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INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Industrial-process measurement and control – Data structures and elements in process equipment catalogues –
Part 13: Lists of properties (LOP) for pressure measuring equipment for electronic data exchange**

**Mesure et commande dans les processus industriels – Éléments et structures de données dans les catalogues d'équipements de processus –
Partie 13: Listes des propriétés (LOP) pour les équipements de mesure de pression pour l'échange électronique de données**

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

Part 13: Lists of properties (LOP) for pressure measuring equipment for electronic data exchange

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International Standard IEC 61987-13 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this standard is based on the following documents:

CDV	Report on voting
65E/398/CDV	65E/471/RVC

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61987, 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 publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

INTRODUCTION

The exchange of product data between companies, business systems, engineering tools, data systems within companies and, in the future, control systems (electrical, measuring and control technology) can run smoothly only when both the information to be exchanged and the use of this information has been clearly defined.

Prior to this standard, requirements on process control devices and systems were specified by customers in various ways when suppliers or manufacturers were asked to quote for suitable equipment. The suppliers in their turn described the devices according to their own documentation schemes, often using different terms, structures and media (paper, databases, CDs, e-catalogues, etc.). The situation was similar in the planning and development process, with device information frequently being duplicated in a number of different information technology (IT) systems.

Any method that is capable of recording all existing information only once during the planning and ordering process and making it available for further processing, gives all parties involved an opportunity to concentrate on the essentials. A precondition for this is the standardization of both the descriptions of the objects and the exchange of information.

This standard series proposes a method for standardization which will help both suppliers and users of measuring equipment to optimize workflows both within their own companies and in their exchanges with other companies. Depending on their role in the process, engineering firms may be considered here to be either users or suppliers.

The method specifies measuring equipment by means of blocks of properties. These blocks are compiled into lists of properties (LOPs), each of which describes a specific equipment (device) type. This standard series covers both properties that may be used in an inquiry or a proposal and detailed properties required for integration of the equipment in computer systems for other tasks.

IEC 61987-10 defines structure elements for constructing lists of properties for electrical and process control equipment in order to facilitate automatic data exchange between any two computer systems in any possible workflow, for example engineering, maintenance or purchasing workflow and to allow both the customers and the suppliers of the equipment to optimize their processes and workflows. IEC 61987-10 also provides the data model for assembling the LOPs.

IEC 61987-11 specifies the generic structure for operating and device lists of properties (OLOPs and DLOPs). It lays down the framework for further parts of IEC 61987 in which complete LOPs for device types measuring a given physical variable and using a particular measuring principle will be specified. The generic structure may also serve as a basis for the specification of LOPs for other industrial-process control instrument types such as control valves and signal processing equipment.

IEC 61987-13 concerns pressure measuring equipment. It provides one operating LOP for all types of pressure transmitter or pressure gauge which can be used, for example, as a request for various sorts of quotation. The DLOPs for the various pressure transmitter and gauge types provided in this part of IEC 61987 can be used in very different ways in the computer systems of equipment manufacturers and suppliers, in CAE and similar systems of EPC contractors and other engineering companies and especially different plant maintenance systems of the plant owners. The OLOP and the DLOPs provided correspond to the guidelines specified in IEC 61987-10 and IEC 61987-11.

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

Part 13: Lists of properties (LOP) for pressure measuring equipment for electronic data exchange

1 Scope

This part of IEC 61987 provides an

- operating list of properties (OLOP) for the description of the operating parameters and the collection of requirements for a pressure measuring equipment, and
- device lists of properties (DLOP) for a range of pressure measuring equipment types describing them.

The structures of the OLOP and the DLOP correspond with the general structures defined in IEC 61987-11 and agree with the fundamentals for the construction of LOPs defined in IEC 61987-10.

Aspects other than the OLOP, needed in different electronic data exchange processes described in IEC 61987-10, will be published in IEC 61987-92[1].

Libraries of properties and of blocks used in the concerned LOPs are listed in Annex C and Annex D.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61360-1 (all parts), *Standard data elements types with associated classification scheme for electric items – Part 1: Definitions – Principles and methods*

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 61987-11:2012, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 11: List of Properties (LOP) of measuring equipment for electronic data exchange – Generic structures*

1 Under consideration.

3 Terms and definitions

3.1 General

For the purposes of this document, the terms and definitions given in IEC 61987-10 and IEC 61987-11, as well as the following apply.

3.2 Terms relating to measuring range

3.2.1
measuring range
range defined by two values of the measurand, or quantity to be supplied, within which the limits of uncertainty of the measuring instrument are specified

Note 1 to entry: The measuring range is defined by two values, the lower range limit (LRL) and the upper range limit (URL).

Note 2 to entry: Where a device can be adjusted to measure intervals within the specified measuring range or offers fixed sub-ranges, the sub-range is defined by two values, the lower range-end value (LRV) and the upper range-end value (URV).

[SOURCE: IEC 60050-311, 311-03-12, modified (notes added)]

3.2.2
span
algebraic difference between the upper and lower end values of the set measuring range

Note 1 to entry: If the device is set up to measure over the specified measuring range, then the span is the algebraic difference between the upper range limit and the lower range limit: this value is often called the maximum span.

[SOURCE: IEC 60050-311, 311-03-13 modified ("set" and note added)]

3.2.3
turndown ratio
ratio of the maximum span to the set span

3.2.4
zero adjustment
maximum value by which a pressure measurement can be offset to provide a reading of zero on an output

3.3 Terms relating to performance

3.3.1
influence of alternating bilateral overpressure
maximum deviation (modulus) of zero pressure reading after applying successively the maximum positive and then the maximum negative allowed overpressure successively to both sides of a differential pressure transmitter at reference temperature

3.3.2
influence of alternating unilateral overpressure
maximum deviation (modulus) of zero pressure reading after applying successively the maximum positive and then the maximum negative allowed overpressure to one side of a differential pressure transmitter at reference temperature

3.3.3
influence of ambient temperature
for a pressure transmitter, combined influence on zero and span caused by a change in ambient temperature over a given range, expressed as percentage of URL

Note 1 to entry: Manufacturers of pressure transmitters currently express this influence in one of two ways:

– a change in ambient temperature over the range of –10 °C to + 60 °C,

– a change in ambient temperature of + 28 °C (+ 82,5 °F) with respect to reference ambient temperature.

Note 2 to entry: The corresponding properties are to be found in the CDD[2].

3.3.4
influence of static pressure on span
influence of static pressure applied on both sides of a differential pressure meter on span per given pressure interval

Note 1 to entry: Manufacturers of pressure transmitters currently express this influence in one of two ways:

– per 100 bar,

– per 69 bar (1 000 psi).

Note 2 to entry: The corresponding properties are to be found in the CDD.

3.3.5
influence of static pressure on zero
influence of static pressure applied on both sides of a differential pressure meter on zero per given pressure interval

Note 1 to entry: Manufacturers of pressure transmitters currently express this influence in one of two ways:

– per 100 bar,

– per 69 bar (1 000 psi).

Note 2 to entry: The corresponding properties are to be found in the CDD.

3.3.6
non-conformity
deviation from ideal behaviour for devices that have a non-linear input/output relationship, determined from the curve plotted using the overall average of corresponding upscale and downscale errors

Note 1 to entry: Non-conformity can be calculated and expressed in one of three ways:

– independent: line positioned so as to minimize the maximum deviation,

– terminal-based: line positioned so as to coincide with the actual characteristic curve at the upper and lower range values,

– zero-based: line positioned so as to coincide with the actual characteristic curve at the lower range-value.

Note 2 to entry: The corresponding properties are to be found in the CDD.

3.3.7
non-linearity
deviation from ideal behaviour for devices that have a linear input/out relationship, determined from the curve plotted using the overall average of corresponding upscale and downscale errors

Note 1 to entry: Non-linearity can be calculated and expressed in one of three ways:

– independent: line positioned so as to minimize the maximum deviation,

– terminal-based: line positioned so as to coincide with the actual characteristic curve at the upper and lower range-values,

– zero-based: line positioned so as to coincide with the actual characteristic curve at the lower range-value.

Note 2 to entry: The corresponding properties are to be found in the CDD.

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2 CDD: Common Data Dictionary.

3.3.8
span error
difference between the actual span and the maximum span when the input is at the upper range limit, expressed as percentage of maximum span

3.3.9
span error for bilateral application of static pressure
difference between the actual span and the maximum span, expressed as percentage of maximum span, when the same static pressure is applied on both sides of a differential pressure transmitter

3.3.10
total error
sum of the total performance and the long term drift per annum, expressed as percentage of span

Note 1 to entry: Manufacturers currently express total performance in several different ways, see notes to 3.3.11.

Note 2 to entry: The corresponding properties are to be found in the CDD.

3.3.11
total performance
square root of (non-linearity)² + (influence of ambient temperature)² + (influence of static pressure on span)², expressed as percentage of span

Note 1 to entry: Manufacturers of pressure transmitters currently express total performance in one of two ways:

– for a change in ambient temperature over the range of –10 °C to + 60 °C and static pressure per 100 bar,
– for a change in ambient temperature of ± 28 °C (± 82,5 °F) with respect to reference ambient temperature and static pressure per 69 bar (1 000 psi).

Note 2 to entry: Some manufactures include the (influence of static pressure on zero)² and also (influence of overpressure up to rated pressure on span)² in the expression of total performance.

Note 3 to entry: The corresponding properties are to be found in the CDD.

3.3.12
zero point error
absolute error of a device under reference conditions, when the input is at the lower range limit

3.3.13
zero point error for bilateral application of static pressure
deviation of pressure reading from zero when the same static pressure is applied on both sides of a differential pressure transmitter

4 General

4.1 Overview

The LOPs provided by this document are intended for use in electronic data exchange processes performed between any two computer systems. The two computer systems can both belong to the same company or they can belong to different companies as described in Annex C of IEC 61987-10:2009.

The OLOP for the family of pressure measuring equipment is to be found in Annex A while the DLOPs of the individual pressure device types are to be found in Annex B.

Structural elements such as LOP type, block and property defined in this standard are available in electronic form in the “Process automation” domain of the IEC Common Data Dictionary (CDD).

4.2 Depiction of OLOPs and DLOPs

4.2.1 General

The properties of the OLOPs and DLOPs used in this part of IEC 61987 have been created in conformance with the requirements of the IEC 61360 series. As such, the structural elements, properties and attributes to be found in the IEC Common Data Dictionary are normative.

4.2.2 Structural roles

The entities within a list of properties can have one of a number of structural roles.

a) Property

A property exists as a property only.

b) Ref. property + Block

A reference property connects a block to the superordinate block or LOP in which it is embedded.

Properties and sub-blocks listed below a block name and placed one position to the right are elements of the block. A block ends when another block name appears in the same column as the block name or in any other column to its left.

The reference property has the same preferred name as the block to which it refers. All attributes of these properties are available in the IEC Common Data Dictionary (CDD).

c) Cardinality property

A cardinality property is connected to the block which immediately follows it. The value of the property (0 … n) in a transaction file determines the number of times the associated block shall be repeated.

The preferred name of a cardinality property is with “Number of <xxxx>“ where <xxxx> is derived from the name of the block with which it is associated.

In the transaction file (see examples in 4.3), it can be seen that a block has been repeated twice:

- the cardinality property directly before the block has a value greater than 1,
- the name of the repeated block is extended by “_” followed by the repetition number.

Example:

If the block “Signal function” should be repeated 3 times, the following construction should occur in the transaction file:

“number of signal function” has the value “3” ....cardinality property

“Signal function_1” ....first repeated block

“Signal function_2” ....second repeated block

“Signal function_3”t ....hird repeated block

d) Polymorphic control property

A polymorphic control property provides the means of introducing complete blocks of properties describing different realizations of a particular device function, for instance inputs and outputs. The property has a value list containing the designations of the blocks that may be introduced. When in a transaction file a polymorphic control property is assigned a value, the corresponding block follows (see examples in Tables 2 and 3).

The preferred name of a polymorphic property is “<xxxx> type“ where <xxxx> is normally the derived from name of the block with which it is associated.

e) Polymorphic control property with the fixed value: “<Block name from value list>”

This property appears directly behind the polymorphic block property. It is the same property as the polymorphic control property for the block, but with the fixed value used to create the block (see IEC 61987-10).

4.2.3 Marking of polymorphic areas

To help identify the possible polymorphic blocks in a list of properties in the printable version of this standard a number with grey background can be added to the rightmost column of the DLOP to indicate the properties associated with the block. It should be noted that in transaction file, only the polymorphic block selected from value list of the polymorphic control property would appear in the superordinate block.

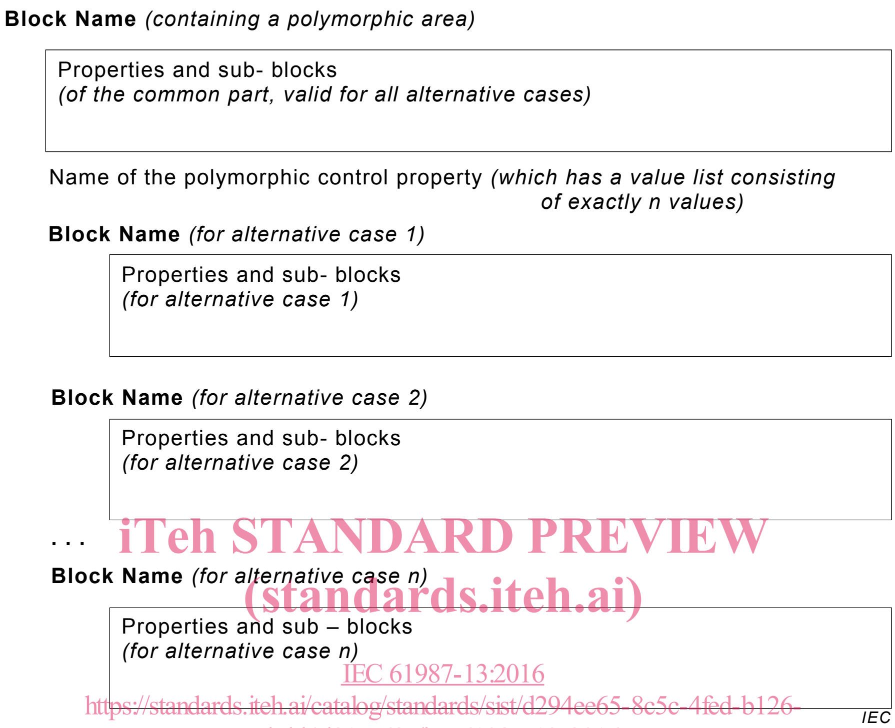

Figure 1 – Structure of a polymorphic area

Every polymorphic area corresponds to a block, the structure of which is shown in Figure 1. A polymorphic area begins with the name of this block containing this area. The block name can be optionally followed by any number of additional properties or sub-blocks, provided that they are valid for all alternative sub-blocks that can be generated by the polymorphism. The polymorphic control property follows, by means of which one of the alternative blocks can be selected. The alternative sub-blocks with their properties and sub-blocks are now listed one after the other. The polymorphic area ends with the last property of the last sub-block that can be selected using the value list of the polymorphic control property.

In order to facilitate the analysis of the LOPs, the following non-normative numerical marking system can be used. A polymorphic area can have one or more subordinate, polymorphic areas embedded in it. Table 1 shows a structure of the polymorphic areas. In Table 1, each individual polymorphic area has been assigned a unique number. The areas have been numbered in the sequence which they occur in the LOP, not according to their level in the structure. The number of an embedded area has therefore a marking number greater than the marking number of area in which it is embedded.

For example, the majority of the content of the “Output” block is generated from the polymorphic area marked with the number 8, which starts at “Type of output” and can include any of the specialisations which also are marked with the number 8. Each specialization also includes in this case a further polymorphic area, “Assigned variable” which is marked by its own number (>8).

In Table 1, the missing marking numbers 3 to 7 are used in the DLOPs for flow measuring equipment (see IEC 61987-12[3]). The polymorphic areas marked by 9, 10, 11, 13 and 14 are nested in the larger polymorphic area marked by 8.

Table 1 – Example of structure of polymorphic areas in the DLOPs

Block name				Marking number of 1st level polymorphic area	Marking number of nested polymorphic area (2nd level)
Input					
	Measured variable				
		Type of measured variable		1	
	Auxiliary input				
		Type of auxiliary input		2	
Output					
	Type of output			8	
		Analog current output		8	
			Assigned variable	8	9
		Analog voltage output		8	
			Assigned variable	8	10
		Frequency output		8	
			Assigned variable	8	11
		Pulse output		8	
			Assigned variable	8	12
		Manufacturer-specific		8	
			Assigned variable	8	13
		Pneumatic/hydraulic output		8	
			Assigned variable	8	14
Performance					
	Performance variable				
		Type of performance variable		15	

In the OLOP for pressure measuring equipment, there are two polymorphic areas without nested sub-areas. Table 2 shows in which blocks they appear.

3 Under consideration.

Table 2 – Example of structure of polymorphic areas in the OLOP

Block name	Marking number of 1st level polymorphic area
Process case	
High/single pressure side process case variables	
Process case variables	
Phase	1
Low pressure side process case variables	
Process case variable	
Phase	1

In order to make clear how the structural elements such as block, cardinality and polymorphism can be implemented using the LOPs of this standard some examples are provided in 4.3.

4.3 Examples of DLOP block usage

4.3.1 Block "Digital communication"

A pressure transmitter has a FOUNDATION fieldbus interface. It is designed for use in a safe area and is equipped with a plug connector. The transmitter offers a number of function blocks and can be configured as a LAS device if required. The "Digital Communication" block might be configured as shown in Table 3 (... indicates a property or properties that have not been used).

Table 3 – Example for "Digital Communication"

Name of LOP type, block or property[4]	Assigned value	Unit
Digital communication		
number of digital communication interfaces	1	
Digital communication interface		
designation of digital communication interface	FOUNDATION fieldbus	
Communication protocol		
type of protocol	FOUNDATION fieldbus H1	
device class	Basic device	
LAS functionality	Yes	
assigned LAS functionality	Disabled	
number of communication variables	2	
Communication variable_1		
designation of digital communication channel	CHANNEL_1	
assigned variable	Pressure	
type of communication variable	Analog input	
Communication variable_2		
designation of digital communication channel	CHANNEL_2	

4 In the CDD, block names start with a capital letter, property names with a lower case letter.