Product name						
	Vendor/Manufacturer						
2	Application						
3	Function and System Design						
	Measuring principle						
	Equipment architecture						
	Communication and data processing						
	Climate Class						
	Dependability						
	Reliability						
	Maintainability						
	Integrity						
	Security						
4	Input						
	Measured variable						
	Measuring range						
5	Output						
	Output signal						
	Signal on alarm						
	Load						
6	Performance characteristics						
	Maximum measured error						
	Hysteresis						
	Non-repeatability						
	Start-up drift						
	Long-term drift						
	Influence of ambient temperature						
	Influence of medium temperature						
	Settling time						
			Dependent on construction				

Classification and documentation structure of process equipment (measuring equipment) 02.11.2001	Measuring equipment	Flow	Level	Pressure	Temperature	Density
7 Operating Conditions						
7.1 Installation						
Installation instructions						
Start-up conditions						
Warm-up time						
7.2 Environment						
Ambient temperature range						
Ambient temperature limits						
Storage temperature						
Immunity to temperature change						
Shock resistance						
Vibration resistance						
Electromagnetic compatibility						
7.3 Process						
Process temperature range						
Process temperature limits						
Process pressure range						
Process pressure limits						
8 Mechanical Construction						
Design						
Dimensions (length x breadth x height)						
Weight						
Material						
Electrical connection						
Degree of protection						
Type of protection						
Process connection						
9 Operability						
10 Power Supply						
11 Certificates and Approvals						
12 Ordering Information						
13 Documentation						



Annex B (informative)

Classification of terms as a function of measurement principle

In the following tables, each measurement principle considered to date for a particular process variable is assigned to a column. The document structure and data elements are assigned to the rows.

- If a light in the column “..... equipment” is shaded, the corresponding data element has been inherited from process equipment level: the data element applies to all measurement principles.
- If a light in this column is not shaded, then the data element has been added to the structure. It applies to a particular measurement principle only if the associated light in the following columns has been shaded.

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WithDrawn

B.1 Additional data elements proposed for flow measurement principles

Classification and documentation structure of flow measuring equipment 02.11.2001	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										
Vendor/Manufacturer										
2 Application										
3 Function and System Design										
Measuring principle										
Equipment architecture										
Communication and data processing										
Climate Class										
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 Performance characteristics										
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										

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Classification and documentation structure of flow measuring equipment 02.11.2001	Flow equipment	Variable area	Electromagnetic	Ultrasonic	Vortex	Turbine	Coriolis	Thermal	Positive displacement	Differential pressure
7 Operating Conditions										
7.1 Installation										
Installation instructions										
Start-up conditions										
Warm-up time										
Inlet and outlet run										
Cable length										
7.2 Environment										
Ambient temperature range										
Ambient temperature limits										
Storage temperature										
Immunity to temperature change										
Shock resistance										
Vibration resistance										
Electromagnetic compatibility										
7.3 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										
8 Mechanical Construction										
Design										
Dimensions (length x breadth x height)										
Weight										
Material										
Electrical connection										
Degree of protection										
Type of protection										
Field coil isolation class										
Process connection										
9 Operability										
10 Power Supply										
11 Certificates and Approvals										
12 Ordering Information										
13 Documentation										

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B1.1 Output

B1.1.1 Signal resolution

The resolution of the output signal

B1.1.2 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).

B1.2 Performance characteristics

B1.2.1 Influence of Reynolds number

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

B1.2.2 Rise time

Rise time for 10% to 90% as defined in IEC 61298-2/IEV 351-14-41

B1.2.3 Influence of medium pressure

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

B1.3 Installation

B1.3.1 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.

B1.3.2 Cable length

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

B1.4 Process

B1.4.1 State of aggregation

The permissible state of aggregation of the fluid (e.g. liquid, gas, steam).

B1.4.2 Density

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

B1.4.3 Viscosity

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

B1.4.4 Conductivity

The minimum conductivity of the medium above which a device will operate within specified accuracy limits.

B1.4.5 Reynolds number

The range of the Reynolds number of the flow within which a device will operate within specified accuracy limits.

B1.4.6 Gas content

The maximum gas content of a liquid below which a device will operate within specified accuracy limits.

B1.4.7 Limiting flow

The maximum flowrate of the flowmeter, below which no damage to the primary device must be expected.

B1.4.8 Pressure loss

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

B1.4.9 Downstream pressure

The minimum downstream static pressure above which no damage to the primary device must be expected (cavitation).

B1.5 Mechanical construction

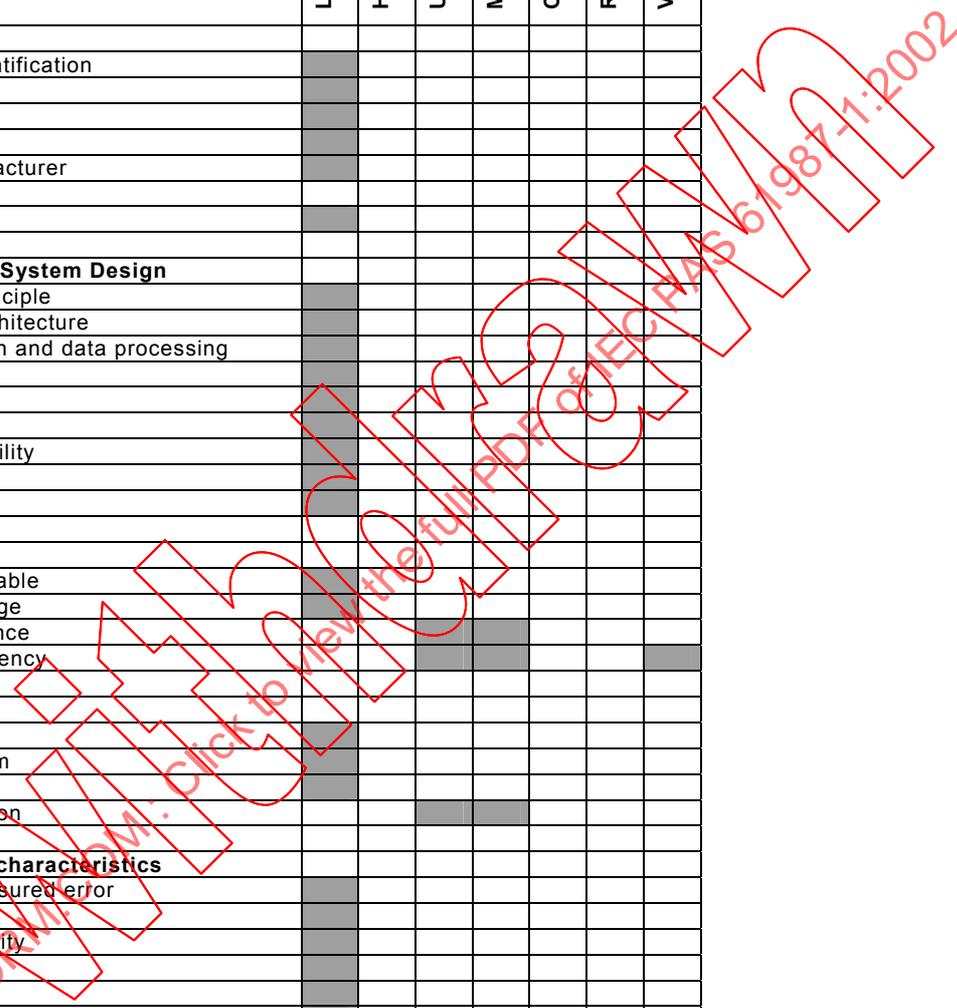
B1.5.1 Field coil isolation class

Isolation class of the field coils of the primary device.

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B.2 Additional data elements proposed for level measurement principles

Classification and documentation structure of level measuring equipment 02.11.2001	Level equipment	Hydrostatic	Ultrasonic	Microwave/radar	Capacitance	Radiometric	Vibration
1 Identification							
Document identification							
Date of issue							
Product type							
Product name							
Vendor/Manufacturer							
2 Application							
3 Function and System Design							
Measuring principle							
Equipment architecture							
Communication and data processing							
Climate Class							
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 Performance characteristics							
Maximum measured error							
Hysteresis							
Non-repeatability							
Start-up drift							
Long-term drift							
Influence of ambient temperature							
Influence of medium temperature							
Settling time							



B2.1 Input

B2.1.1 Blocking distance

The distance immediately below an ultrasonic sensor within which measurements are technically impossible.

B2.1.2 Operating frequency

The frequency at which the measuring equipment operates.

B2.2 Output

B2.2.1 Signal resolution

The resolution of the output signal.

B2.3 Performance characteristics

B2.3.1 Influence of medium pressure

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

B2.4 Installation

B2.4.1 Emitting angle

The solid angle at which radiation is emitted from the source of radiation.

B2.5 Process

B2.5.1 Thermal shock resistance

The 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 the standard.

B2.5.2 Viscosity

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

B2.5.2 Conductivity

The minimum conductivity of the medium above which a device will operate within specified accuracy limits.

B2.5.3 Dielectric constant

The range of the dielectric constants within which a device will operate within specified accuracy limits.

B.3 Additional data elements proposed for pressure measurement principles

Classification and documentation structure of pressure measuring equipment 02.11.2001	Pressure equipment	Relative/absolute	Differential
1 Identification			
Document identification			
Date of issue			
Product type			
Product name			
Vendor/Manufacturer			
2 Application			
3 Function and System Design			
Measuring principle			
Equipment architecture			
Communication and data processing			
Climate Class			
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			
6 Performance characteristics			
Maximum measured error			
Accuracy			
Hysteresis			
Non-repeatability			
Start-up drift			
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 electromagnetic interference			
Influence of load			
Settling time			



Depending on process connection

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Classification and documentation structure of pressure measuring equipment 02.11.2001	Pressure equipment	Relative/absolute	Differential
7 Operating Conditions			
7.1 Installation			
Installation instructions			
Start-up conditions			
Warm-up time			
Emission angle			
7.2 Environment			
Ambient temperature range			
Ambient temperature limits			
Storage temperature			
Immunity to temperature change			
Shock resistance			
Vibration resistance			
Electromagnetic compatibility			
7.3 Process			
Process temperature range			
Process temperature limits			
Thermal shock resistance			
Process pressure range			
Static pressure range			
Process pressure limits			
Static pressure limits			
Overpressure limits			
8 Mechanical Construction			
Design			
Dimensions (length x breadth x height)			
Weight			
Material			
Electrical connection			
Degree of protection			
Type of protection			
Process connection			
9 Operability			
10 Power Supply			
11 Certificates and Approvals			
12 Ordering Information			
13 Documentation			



Depending on process connection

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B3.1 Input

B3.1.1 Maximum span

The maximum span of the transmitter should be 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.

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

EXAMPLES:

- Differential pressure transmitter
 - Max span: 10 bar
 - Reference range: 0 bar to 10 bar
 - Extended span: 20 bar (Range ± 10 bar)
- Gauge pressure transmitter
 - Max span: 10 bar
 - Reference range: 0 bar to 10 bar
 - Extended span: 11 bar
(Range: -1 to 10 bar)
with the input pressure limit to 15 mbar abs
- Absolute pressure transmitter
 - Max span: 10 bar abs
 - Reference range: 0 bar abs to 9 bar abs
 - Extended range: not applicable
with the input pressure limit to 0.1 mbar abs

B3.1.2 Turndown ratio

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

The 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

B3.2 Output

B3.2.1 Signal on overload (overrange)

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

B3.3 Performance characteristics

B3.3.1 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“.

B3.3.3 Rise time

Rise time for 10% to 90% as defined in IEC 61298-2/IEV 351-14-41.

B3.3.3 Influence of medium pressure

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

B3.3.4 Influence of mounting position

The effect of change in mounting position on the measurement as defined e.g. in IEC 61298-3.

B3.3.5 Influence of supply voltage

The effect of a change in supply voltage on the measurement as defined e.g. in IEC 61298-3.

B3.3.6 Influence of load

The effect of a change in output load on the measurement as defined e.g. in IEC 61298-3.

B3.3.7 Influence of electromagnetic interference

The effect of a electromagnetic interference on the measurement as defined e.g. in IEC 61298-3.

B3.4 Operating conditions/Process

B3.4.1 Static pressure range

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

B3.4.2 Static pressure limits

The range of static pressures to which a differential pressure transmitter may be subject without permanent impairment of operating characteristics.

B3.4.3 Overpressure limits

The peak pressure to which a pressure transmitter may be subject without permanent impairment of operating characteristics.

B.4 Additional data elements proposed for temperature measurement principles

Classification and documentation structure of temperature measuring equipment 02.11.2001	Temperature equipment		
		RTD	Thermocouple
1 Identification			
Document identification			
Date of issue			
Product type			
Product name			
Vendor/Manufacturer			
2 Application			
3 Function and System Design			
Measuring principle			
Equipment architecture			
Communication and data processing			
Climate Class			
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			
Linearization			
6 Performance characteristics			
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			

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Classification and documentation structure of temperature measuring equipment 02.11.2001	Temperature equipment		
	RTD	Thermocouple	
7 Operating Conditions			
7.1 Installation			
Installation instructions			
Start-up conditions			
Warm-up time			
Emission angle			
7.2 Environment			
Ambient temperature range			
Ambient temperature limits			
Storage temperature			
Immunity to temperature change			
Shock resistance			
Vibration resistance			
Electromagnetic compatibility			
7.3 Process			
Process temperature range			
Process temperature limits			
Process pressure range			
Process pressure limits			
8 Mechanical Construction			
Design			
Dimensions (length x breadth x height)			
Weight			
Material			
Electrical connection			
Degree of protection			
Type of protection			
Process connection			
9 Operability			
10 Power Supply			
11 Certificates and Approvals			
12 Ordering Information			
13 Documentation			

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B4.1 Input

B4.1.1 Sensor type

Type of resistance thermometer according to IEC 60751 or the thermocouple according to IEC 60584.

B4.1.2 Sensor connection

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

B4.1.3 Insulation resistance

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

B4.2 Output

B4.2.1 Linearization

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

B4.3 Performance characteristics

B4.3.1 Rise time

Rise time for 10% to 90% as defined in IEC 61298-2/IEV 351-14-41.

B4.3.2 Thermal response time

The thermal response time $t_{0.95}$ in flowing water with a flowrate of 0.4 m/s and in flowing air with a flowrate of 3 m/s.

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B.5 Additional data elements proposed for density measurement principles

Classification and documentation structure of density measuring equipment 02.11.2001	Density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
1 Identification					
Document identification					
Date of issue					
Product type					
Product name					
Vendor/Manufacturer					
2 Application					
3 Function and System Design					
Measuring principle					
Equipment architecture					
Communication and data processing					
Climate Class					
Dependability					
Reliability					
Maintainability					
Integrity					
Security					
4 Input					
Measured variable					
Measuring range					
5 Output					
Output signal					
Signal on alarm					
Load					
6 Performance characteristics					
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					

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Classification and documentation structure of density measuring equipment 02.11.2001	Density equipment	Oscillation	Radiometric	Ultrasonic	Refractive index
7 Operating Conditions					
7.1 Installation					
Installation instructions					
Start-up conditions					
Warm-up time					
Cable length					
7.2 Environment					
Ambient temperature range					
Ambient temperature limits					
Storage temperature					
Immunity to temperature change					
Shock resistance					
Vibration resistance					
Electromagnetic compatibility					
7.3 Process					
Process temperature range					
Process temperature limits					
Process pressure range					
Process pressure limits					
State of aggregation					
Density					
Viscosity					
Gas content					
8 Mechanical Construction					
Design					
Dimensions (length x breadth x height)					
Weight					
Material					
Electrical connection					
Degree of protection					
Type of protection					
Process connection					
9 Operability					
10 Power Supply					
11 Certificates and Approvals					
12 Ordering Information					
13 Documentation					

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B5.1 Performance characteristics

B5.1.1 Influence of medium pressure

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

B5.2 Installation conditions

B5.3.1 Cable length

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

B5.3 Process conditions

B5.3.1 State of aggregation

The permissible state of aggregation of the fluid (e.g. liquid, gas, steam).

B5.3.2 Density

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

B5.3.3 Viscosity

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

B5.3.4 Gas content

The maximum gas content of a liquid below which a device will operate within specified accuracy limits.

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Annex C
(informative)
Alphabetical list of terms, definitions and sources

C.1

ambient temperature

The 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.

C.2

ambient temperature limits

The range of ambient temperatures to which a device may be subject without permanent impairment of operating characteristics.

NOTE The performance characteristics may be exceeded in the range between the limits of normal operation and the operating temperature limits.

C.3

ambient temperature range

The range of ambient temperatures within which a device is designed to operate within specified accuracy limits.

C.4

analogue signal

A signal, whose information parameter may assume any value within a given continuous range.

[IEV 351-12-18]

C.5

binary signal

A digital signal whose information parameter may assume one of two discrete values.

[IEV 351-12-20]

C.6

climate class

The 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: 1993 defines four location classes with respect to climatic conditions:

- Class A: Air-conditioned location
A location in which both air temperature and humidity are controlled within specific limits.
- Class B: Heated and/or cooled enclosed location
A location where only air temperature is controlled within specific limits.
- Class C: Sheltered location
A 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.
- Class D: Outdoor location
A location where neither air temperature nor humidity are controlled. The equipment exposed to outdoor atmospheric condition such as direct sunlight, rain, hail, sleet, snow, icing, wind and blown sand.

The exact climatic conditions for the different location classes can be taken from [IEC 60654-1].

C.7 degree of protection

The measures applied to the enclosures of electrical apparatus to provide for:

- the protection of persons against contact with or approach to live parts and against contact with moving parts (other than smooth rotating shafts and the like) and the protection of the apparatus against the ingress of solid foreign bodies.
- the protection of the apparatus inside the enclosure against harmful ingress of water.

[IEC 60529]

C.8 digital signal

A signal whose information parameter may assume one out of a set of discrete values.

[IEV 351-12-19]

C.9 drift

An undesired gradual change in the input-output relationship of a device over a period of time, not caused by external influences on the device.

C.10 electromagnetic compatibility

The ability of the measurement equipment to function properly within a given electromagnetic environment without being influenced by or itself influencing the said environment and its pertinent equipment.

C.11 environmental conditions

A specification of surrounding parameter values necessary for the protection or proper operation of the function unit.

- Examples for surrounding parameters are temperature, humidity, vibration, shock, explosively hazardous areas, and dust.
- An environmental condition is usually specified as a nominal value and a tolerance range.
- For a certain device there may be more than one set of environmental conditions, for example, one each for transport, storage and operation.

see also [151-04-05]

C.12 environmental influence

The 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.

C.13 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.

[IEC 61298-2]

C.14
influence of ambient temperature

The 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.

C.15
input variable

A variable acting on a system from the outside which is independent of other variables of the system.

[IEV 351-12-01]

C.16
long-term drift

The drift in output monitored for 30 days at 90% of span.

[IEC 61298-2]

C.17
maximum measured error

The largest positive or negative value of error of the average upscale or downscale value at each point of measurement.

[IEC 61298-1]

C.18
measured variable

The quantity, property or condition which is measured.

C.19
measuring range

Range of values defined by two extreme values within which a variable can be measured within the specified accuracy.

[IEV 351-12-35]

NOTE The extreme values are usually termed the upper range-limit and the lower range-limit.

C.20
non-repeatability (repeatability error)

Is the 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.

It is usually expressed in percentage of span and does not include hysteresis and drift.

[IEC 61298-2]

C.21
normal operating conditions

The range of operating conditions within which a device is designed to operate within specified performance limits.

C.22
operating conditions

Conditions to which a device is subjected, not including the variables handled by the device.

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).

**C.23
operating limits**

The range of operating conditions to which a device may be subject without permanent impairment of operating characteristics.

- In general, performance characteristics are not stated for the region between the limits of normal operation conditions and the operating limits.
- Upon returning within the limits of normal operating conditions, a device may require adjustments that restore normal performance.
- The limiting conditions for storage, transport and operation may be different.

**C.24
output variable**

A variable delivered by a system.

[IEV 351-12-04]

**C.25
performance characteristics**

The tabulation of those pertinent parameters and their quantification which define the functions and capabilities of a device under static and dynamic conditions or as a result of a specific test.

**C.26
power source**

The primary source, usually a.c. mains, from which the system's energy is derived.

**C.27
power supply device**

A 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.

**C.28
rangeability**

The 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 $90/10 = 9$.

**C.29
reference operating conditions**

The range of operating conditions within which the influence on the device by the changes in environmental conditions are disregarded.

**C.30
response time (thermal)**

The time a thermometer takes to respond at a specified percentage to a step change in temperature. To specify response time it is necessary to declare:

- the percentage of response (usually 50% or 90%).
- the test medium and the flow conditions (usually water with 0,4 m/sec and air with 3 m/sec).

[IEC 60751]

**C.31
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 values and the instant when it reaches for the first time a large specified percentage of the same steady state difference.

NOTE Conventional values are 5% to 95% or 10% to 90%

[IEV 351-14-41]

**C.32
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 (for this document 1%) from the difference between its final and initial steady-state values.

[IEV 351-14-43]

**C.33
shock**

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

There are two methods to measure shock:

- the first is to specify a value of acceleration or deceleration together with its duration
- the second is to specify a height of free fall on to a specified flat surface.

**C.34
signal**

A physical variable, one or more parameters of which carry information about one or more variables which the signal represents.

NOTE These parameters are called the "information parameters".

[IEV 351-12-16]

**C.35
span (measuring span)**

Absolute value of the difference between the two extreme values of the measuring range.

[IEV 351-12-36]

**C.36
standardized signal**

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

EXAMPLES — 4 mA d.c. - 20 mA d.c.; 20 kPa - 100 kPa.

**C.37
start-up drift**

The drift in output monitored over a period of 4 hours after power is switched on.

[IEC 61298-2]

**C.38
storage and transportation conditions**

The specified conditions to which a device may be subject between the time of construction and the time of operation.

- 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.

C.39**storage temperature**

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

C.40**type of protection**

The specific measures applied to electrical apparatus to avoid ignition of a surrounding explosive atmosphere by such apparatus.

[IEV 426-01-02]

C.41**warm-up time**

The time required after energising a device before its rated performance characteristics apply.

C.42**vibration**

A periodic motion, reciprocating, rotary or both, usually with a well-defined fundamental frequency.

A typical example is the vibration of rotating machinery.

C.43**vibration resistance**

The vibration resistance indicates the range of sinusoidal vibrations of a given severity the measurement equipment can withstand without permanent impairment of operating characteristics. The severity is determined by four parameters: frequency, range, amplitude of vibration and duration of loading.

[IEC 60068-2-6]

C.44**zero adjustment**

A means provided in an instrument to cause a parallel shift in the input-output curve.

[IEC 60770-1]

Annex D (normative)

Document type definitions (DTD) and metadocument of the document in SGML notation

D.1 Document type definition

```

<!SGML "ISO 8879:1986"
--
  This SGML declaration supports the core concrete syntax described
  in ISO 8879-1986. Short references are not supported, and the
  only "features" supported are OMITTAG and SHORTTAG (both are
  resolved when an SGML is retrieved via File:Open).
--

CHARSET
  BASESET "ISO 646-1983//CHARSET International Reference Version
  (IRV)//ESC 2/5 4/0"
  DESCSET
    0      9      UNUSED
    9      2      9
    11     2      UNUSED
    13     1      13
    14     18     UNUSED
    32     95     32
    127    1      UNUSED

CAPACITY
  PUBLIC "ISO 8879-1986//CAPACITY Reference//EN"

SCOPE
  DOCUMENT

SYNTAX
  SHUNCHAR CONTROLS 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 127
255
  BASESET "ISO 646-1983//CHARSET International Reference Version
  (IRV)//ESC 2/5 4/0"
  DESCSET
    0      128     0
  FUNCTION
    RE      13
    RS      10
    SPACE   32
    TAB     SEPCHAR 9
  NAMING
    LCNMSTRT  ""
    UCNMSTRT  ""
    LCNMCHAR  "- ."
    UCNMCHAR  "- ."
    NAMECASE  GENERAL YES
    ENTITY    NO
  DELIM
    GENERAL   SGMLREF
    SHORTREF  NONE
  NAMES      SGMLREF
  QUANTITY   SGMLREF
-- =====
-- REFERENCE      WordPerfect SGML
-- VALUE          MAX VALUE
-- =====
  ATTCNT      40    --      40          80
  ATTSPLN     960  --      960          2048
  BSEQLEN     960  --      960          960 (IGNORED)

```

DTAGLEN	16	--	16	16 (IGNORED)	--
DTEMPLN	16	--	16	16 (IGNORED)	--
ENTLVL	16	--	16	32	--
GRPCNT	32	--	32	256	--
GRPGTCNT	96	--	96	512	--
GRPLVL	16	--	16	32	--
LITLEN	2048	--	240	2048	--
NAMELEN	32	--	8	100	--
NORMSEP	2	--	2	2	--
PILEN	240	--	240	240 (IGNORED)	--
TAGLEN	960	--	960	2048	--
TAGLVL	24	--	24	80	--

FEATURES

MINIMIZE

DATATAG NO
 OMITTAG YES
 RANK NO
 SHORTTAG NO

LINK

SIMPLE NO
 IMPLICIT NO
 EXPLICIT NO

OTHER

CONCUR NO
 SUBDOC NO
 FORMAL NO

APPINFO

NONE

>

<!-- Version 1.0

IEC-Metadocument-DTD

PGB 14.7.98

-->

<!DOCTYPE metadocument [

<!-- PUBLIC ENTITIES included jug 27.01.1996 -->

<!ENTITY % ISOpub PUBLIC
 "ISO 8879:1986//ENTITIES Publishing//EN" >

<!ENTITY % ISOnum PUBLIC
 "ISO 8879:1986//ENTITIES Numeric and Special Graphic//EN" >

<!ENTITY % ISotech PUBLIC
 "ISO 8879:1986//ENTITIES General Technical//EN" >

<!ENTITY % ISodia PUBLIC
 "ISO 8879:1986//ENTITIES Diacritical Marks//EN" >

<!ENTITY % ISolat1 PUBLIC
 "ISO 8879:1986//ENTITIES Added Latin 1//EN" >

<!ENTITY % ISolat2 PUBLIC
 "ISO 8879:1986//ENTITIES Added Latin 2//EN" >

<!ENTITY % ISOamso PUBLIC
 "ISO 8879:1986//ENTITIES Added Math Symbols: Ordinary//EN" >

<!ENTITY % ISOgrk1 PUBLIC
 "ISO 8879:1986//ENTITIES Greek Letters//EN" >

<!ENTITY % ISOgrk3 PUBLIC
 "ISO 8879:1986//ENTITIES Greek Symbols//EN" >

%ISOpub; %ISOnum; %ISotech; %ISodia; %ISolat1; %ISolat2; %ISOamso;
 %ISOgrk1; %ISOgrk3;

<!NOTATION cgmchar PUBLIC "ISO 8632-2:1987//NOTATION Information
 processing systems - Computer Graphics -
 Metafile for the storage and transfer of
 picture description information -
 Part 2: Character encoding//EN" >

<!NOTATION fax PUBLIC "CCITT VII.3 T 6//NOTATION Blue book -
 Terminal equipment and protocols for
 telematic services - Facsimile encoding

```

schemes and coding control functions for
group 4 facsimile apparatus//EN" >

<!ENTITY % p.em.ph "hp1|hp2|hp3|hp4|hp0|cit" -- Emphasized phrases -->
<!ENTITY % ps.elem "artwork" -- Other elements -->
<!ENTITY % p.zz.ph "(%p.em.ph;)|(%ps.elem;)"
--All phrases-->
<!ENTITY % m.ph "(#PCDATA|(%p.zz.ph;))*" -- Phrase model -->
<!ENTITY % ps.zz "%ps.elem;"
-- Para/sect subelements -->
<!ENTITY % s.p.d "p|fig" -- Simple paragraphs -->
<!ENTITY % s.zz "(%s.p.d;)|(%ps.zz;)" -- Section subelements -->
<!ENTITY % m.pseq "(p, ((%s.p.d;)|(%ps.zz;))*" --Paragraph sequence-->
<!-- Includable Subelements -->

<!ELEMENT metadocument - - (frontm, body)
-- the whole document --><?Pub Caret>

<!-- ELEMENTS MIN CONTENT (EXCEPTIONS) -->
<!ELEMENT (%p.em.ph;) - - %m.ph; -- Emphasized phrases -->
<!ELEMENT p 0 0 ((%m.ph;))* -- Paragraphs -->
-->
<!ELEMENT fig - - (figbody, (figcap, figdesc?)) -- figure -->
<!ELEMENT figbody 0 0 (figcomm?,(%s.zz;))* -- Figure body -->
<!ELEMENT figcomm - 0 %m.ph; -- Figure comment -->
<!ELEMENT figcap - 0 %m.ph; -- Figure caption -->
<!ELEMENT figdesc - 0 %m.pseq; -- Figure description -->
<!ELEMENT artwork - 0 EMPTY >
<!ATTLIST artwork name CDATA #REQUIRED >

<!ENTITY % freetext "%m.pseq"
-- element description of a free text (33900 conform, but only
emphasized phrases) -->

<!-- ELEMENTS MIN CONTENT (EXCEPTIONS) -->

<!ELEMENT frontm - - (title, version, date, author)
-- frontmatter informations -->
<!ELEMENT title - - (#PCDATA)
-- title of document -->
<!ELEMENT version - - (#PCDATA)
-- version of document -->
<!ELEMENT date - - (#PCDATA)
-- creation date of document -->
<!ELEMENT author - - (#PCDATA)
-- author of document -->

<!ELEMENT body - - (superdocument?, chapterdescription*)
-- the body that really describes the meta document -->
<!ELEMENT superdocument - - (#PCDATA)
-- the title of the preceding (in a sense of superclass)
metadocument -->
<!ELEMENT chapterdescription - - (chaptertitle, chaptercontentsdescription,
chaptercontents)
-- description of one chapter -->
<!ATTLIST chapterdescription
chapternumber NUMBER #IMPLIED
isinherited (yes|no) no
-- the number (in the actual level) of the chapter -->
<!ELEMENT chaptertitle - - (#PCDATA)
-- the title of the chapter -->
<!ELEMENT chaptercontentsdescription - - (%freetext;)
-- the informal description of the meaning of the
contents of the chapter -->
<!ELEMENT chaptercontents - -
((contentelementdescription|chapterdescription)*)

```

```
-- the description of the contents of a chapter , can
contain content elements and sub chapters -->
<!ELEMENT contentelementdescription - - (contentelementname,
contentdescription, synonym*, contentelementdescription*)
-- the description of an element in a chapter -->
<!ATTLIST contentelementdescription
        contenttype (
datafield|figure|text|numeric|interval|undefined)      "undefined"
        isinherited (yes|no)      no
-- the possible contents -->
<!ELEMENT contentelementname - - (#PCDATA)
-- name of the element -->
<!ELEMENT contentdescription - - (%freetext;)
-- the informal description of the meaning of the contents -->
<!ELEMENT synonym - - (synonymname)
-- a synonym for the name -->
<!ATTLIST synonym
        isinherited (yes|no)      no
-- inheritance flag -->
<!ELEMENT synonymname O O (#PCDATA)
-- a synonym for the name -->
]>
```

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Without a watermark

D.2 Metadocument of Clause 5 of the document

```

<metadocument>
<frontm>
<title> Industrial-Process Measurement and Control: Data Structures
and Elements in Process Equipment Catalogues Part 1: Measuring Equipment
with Analogue
and Digital Output </title>
<version>1.0</version>
<date>20th November 2001</date>
<author>IEC SC65B WG 10</author>
</frontm>
<body>
<chapterdescription chapternumber="1" isinherited="yes">
<chaptertitle>Identification</chaptertitle>
<chaptercontentsdescription>
<p>The information necessary for unambiguous
identification of the measurement equipment shall be specified here. This
information may be
supplemented by illustrations, e.g. drawings or photographs.</p>
<p></p>
</chaptercontentsdescription>
<chaptercontents>
<contentelementdescription contenttype="text">
<contentelementname>Document identification</contentelementname>
<contentdescription>
<p>The type, code number, and if appropriate, the revision number of the
document.</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription contenttype="text">
<contentelementname>Date of issue</contentelementname>
<contentdescription>
<p>The date
of issue of the document.</p>
<p>Note: The vendor/manufacturer is encouraged to supplement
this information with a "valid until" date.</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription contenttype="text">
<contentelementname>Product type</contentelementname>
<contentdescription>
<p>The type of product, e.g. capacitance level
transmitter, differential pressure transmitter, Pt100 resistance
thermometer, variable area
flowmeter.</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription contenttype="text">
<contentelementname>Product name</contentelementname>
<contentdescription>
<p>The product name under which the measuring equipment is marketed
and, where appropriate, its model number.</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription contenttype="text">
<contentelementname>Vendor/Manufacturer</contentelementname>

```

```

<contentdescription>
<p>The name of the
vendor/manufacturer responsible for the measurement equipment, optionally
with address.</p>
<p></p>
</contentdescription>
</contentelementdescription>
</chaptercontents>
</chapterdescription>
<chapterdescription chapternumber="2" isinherited="yes">
<chaptertitle> Application</chaptertitle>
<chaptercontentsdescription>
<p>The applications for which the measurement equipment is
designed, together with the reasons for its use shall be specified
here.</p>
<p></p>
</chaptercontentsdescription>
<chaptercontents>
</chaptercontents>
</chapterdescription>
<chapterdescription chapternumber="3" isinherited="yes">
<chaptertitle> Function and System Design </chaptertitle>
<chaptercontentsdescription>
<p>The means 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.</p>
<p></p>
</chaptercontentsdescription>
<chaptercontents>
<contentelementdescription contenttype="text">
<contentelementname>Measuring principle</contentelementname>
<contentdescription>
<p>The principle used and the physical quantity
measured in order to determine the measured variable.</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription contenttype="text">
<contentelementname>Equipment
architecture</contentelementname>
<contentdescription>
<p>The components, devices,
assemblies or systems used to perform the measuring activity.</p>
<p></p>
</contentdescription>
<synonym>
<synonymname>Modularity</synonymname>
</synonym>
</contentelementdescription>
<contentelementdescription>
<contentelementname>Communication and Data Processing</contentelementname>
<contentdescription>
<p>The components, hardware and software for communication with external
systems and
execution of complex functions</p>
<p></p>

```

```
</contentdescription>
</contentelementdescription>
<contentelementdescription>
<contentelementname>Climate Class</contentelementname>
<contentdescription>
<p>The climatic conditions, i.e. ambient
temperature, pressure and humidity, to which the measuring equipment can be
subjected during
operation (including shutdown), transport and storage (over land or sea),
e,g, as specified in IEC
60654-1.</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription>
<contentelementname>Dependability</contentelementname>
<contentdescription>
<p>Information on the dependability of the equipment as defined in IEC
61508. The scheme as per IEC 61069, Part 5 should be followed.</p>
<p></p>
</contentdescription>
<contentelementdescription>
<contentelementname>Reliability</contentelementname>
<contentdescription>
<p>Where appropriate, the mean time between
faults (MTBF), fault tolerance, internal redundancy etc. shall be entered
here</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription>
<contentelementname>Maintainability</contentelementname>
<contentdescription>
<p>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.
</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription>
<contentelementname>Integrity</contentelementname>
<contentdescription>
<p>Where appropriate, any mechanism which ensures the integrity of the
equipment output on the
discovery of a fault shall be described here.
</p>
<p></p>
</contentdescription>
</contentelementdescription>
<contentelementdescription>
<contentelementname>Security</contentelementname>
<contentdescription>
<p>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.
</p>
<p></p>
</contentdescription>
</contentelementdescription>
</contentelementdescription>
```