

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

**Mesure et commande des processus industriels – Structures de données et éléments dans les catalogues d'équipement de processus –
Partie 11: Listes des propriétés (LOP) d'équipements de mesure pour l'échange électronique de données – Structures génériques**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2016 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

**Mesure et commande des processus industriels – Structures de données et éléments dans les catalogues d'équipement de processus –
Partie 11: Listes des propriétés (LOP) d'équipements de mesure pour l'échange électronique de données – Structures génériques**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40; 35.100.20

ISBN 978-2-8322-3692-5

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	10
3.1 Terms and definitions concerning measuring instruments	10
3.2 Terms and definitions concerning relationships	11
4 General	13
4.1 Characterization scheme.....	13
4.2 Aspects.....	13
4.3 Rules for the construction of LOPs with block structure.....	15
4.3.1 Block order	15
4.3.2 Position of cardinality properties	15
4.3.3 Naming of blocks created by cardinality.....	15
4.3.4 Characterizing property	15
4.3.5 Validity	15
4.4 OLOP and DLOP	15
4.5 Operating conditions	16
4.6 Measuring equipment configuration.....	17
5 Operating list of properties (OLOP).....	18
5.1 Generic block structure	18
5.2 Base conditions	19
5.3 Process case	19
5.3.1 General	19
5.3.2 Process case variables	19
5.3.3 Other process case variable	20
5.4 Operating conditions for device design.....	20
5.4.1 General	20
5.4.2 Installation design conditions.....	20
5.4.3 Environmental design conditions.....	20
5.4.4 Process design conditions	21
5.4.5 Pressure-temperature design conditions	21
5.5 Process equipment	22
5.5.1 General	22
5.5.2 Line or nozzle	22
5.6 Physical location.....	22
5.6.1 General	22
5.6.2 Available power supply	22
5.6.3 Process criticality classification	23
5.6.4 Area classification	23
6 Device list of properties (DLOP)	23
6.1 General.....	23
6.1.1 Generic block structure.....	23
6.1.2 Relationship to IEC 61987-1	25
6.1.3 Multivariable devices	25
6.2 Identification	26

6.3	Application	26
6.4	Function and system design.....	26
6.4.1	General	26
6.4.2	Dependability.....	26
6.5	Input	26
6.5.1	General	26
6.5.2	Measured variable	26
6.5.3	Auxiliary input.....	27
6.6	Output.....	28
6.6.1	General	28
6.6.2	<Signal> output	29
6.7	Digital communication	30
6.7.1	General	30
6.7.2	Digital communication interface	30
6.8	Performance	30
6.8.1	General	30
6.8.2	Reference conditions for the device	30
6.8.3	Performance variable.....	30
6.9	Rated operating conditions	32
6.9.1	General	32
6.9.2	Installation conditions	32
6.9.3	Environmental design ratings.....	33
6.9.4	Process design ratings	33
6.9.5	Pressure-temperature design ratings	34
6.10	Mechanical and electrical construction	34
6.10.1	General	34
6.10.2	Overall dimensions and weight	34
6.10.3	Structural design	35
6.10.4	Explosion protection design approval.....	35
6.10.5	Codes and standards approval	35
6.11	Operability	35
6.11.1	General	35
6.11.2	Basic configuration	35
6.11.3	Parametrization	35
6.11.4	Adjustment	35
6.11.5	Operation	35
6.11.6	Diagnosis	35
6.12	Power supply	36
6.13	Certificates and approvals.....	36
6.14	Component part identifications	36
7	Composite devices	36
7.1	Structure of composite devices	36
7.2	Aspects of components	38
8	Additional aspects	38
8.1	Administrative information.....	38
8.2	Calibration and test.....	39
8.3	Accessories	39
8.4	Device documents supplied.....	39
8.5	Packaging and shipping	39

8.6	Digital communication parametrization	39
8.7	Example of a composite device with aspects.....	39
Annex A (informative) Device type dictionary – Classification of process measuring equipment according to measuring characteristics		41
Bibliography.....		60
Figure 1	– Characterisation of measuring equipment	13
Figure 2	– Simplified UML scheme of device, LOPs and aspects	14
Figure 3	– Assignment of OLOPs and DLOPs for equipment used to measure one type of measured variable	16
Figure 4	– Structure of a composite device	37
Figure 5	– Example for the structure of an LOP for a composite device showing different aspects related to different sub-components	40
Table 1	– Structure of the block “Operating conditions for device design” in the OLOP	17
Table 2	– Structure of the block “Rated operating conditions” in the DLOP	17
Table 3	– Generic block structure of an OLOP	18
Table 4	– Generic block structure of a DLOP	24
Table 5	– DLOP structure for composite devices.....	37
Table A.1	– Classification scheme for process measuring equipment.....	41

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL –
DATA STRUCTURES AND ELEMENTS IN PROCESS
EQUIPMENT CATALOGUES –****Part 11: Lists of properties (LOPs) of measuring equipment
for electronic data exchange – Generic structures**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61987-11 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

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

- a) The classification in Table A.1 has been amended to reflect the changes in the classification scheme of process measuring equipment in the CDD due to the development of IEC 61987-14, IEC 61987-15 and IEC 61987-16.
- b) Annex A has become “informative”.

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

CDV	Report on voting
65E/467/CDV	65E/509/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 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,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

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 document, 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.

Content of the lists of properties (LOPs)

The LOPs specified in this document describe at generic level:

- the operating conditions of the measuring equipment;
- the ambient conditions at the measuring point;
- the performance of the measuring equipment;
- the metrological, mechanical and electrical features of the measuring equipment;
- the compliance of the measuring instrument to specific industrial requirements.

The LOPs mirror constructive reality but do not represent an instrument model.

Measuring equipment configuration

The generic LOPs have been so constructed that they take account of integral equipment and separately mounted equipment.

Device type dictionary

Annex A describes a characterisation of measuring equipment based on the STEP library, ISO 10303. This is a tree of relationships between different device types. Starting at the root “equipment for industrial-process automation”, it first characterizes measuring equipment according to type, then according to process variable measured and finally according to the measuring method employed. This structure will be used in the IEC Common Data Dictionary (CDD) “Process automation (IEC 61987 series)” domain.

For the purpose of this document, the following types of measuring equipment have been identified, see Clause 3 for definitions:

- sight indicator (with direct indicating qualitative output),
- gauge (with quantitative output only in the form of a direct indicating display),
- transmitter (with quantitative analogue output or corresponding digital output signal),
- switch (with discrete output or corresponding digital output signal),
- measuring assembly (as a grouping of instrument components, which together form a gauge, transmitter or switch).

It should be noted that in the real world, there is not such a clear demarcation between types of measuring equipment. In commercial literature, indicators are often called gauges, although the products offer no quantitative measurement. Similarly, direct indicating displays are often equipped with electrical trip switches which allow a gauge to act as a switch. Finally “transmitter” is by no means a universal term and in particular for flow measurement many manufacturers call this kind of equipment “meter”.

Composite devices

A structural scheme is given, defining how to build up LOPs for devices consisting of several components or assembled from different parts, that is, composite devices and measuring assemblies.

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

Part 11: Lists of properties (LOPs) of measuring equipment for electronic data exchange – Generic structures

1 Scope

This part of IEC 61987 provides:

- a characterisation of industrial process measuring equipment (device type dictionary) for integration in the Common Data Dictionary (CDD), and
- generic structures for operating lists of properties (OLOP) and device lists of properties (DLOP) of measuring equipment in conformance with IEC 61987-10.

The generic structures for the OLOP and DLOP contain the most important blocks for process measuring equipment. 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 IEC 61987-11. For instance, the OLOP and DLOP for flow transmitters with blocks and properties are to be found in IEC 61987-12.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60947-5-6, *Low-voltage switchgear and controlgear – Part 5-6: Control circuit devices and switching elements – DC interface for proximity sensors and switching amplifiers (NAMUR)*

IEC 61069-5, *Industrial-process measurement, control and automation – 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 61987-10:2009, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 10: Lists of Properties (LOPs) for Industrial-Process Measurement and Control for Electronic Data Exchange – Fundamentals*