

INTERNATIONAL STANDARD

**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**

IEC 61987-10:2009

<https://standards.iteh.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 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.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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.

- Catalogue of IEC publications: www.iec.ch/searchpub

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 It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

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

- Electropedia: www.electropedia.org

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

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

IEC 61987-10:2009

<http://www.iec.ch/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009>



IEC 61987-10

Edition 1.0 2009-07

INTERNATIONAL STANDARD

**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**

IEC 61987-10:2009

<https://standards.iteh.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

X

ICS 25.040.40; 35.100.20

ISBN 978-2-88910-597-7

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	10
2 Normative references.....	10
3 Terms, definitions and abbreviations.....	11
3.1 Terms and definitions.....	11
3.2 Abbreviations.....	15
4 Structural elements and concepts of lists of properties.....	16
4.1 General.....	16
4.2 Structural elements.....	16
4.2.1 Properties.....	16
4.2.2 Blocks of properties.....	18
4.2.3 Views.....	19
4.3 Structural concepts.....	19
4.3.1 Cardinality.....	19
4.3.2 Polymorphism.....	20
4.3.3 Composition/Aggregation.....	21
5 Types of Lists of Properties.....	22
5.1 General.....	22
5.2 Administrative List of Properties (ALOP).....	22
5.3 Operating List of Properties (OLOP).....	23
5.4 Device List of Properties (DLOP).....	23
5.5 Commercial List of Properties (CLOP).....	24
5.6 Additional types of Lists of Properties.....	24
5.7 LOP types for composite devices.....	25
6 Structural and Transaction Data.....	25
6.1 Concept Identifier.....	25
6.2 Structural Data.....	26
6.3 Transaction Data.....	26
Annex A (normative) Conceptual model of a List of Properties.....	30
Annex B (informative) Usage of LOPs.....	34
Annex C (informative) Use cases for engineering.....	41
Bibliography.....	48
Figure 1 – Layers of electronic exchange procedures considered in this standard.....	7
Figure 2 – Support for business-to-business relationships through the use of Lists of Properties.....	8
Figure 3 – A property and its attributes.....	17
Figure 4 – Interpretation of a block of properties.....	18
Figure 5 – Illustration of cardinality.....	20
Figure 6 – Illustration of polymorphism.....	21
Figure 7 – Structure of a composite device.....	22
Figure 8 – Relationship between property values in the OLOP and DLOP.....	24
Figure A.1 – Simplified UML scheme of an LOP.....	30

Figure A.2 – Conceptual UML scheme of the data model	31
Figure C.1 – Use of LOP types at individual project stages	41
Figure C.2 – Data exchange in the engineering workflow	42
Figure C.3 – Structural and transaction data for inquiry and offer	44
Figure C.4 – Data exchange throughout the life-cycle of a device	47
Table 1 – Example of concept Identifiers	26
Table 2 – Example of transaction data	27
Table 3 – Example of visualisation of the transaction data	29
Table B.1 – Suggestion for an Administrative List of Properties	34
Table B.2 – Example of Operating List of Properties	37
Table B.3 – Example of Device List of Properties	38
Table C.1 – Structural and transaction data for the example described	46

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC 61987-10:2009](#)

<https://standards.itih.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 61987-10 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, controls and automation.

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

FDIS	Report on voting
65E/134/FDIS	65E/145/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.

This part of IEC 61987 has to be read in conjunction with IEC 61987-1.

A list of all parts in the IEC 61987 series, under the general titles *Industrial-process measurement and control 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 maintenance result date indicated on the IEC web site 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.

A bilingual version of this publication may be issued at a later date.

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC 61987-10:2009](#)

<https://standards.itih.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009>

INTRODUCTION

The exchange of product data between companies, business systems, engineering tools 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.

In the past, 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 once only 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.

IEC 61987-1 makes an important step towards this goal by defining a generic structure in which product features of industrial process measurement and control equipment with analogue or digital output can be arranged. This facilitates the understanding of product descriptions when they are transferred from one party to another. Part 1 of this series of standards applies to the production of catalogues of process measuring and control equipment in paper form supplied by the manufacturer of the product.

The objective of IEC 61987-10 is to make processes involving measuring and control devices more efficient. This means that in addition to the device catalogue data of IEC 61987-1, information on operational and environmental aspects of the device is required. These aspects should be described and expressed in a form that can also be exchanged electronically and handled automatically.

In IEC 61987-10, devices are specified by creating lists of properties (LOPs). The properties themselves are compiled into blocks that describe particular features of a device. By compiling blocks, it is possible to produce a list of properties that completely describe a particular device type or the surroundings in which the devices is or will be installed and operate.

This part of IEC 61987 deals with the following.

- It concerns both properties that may be used in an inquiry and a quotation. It also addresses detailed properties required for integration of a process control device in systems for other tasks, such as planning (for example in Computer Aided Engineering (CAE) systems), maintenance and Enterprise Resource Planning (ERP) systems.
- It provides a method for standardization that helps both suppliers and users of process control equipment and systems to optimize workflows, both within their own companies and in their exchanges with other companies. Depending on their role in the process, engineering, procurement and construction (EPC) contractors may be considered to be either users or suppliers.
- It ensures the clarity of the information provided, as the data and structures are described in unambiguous terms.

It should also be noted that the component data dictionary might also be used for other applications, for example the generation of parts lists. It is also possible to generate legacy specifications from the same source.

Layers of electronic data exchange

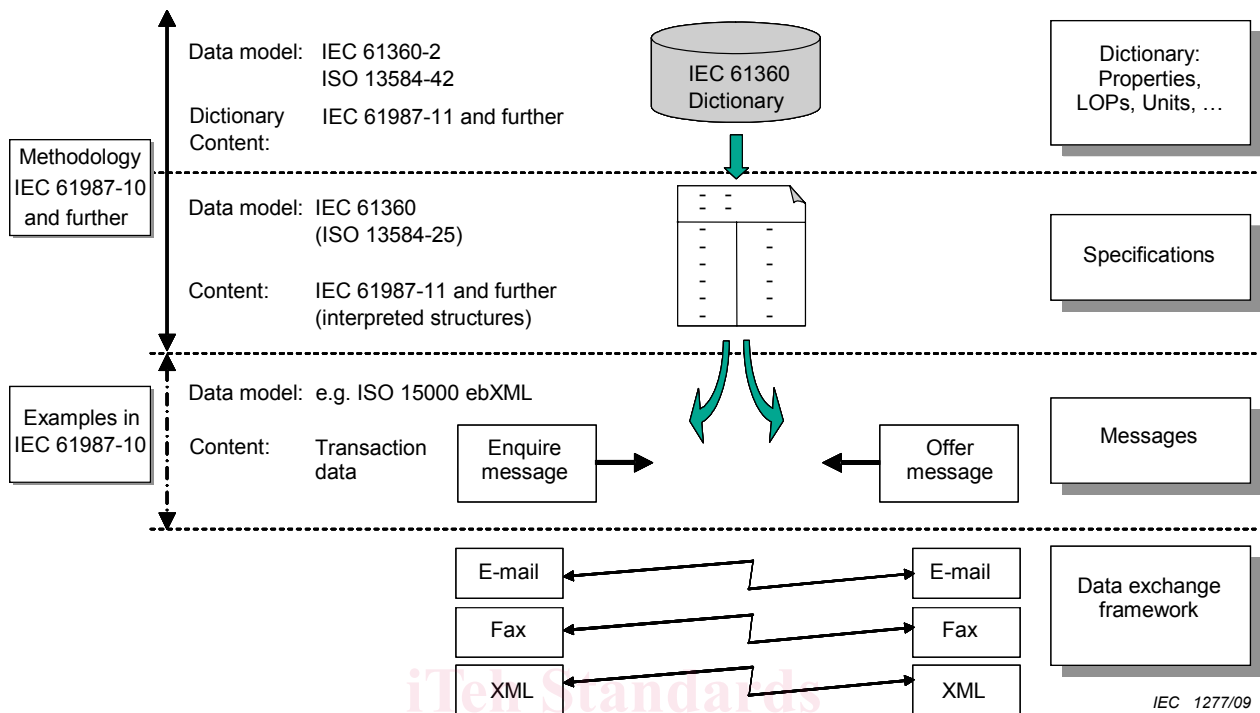


Figure 1 – Layers of electronic exchange procedures considered in this standard

The individual layers of data exchange considered in this part of IEC 61987 are described as follows (see also Figure 1).

<https://standards.iteh.ai/standards/iec/61987-10/2009>

Dictionary: To achieve standardized, distributed, common semantics of the devices, this standard describes a concept dictionary that captures terms, definitions and relationships of the devices. The basis is an IEC component data dictionary for industrial process measurement and control devices that uses the data models of IEC 61360-2 and ISO 13584-42. The dictionary content comprises the properties and blocks which will be defined in future IEC 61987-11, etc. The same standards also define lists of properties for process measurement and control devices.

NOTE 1 Not all devices will be included in the first edition of the dictionary, and it is possible that other devices will be added as new devices and technologies are developed.

Specifications: A process engineer planning a particular area in a plant uses an electronic specification sheet which draws its content from the component data dictionary. Similarly, a manufacturer quoting for an industrial process measuring device that fulfils the conditions defined in the specification sheet defines his device according to another specification sheet, which again draws its content from the component data dictionary. In interpretation of the specifications, the patterns of cardinality or polymorphism are evaluated.

Messages: Communication messages containing information about sender, receiver and transport protocol are generated from specifications.

NOTE 2 The generation of messages is not in the scope of this standard.

Data exchange framework: The messages are sent from one business partner to the other using data exchange frameworks. These can be conventional (e-mail, fax) using templates as described in Annex C of this standard, or XML message based distribution frameworks.

EXAMPLE: One example of a XML message distribution framework is ISO 15000 (ebXML).

The methodology to create these specifications and the description of the mechanisms that are required to compile meaningful data into such specifications are defined in this standard. Several aspects of the devices are also the subject of standardisation in this standard. For example, one aspect describes the operating environment at the installation point, that is the conditions under which a process measuring device must operate, and another describes the device specification which meets these conditions.

The properties contained in the component data dictionary however, may also serve other purposes, for example, the precise location of the production unit or control loop might form part of administrative and commercial exchanges. Similarly, more precise engineering data such as the designation of terminals or device calibration data might also be exchanged by means of additional specification sheets or by supplementing the device specification sheets.

Beyond the scope of this standard is the specification of transactional data required to exchange electronic specification sheets between companies, as shown in the messages layer of Figure 1. Similarly, no particular framework for data exchange is specified.

Each device type is defined by an LOP containing the properties that apply to it. This is a basic requirement for exchanging device information between different information technology (IT) systems.

The use of the LOPs therefore supports data exchange between systems in a business-to-business relationship and between systems within an organization, for example, CAE or ERP systems (see Figure 2). This standard also makes provision for the storage of device data as LOPs in process control systems or field devices.

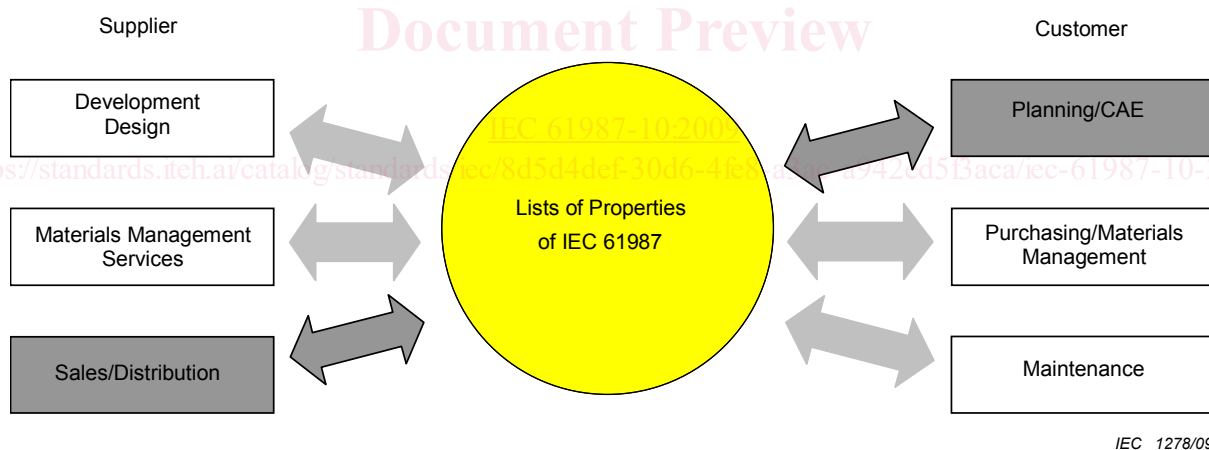


Figure 2 – Support for business-to-business relationships through the use of Lists of Properties

IEC 61987-10, IEC 61987-11 and further

IEC 61987-10 defines the approach for structuring lists of properties for electrical and process control equipment, for example measuring devices, actuators, motors, low-voltage switchgear, etc., in order to facilitate fully automatic engineering workflows in the planning and maintenance of industrial plants and to allow both the customers and the suppliers of the devices to optimize their processes and workflows.

Future IEC 61987-11 will contain lists of properties for measuring device types commonly used in the process industry.

Subsequent parts of IEC 61987 are already planned. These will contain lists of properties for other device families, such as actuators or signal conversion devices.

The properties themselves are to be found in the IEC Component Data Dictionary and follow the semantics and the structure of the IEC 61360 and ISO 13584 series of standards.

The concept of properties and structured lists is the subject of various standards. The data model described in the IEC 61360 and ISO 13584 series of standards is used in this standard. The structure defined for industrial-process measuring equipment in IEC 61987-1 is used, with some additions and modifications, to organise the contents of Device LOPs into blocks.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 61987-10:2009](#)

<https://standards.iteh.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/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

1 Scope

This part of IEC 61987 provides a method of standardizing the descriptions of process control devices, instrumentation and auxiliary equipment as well as their operating environments and operating requirements (for example, measuring point specification data). The aims of this standard are

- to define a common language for customers and suppliers through the publication of Lists of Properties (LOPs),
- to optimize workflows between customers and suppliers as well as in processes such as engineering, development and purchasing within their own organizations,
- to reduce transaction costs.

The standard describes industrial-process device types and devices using structured lists of properties and makes the associated properties available in a component data dictionary.

The intention is to produce a reference dictionary which allows a description of the inquiry, offer, company internal and other descriptions of process control systems, instrumentation and auxiliary equipment based on list of properties.

2 Normative references

[IEC 61987-10:2009](https://standards.iteh.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009)

<https://standards.iteh.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009>

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

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
Amendment 1 (1999)

IEC 61346-1:1996, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules*

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

IEC 61360-1, *Standard data element types with associated classification scheme for electric components – Part 1: Definitions – Principles and methods*

IEC 61360-2, *Standard data element types with associated classification scheme for electric components – Part 2: EXPRESS dictionary schema*

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

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*

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

ISO 13584-42, *Industrial automation systems and integration – Parts library – Part 42: Description methodology: Methodology for structuring part families*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1 administrative list of properties

ALOP

list of properties describing the aspect concerning initiating, tracking and completing a transaction

NOTE 1 The administrative list of properties contains, for example, information about the type of document (for example, inquiry, quotation) and the issuing details (for example, contact data of the author) and may be placed at the head of the transaction document.

NOTE 2 An ALOP may apply to a transaction of multiple instances of one or more device types, and will seldom be related to only a single device type.

3.1.2 aspect

specific way of selecting information on or describing a system or an object of a system

[IEC 61346-1, 3.3]

EXAMPLE: Such a way may be

- information about how to describe an object (device) – the describing aspect,
- information about the surrounding conditions in which a device operates – the operating aspect.

3.1.3 attribute

characteristic of an object or entity

[ISO/IEC 11179-1:2004, 3.1.1]

EXAMPLE: Properties, blocks, LOPs, units of measure etc. are entities.

3.1.4 block of properties

collection of properties relating to (describing) one concept of the device type being considered, for example device output, environmental conditions, operating conditions, device dimensions

NOTE 1 A block may also comprise other blocks of properties.

NOTE 2 A block of properties is a feature class in the sense of the series of standards IEC 61360 and ISO 13584.

3.1.5 cardinality

pattern defining the number of times a concept reoccurs within a description

NOTE 1 In IEC 61987-10 and future parts of IEC 61987, cardinality is used to indicate the repetition of blocks of properties or LOPs.

NOTE 2 In structural data cardinality defines the fact that the block may be repeated, whereas in transactional data the cardinality defines the number of times the block is repeated.

NOTE 3 Cardinality may be zero.

NOTE 4 Cardinality allows a block of properties contained in a list of properties to be used more than once for a particular transaction in order to describe, for example, a device with several different outputs or more than one process cases in describing the requirements for a device.

NOTE 5 Cardinality is mapped to IEC 61360 data model by means of a property that is placed directly before the block or property which can be repeated. The repeated block or property occurs in the structural data only once but in the transaction data as many times as the value of the cardinality property defines

3.1.6 characteristic

abstraction of a property of an object or of a set of objects

[ISO 1087-1:2000, 3.2.4]

NOTE 1 Characteristics are used for describing concepts.

NOTE 2 This standard uses properties to describe devices, their operating environment (ambient conditions) or other aspects.

3.1.7 commercial list of properties CLOP

list of properties describing the aspect concerning business workflows

NOTE A commercial list of properties contains for example prices, costs, delivery times, transport information, and order or delivery quantity.

3.1.8 composite device

device composed of various devices

[IEC 61987-10:2009](https://standards.iteh.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009)

<https://standards.iteh.ai/catalog/standards/iec/8d5d4def-30d6-4fe8-a3ac-a942ed5f3aca/iec-61987-10-2009>

NOTE These devices might be supplied as a whole or the parts comprising the assembly of the composite device might be supplied individually.

EXAMPLE: A control valve which consists of the valve itself, a drive and a positioner.

3.1.9 concept

unit of knowledge described by a unique combination of characteristics

[ISO 1087-1:2000, 3.2.1, modified]

EXAMPLE: IEC 61987 subsumes LOP, blocks, properties, unit of measure, values etc. as concepts.

3.1.10 concept identifier

sequence of characters, capable of uniquely identifying that with which it is associated, within a specified context

[ISO/IEC 11179-1:2004, 3.1.3, modified]

NOTE This standard prefers the approach of IEC 61360-1 with a six-character code, which is unique for all concepts.

3.1.11 customer

organization or person that receives a product