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Industrial-process measurement and control – Data structures and elements in
process equipment catalogues –
Part 21: List of Properties (LOP) of automated valves for electronic data
exchange – Generic structures

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Mesure et commande dans les processus industriels – Structures de données et
éléments dans les catalogues d'équipement de processus –

Partie 21: Liste de propriétés (LOP) des vannes automatisées pour l'échange
électronique de données – Structures génériques



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**Industrial-process measurement and control – Data structures and elements in process equipment catalogues –
Part 21: List of Properties (LOP) of automated valves for electronic data exchange – Generic structures**

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Partie 21: Liste de propriétés (LOP) des vannes automatisées pour l'échange électronique de données – Structures génériques**

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
General.....	7
Device type dictionary.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 General	9
4.1 Characterization scheme.....	9
4.2 OLOP and DLOP	10
4.3 Cardinality and polymorphism	11
5 Operating List of Properties (OLOP)	11
5.1 Generic block structure	11
5.2 Base conditions	12
5.3 Process case	12
5.3.1 General.....	12
5.3.2 Process conditions for final control elements	13
5.3.3 Other process case variable	13
5.4 Operating conditions for device design.....	13
5.4.1 General	13
5.4.2 Installation design conditions	14
5.4.3 Environmental design conditions.....	14
5.4.4 Process design conditions	15
5.4.5 Design conditions for valve body assembly.....	15
5.4.6 Pressure-temperature design conditions	15
5.5 Process equipment	15
5.5.1 General	15
5.5.2 Line or nozzle	16
5.6 Physical location	16
5.6.1 General	16
5.6.2 Available power supply	16
5.6.3 Process criticality classification	16
5.6.4 Area classification	16
6 Device List of Properties (DLOP)	17
6.1 Basic structure.....	17
6.1.1 General	17
6.1.2 Generic block structure.....	17
6.1.3 Relationship to IEC 61987-1	19
6.2 Identification	19
6.3 Application	19
6.4 Parameters of <device group>	19
6.5 Function and system design.....	19
6.5.1 General	19
6.5.2 Dependability.....	19

6.6	Input	19
6.6.1	General	19
6.6.2	Control input	20
6.6.3	Type of auxiliary input	20
6.7	Output	21
6.7.1	General	21
6.7.2	Type of output	21
6.8	Digital communication	22
6.8.1	General	22
6.8.2	Digital communication interface	22
6.9	Performance	23
6.9.1	General	23
6.9.2	Reference conditions for the device	23
6.9.3	Performance variable	23
6.10	Rated operating conditions	24
6.10.1	General	24
6.10.2	Installation conditions	24
6.10.3	Environmental design ratings	25
6.10.4	Process design ratings	25
6.10.5	Pressure-temperature design ratings	26
6.11	Mechanical and electrical construction	26
6.11.1	General	26
6.11.2	Overall dimensions and weight	26
6.11.3	Structural design	26
6.11.4	Explosion protection design approval	26
6.11.5	Codes and standards approval	26
6.12	Operability	27
6.12.1	General	27
6.12.2	Basic configuration	27
6.12.3	Parametrization	27
6.12.4	Adjustment	27
6.12.5	Operation	27
6.12.6	Diagnosis	27
6.13	Power supply	27
6.14	Certificates and approvals	27
6.15	Component part identifications	28
7	Composite devices	28
8	Additional aspects	28
Annex A (informative)	Device type dictionary – Classification of final control elements	29
Bibliography	33
Figure 1	– Characterization of final control elements on the basis of IEC 60534-1	9
Figure 2	– Characterization of actuators	10
Figure 3	– Assignment of OLOP and DLOPs for valve body assembly	10
Figure 4	– Assignment of OLOP and DLOPs for actuators	11
Table 1	– Generic block structure of an OLOP	12

Table 2 – Generic block structure of a DLOP	18
Table A.1 – Classification scheme for final control elements	29

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**INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL – DATA
STRUCTURES AND ELEMENTS IN PROCESS EQUIPMENT CATALOGUES –****Part 21: List of Properties (LOP) of automated valves
for electronic data exchange – Generic structures**

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International Standard IEC 61987-21 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation.

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

FDIS	Report on voting
65B/996/FDIS	65B/1024/RVD

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 series, published under the general title *Industrial-process measurement and control – Data structures and elements in process equipment catalogues*, can be found on the IEC website.

The committee has decided that the contents of this 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,
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INTRODUCTION

General

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 have 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.

The IEC 61987 series proposes a method for standardization which will help both suppliers and users of process control 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 process control 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. The IEC 61987 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, while specifying a generic structure for measuring equipment, provides several important detail descriptions, such as the handling of composite devices that are also required for LOPs describing automated industrial valves. This part of IEC 61987 specifies the generic structure for Operating and Device Lists of Properties (OLOPs and DLOPs) for automated industrial valves. Automated industrial valves are so-called final control elements and include control valves, automated on/off-valves, and process regulators. It lays down the framework for further parts of IEC 61987 in which complete LOPs for final control elements of different construction and functional 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.

Device type dictionary

Annex A contains a characterisation of final control elements. This is a tree of relationships between different device types. Starting at the root "equipment for industrial-process automation", it introduces the final control elements. In addition to control valves, actuators as well as accessories such as positioners belong to this group. This characterisation is used in the Process Automation domain of the IEC Common Data Dictionary (CDD).

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

Part 21: List of Properties (LOP) of automated valves for electronic data exchange – Generic structures

1 Scope

This part of IEC 61987 provides

- a characterization for the integration of automated valves, including control valves, automated on/off-valves and process regulators, in the Common Data Dictionary (CDD);
- generic structures in conformance with IEC 61987-10 for Operating Lists of Properties (OLOPs) and Device Lists of Properties (DLOPs) of final control elements.

The generic structures for the OLOP and DLOP contain the most important blocks for final control elements. Blocks pertaining to a specific equipment type will be described in the corresponding part of the IEC 61987 standard series. Similarly, equipment properties are not part of this part of IEC 61987. For instance, the OLOP and DLOP for globe valves and rotary valves are found in IEC 61987-22.

NOTE Within the classification (see also Figure 1), “final control element” has only the specializations automated valves and process regulators. In practice there are other specializations that are not considered in this standard.

2 Normative references

[IEC 61987-21:2015](https://standards.iteh.ai/catalog/standards/sist/114489ec-cbf2-41c7-9120-50916675a126/iec-61987-21-2015)

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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 60534-1, *Industrial-process control valves – Part 1: Control valve terminology and general considerations*

IEC 61069-5, *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment – Part 5: Assessment of system dependability*

IEC 61508-6, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3*

IEC 61987-1:2006, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 1: Measuring equipment with analogue and digital output*

IEC 61987-10, *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, *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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61987-10, IEC 61987-11 and IEC 60534-1 apply.

4 General

4.1 Characterization scheme

IEC 61987-1 describes a general classification scheme for industrial process measuring equipment based on measured variables. The introduction of the LOPs of any area of technology into the IEC Common Data Dictionary (CDD) requires the creation of a characterization scheme for the device types of this technology area.

The area of technology considered in this standard concerns final control elements. The characterisation of the area for the CDD is provided in Table A.1.

The area of final control elements belongs to the domain of “Process Automation” in the CDD. This area consists of two sub-areas for:

- control valves and automated on/off-valves, and
- process regulators.

While the sub-area for process regulators contains only a list of device types, the sub-area for control valves and automated on/off-valves comprises the substructure shown in Figure 1. Since the term “valve” is normally used to describe a complete assembly, i.e. valve body, actuator, and accessories such as positioners and feedback units, at the next sub-level the various types of valve are classified according to their valve body assembly. The branch “actuator” in Figure 1 also has the substructure shown in Figure 2.

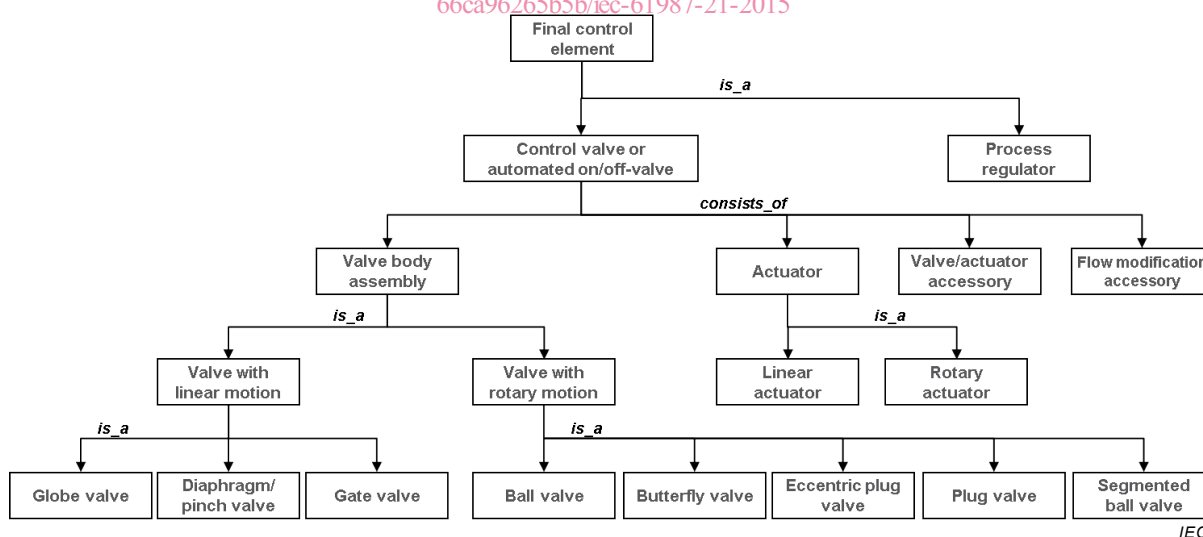


Figure 1 – Characterization of final control elements on the basis of IEC 60534-1

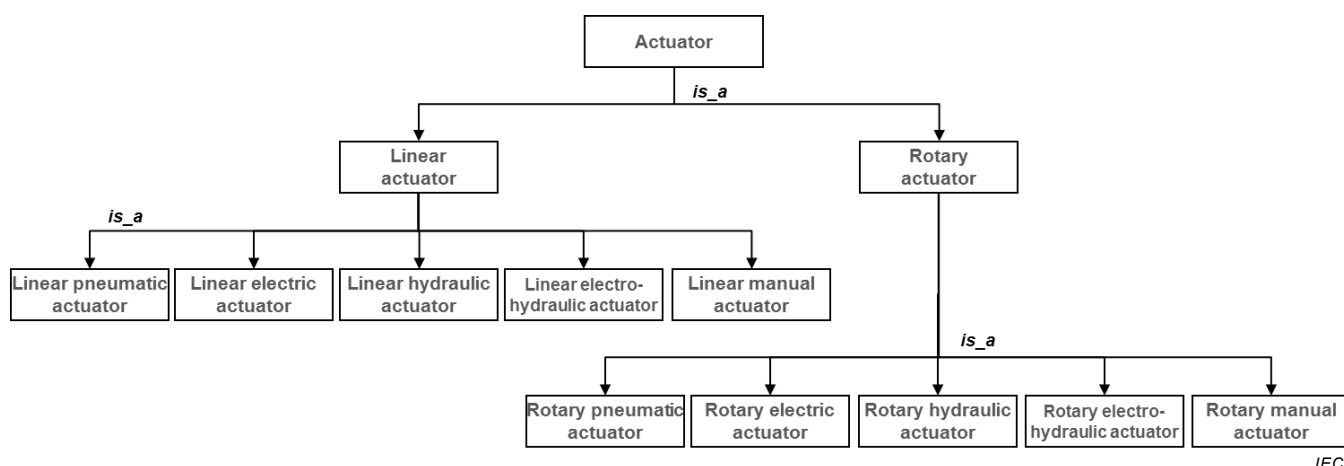


Figure 2 – Characterization of actuators

4.2 OLOP and DLOP

An Operating List of Properties (OLOP) describes an aspect relating to a device type, for example, the operational environment of the device, the device design requirements as well as all the boundary conditions applicable to the point of operation. The structure element “aspect” is described in IEC 61987-11. Among a range of possible aspects, the operating aspect represented by the OLOP is the most important.

The Device List of Properties (DLOP) is used to describe a given device type, for example a globe control valve, a pneumatic linear actuator or a positioner. The DLOP describes, for example, the mechanical construction, the electrical construction and performance of a device. Each DLOP describes a particular device type.

For automated valves two OLOPs are available, one for valve body assemblies and process regulators and one for actuators. This is necessary because of the different requirements that shall be specified for each.

Figure 3 shows the relationship between the OLOP and DLOPs for valve body assemblies. The OLOP is valid for the generic DLOP as well as for the DLOPs for the various device types, for example globe valves, gate valves etc., which differ in their valve body assembly.

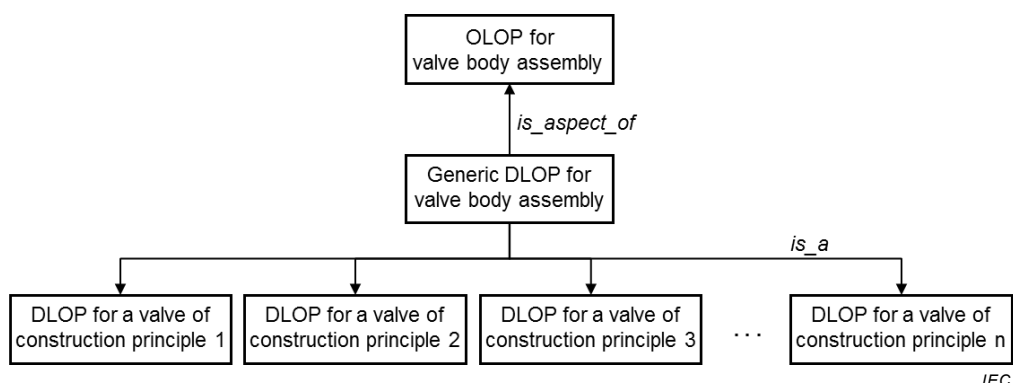


Figure 3 – Assignment of OLOP and DLOPs for valve body assembly

Figure 4 shows the relationship between the OLOP for actuators and the actuator DLOPs. The OLOP is valid for the generic DLOP as well as for the DLOPs for the various device types, for example linear electrical actuators, rotary pneumatic actuators etc., which differ in their construction and power source.

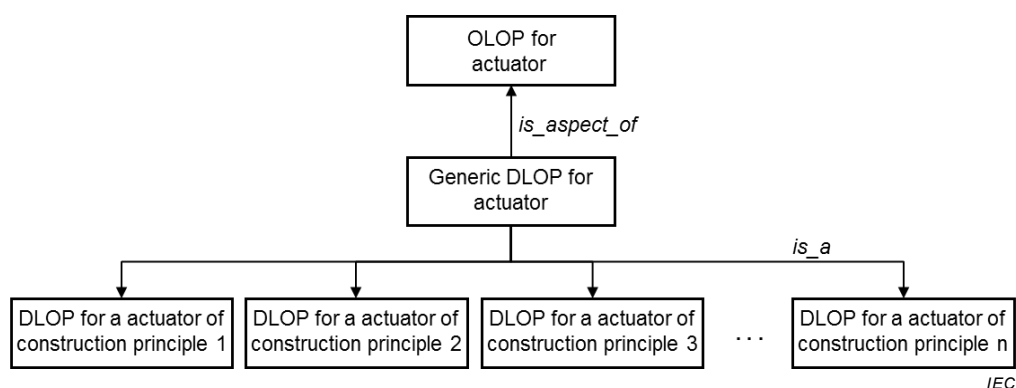


Figure 4 – Assignment of OLOP and DLOPs for actuators

At higher levels of their construction, OLOPs and DLOPs contain blocks of properties that are common to all process variables or device types respectively. This part of IEC 61987 specifies these generic block structures.

Further parts of this standard series specify the block structures and properties of OLOPs and DLOPs for particular construction principles.

4.3 Cardinality and polymorphism

The principles and the description of the cardinality and polymorphic areas applied in this standard are described in IEC 61987-10 and IEC 61987-11. These structural elements introduce a high degree of flexibility in the description of a device and its surroundings, provided the block structure in the LOP is used. They can be briefly described as follows:

- Cardinality allows a LOP element, for example a property block describing a particular feature of a device, to be repeated as many times as necessary.
- Polymorphism allows the introduction of a complete property block from a selection of property blocks at a particular structure level of a LOP.

In the case of final control elements, the cardinality can be used for replication of the “End connection” block. For example a final control element can have four end connections: two for the controlled medium and two for steam heating, requiring four end-connection property blocks. Two of the end connections can be flanges, one a thread and one a welded joint.

5 Operating List of Properties (OLOP)

5.1 Generic block structure

An operating list of properties is a list of properties describing the aspect concerning the operational conditions of the device and additional information regarding the design conditions under which it will be applied. An OLOP contains no information about the device itself: this is to be found in the DLOP.

The role of an OLOP is similar to that of an engineering datasheet, in which data describing the plant environment where the device is to operate are collected. This includes information on the process medium, the ambient conditions, the design safety conditions and plant infrastructure. All of these data are described with an OLOP.

The generic block structure of an OLOP for valve body assemblies and process regulators shall correspond to that shown in Table 1. It corresponds to the generic block structure of an OLOP for measuring equipment (see IEC 61987-11). Details of the individual blocks are to be found in 5.2 to 5.7. The generic block structure for the OLOP of actuators and the accessories of valves follows the general structure.

Table 1 – Generic block structure of an OLOP

Operating list of properties			
	Base conditions		
	Process case [c]		
		Process conditions for final control elements	
			Process conditions at the inlet [c]
			Liquid phase
			Vapor phase
			Gas phase
			Other material properties
		Process conditions at the outlet [c]	
			Liquid phase
			Vapor phase
			Gas phase
			Other material properties
		Calculation results	
		Other process case variable [c]	
	Operating conditions for device design		
		Installation design conditions	
		Environmental design conditions	
			Normal environmental design conditions
			Limiting environmental design conditions
			Design conditions for external cleaning in place
		Process design conditions	
			Normal process design conditions
			Design conditions for internal cleaning in place
		Design conditions for valve body assembly	
		Pressure-temperature design conditions	
			Design deratings [c]
		Process equipment	
			Line or nozzle [c]
			End connection
		Physical location [c]	
		Available power supply	
		Process criticality classification	
		Area classification [c]	
[c] The block can be repeated as many times as needed using cardinality, which means that a cardinality property with the name “number of <name of the block>” directly precedes the block (see IEC 61987-10).			

5.2 Base conditions

The block base conditions shall contain the properties of the reference variables that are to be used throughout the document. Such variables give the reference state or reference conditions to which calculated variables such as normalized flow rate are calculated.

For example the conditions of pressure and temperature to be used to calculate density would be entered in the properties "absolute base pressure" and "base temperature".

NOTE Base conditions are often standardized for particular industries or applications.

5.3 Process case

5.3.1 General

The block process case shall contain the properties required to characterize the process media at the point of control. It comprises at least the sub-blocks:

- Process conditions for final control elements

- Other process case variable

NOTE A process case contains the data corresponding to an operating point of the plant at the location where the final control element is installed. It defines process medium-related data such as pressure, temperature, viscosity, conductivity, etc.

5.3.2 Process conditions for final control elements

5.3.2.1 General

The block process conditions for final control elements shall contain properties that characterize the operating state conditions and the physical properties of process media for different phases. It comprises the following blocks:

- Process conditions at the inlet
- Process conditions at the outlet
- Calculation results of control devices

5.3.2.2 Process conditions at the inlet

The block process conditions at the inlet shall contain the properties of the set of common process variables for a stream consisting of one or more phases at the inlet of the final control element.

- Liquid phase
- Vapor phase
- Gas phase
- Other material properties

5.3.2.3 Process conditions at the outlet

The block process conditions at the outlet shall contain the properties of the set of common process variables for a stream consisting of one or more phases at the outlet of the final control element.

- Liquid phase
- Vapor phase
- Gas phase
- Other material properties

5.3.2.4 Calculation results of control devices

The block calculation results of control devices shall comprise the results of calculations based on the current process case such as flow coefficients or sound pressure levels.

5.3.3 Other process case variable

The block other process case variable contains text properties which allow the user to characterize variables that are not foreseen in the block process case variables.

The cardinality property “number of other process case variables” allows the block to be replicated the required number of times to describe all other process case variables.

5.4 Operating conditions for device design

5.4.1 General

The block operating conditions for device design shall contain properties describing the nominal conditions to be found at the control point. It comprises five sub-blocks: