# IEC 62569-1

Edition 1.0 2017-07

# INTERNATIONAL STANDARD

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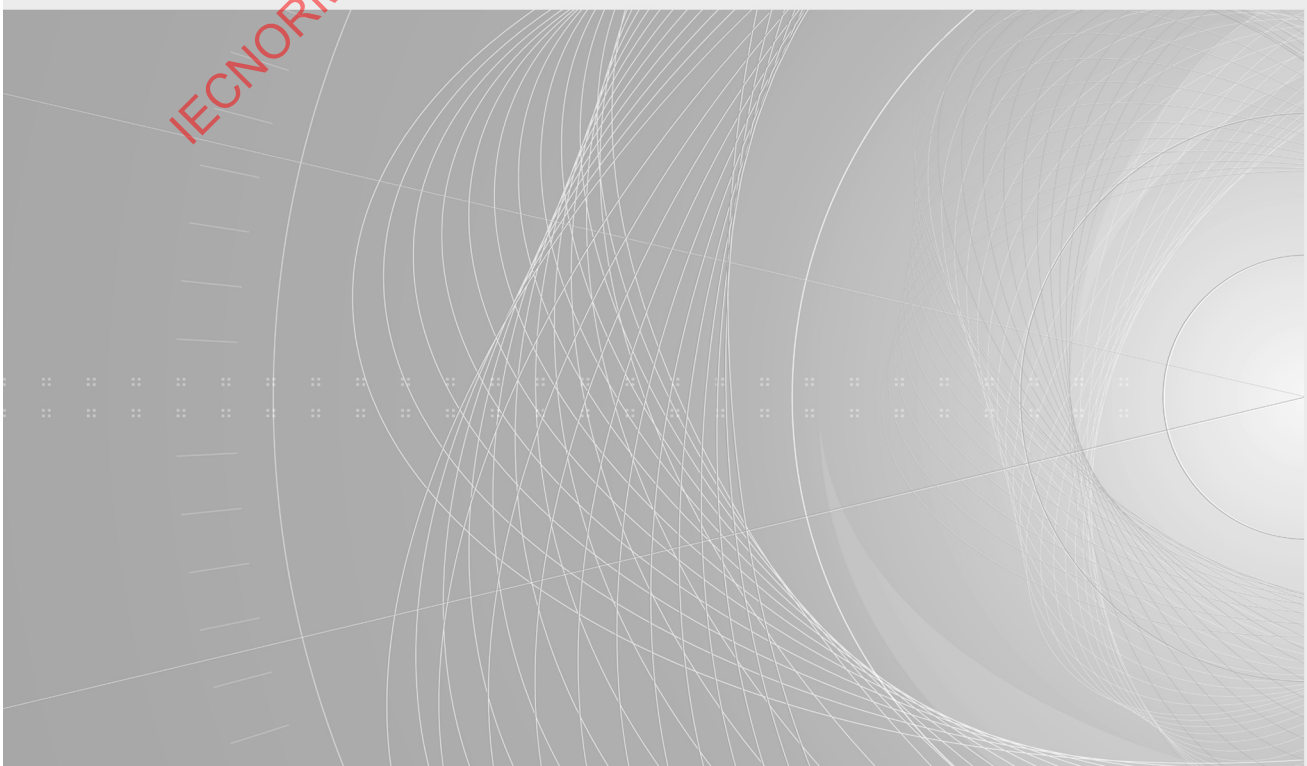
HORIZONTAL STANDARD

## Generic specification of information on products by properties – Part 1: Principles and methods





IEC 62569-1:2017-07(en)

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# INTERNATIONAL STANDARD



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## Generic specification of information on products by properties – Part 1: Principles and methods



INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 01.110 ; 29.020

ISBN 978-2-8322-4428-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# GENERIC SPECIFICATION OF INFORMATION ON PRODUCTS BY PROPERTIES –

## Part 1: Principles and methods

## FOREWORD

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International Standard IEC 62569-1 has been prepared by IEC technical committee 3: Information structures and elements, identification and marking principles, documentation and graphical symbols.

This first edition cancels and replaces IEC PAS 62569-1:2009. This edition constitutes a technical revision.

The text of this International Standard is based on the following documents:

| FDIS | Report on voting |
|---|---|
| 3/1310/FDIS | 3/1314/RVD |

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

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

Terms which are defined in Clause 3 are *italicized* when they occur in definitions of other terms in Clause 3.

A list of all parts in the IEC 62569 series, published under the general title *Generic specification of information on products by properties*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

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

**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

This document establishes general principles and methods required for all parts of IEC 62569, to manage the product-related information as described in the following parts along the life cycle of an object, e.g. a product during its operational use.

IEC 62569-2 provides a generally applicable structure of a generic specification of information on products presenting those common clauses which are independent of any specific equipment, component and device. It serves as a guide for the preparation of technical specifications for various objects. Due to its generic type, particular issues referring to specific product groups are excluded. These need to be obtained from the specific product descriptions within product standards.

IEC 62569-3 provides a collection of generally applicable object properties used in conjunction with the predefined structure in IEC 62569-2, being the basis for, for example, an XML-based electronic template, serving as generic template for the development of product-specific specifications of information by product committees within IEC and ISO, industrial consortia or other industrial organizations.

Figure 1 provides an overview of the intention of this standard. The generic specification for information of objects represents an overall approach for those mainly technical information issues which are generally required by users of an object, and being independent of any specific product class, such as identification, classification or accessibility information for logical or physical interconnection to other products. It provides sets of object properties which may contain quantitative, non-quantitative or conditional types, containing predefined value sets for the non-quantitative, or units for the quantitative types.

The next step is the application of the available generic information on a specific product class such as motor, transformer or resistor. In this step the previously available generic information is aggregated by additional information focusing on that information which is typically applicable for the considered specific class. The result is applicable only for that considered class, and named product-class-specific blank detail specification. For each further class, such a step is repeated. The object properties contained in a blank detail specification for a specific product class are either of the quantitative or non-quantitative type and also foreseen with predefined value sets for the non-quantitative, or units for the quantitative types.

These blank detail specifications should be made available (e.g. as a web-based collection), allowing users to establish the detail specifications (instantiate or populate with data) for automated and controlled use by industry in the business process.

The next step is the application of blank detail specifications in daily practice in industry, when a user populates the object properties of the blank detail specification with required values for his specific application. Depending on the needs, further object properties may be added, marked as not applicable or complemented by qualifiers, etc.

The result may be used, for example, as a functional specification for a specific object within a system or plant, or used for an inquiry.

From this perspective it is easy to deduce that a prerequisite for an economic implementation of the above specifications is the existence of an internationally available data dictionary with public access, providing internationally standardized collections of (dictionary) properties following common methods as defined in the IEC 61360 series.

Referring from object descriptions to previously defined standardized semantic (dictionary) property descriptions is the key issue of an effective, reliable and secure electronic business. For the relations among (dictionary) properties, the associated data dictionary and the different specifications, see Figure 1.

Within this document two main concepts are differentiated:

A. a specification concept for “real or abstract” objects;

B. a data dictionary containing predefined information elements, each described by a rigorous set of attributes and unambiguously identified, so that its information elements can be used as a reference when preparing the concept A. Such a data dictionary is an optional tool to make the descriptions for concept A. It is of course a “real world” object but a quite different one and separated from the “real world” intended to be described.

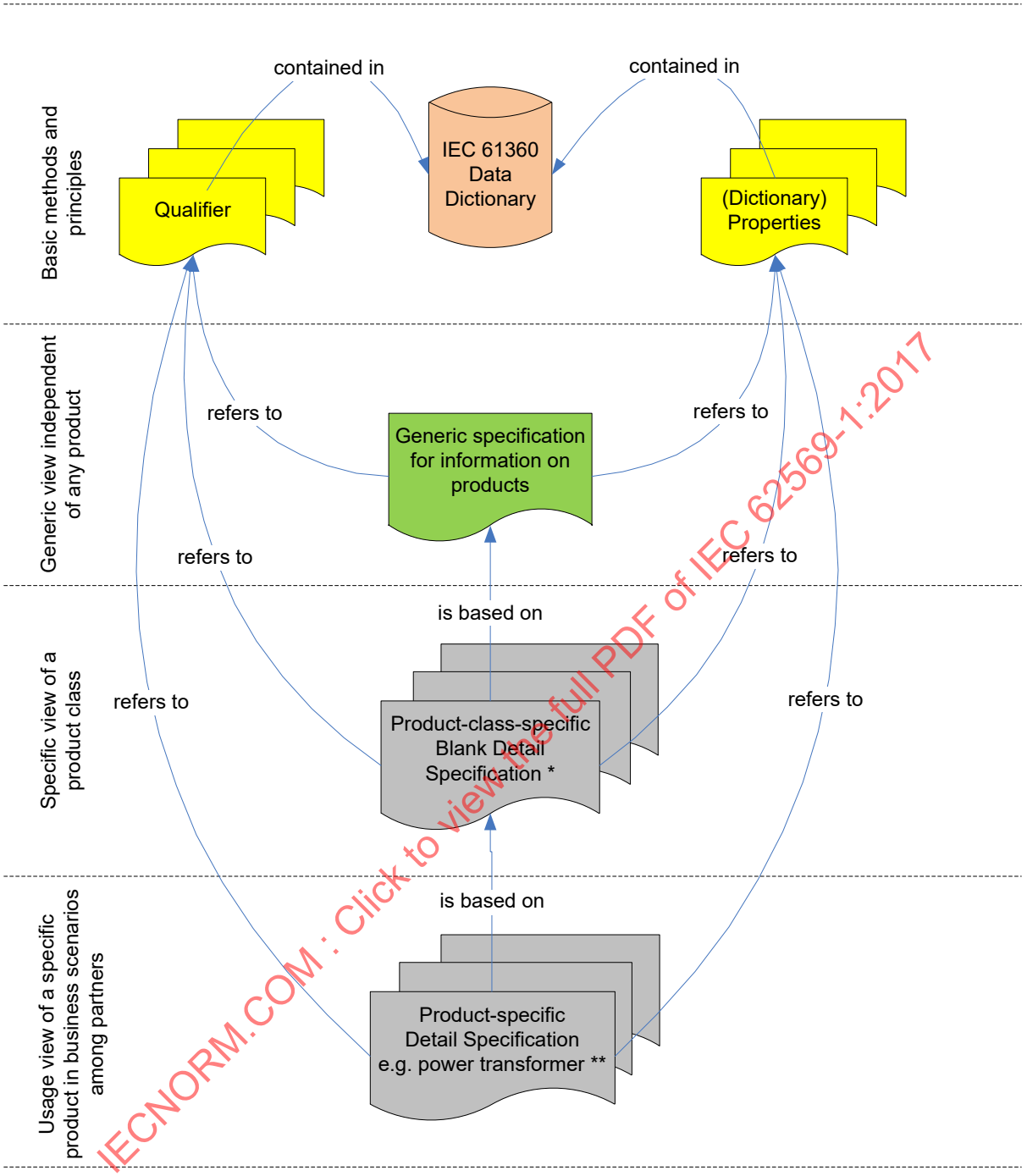
For concept A, the term object property and set of object properties will be applied. For issues relating to concept B, the term (dictionary) property and set of (dictionary) properties will be applied to indicate that here a property or set of properties residing in a data dictionary is meant.

The purpose of this document is to describe how real world specifications or descriptions are to be prepared by making use of the data dictionary defined in IEC 61360.

The IEC 62569 series is a companion standard providing methods of expanding the use of existing standardized (dictionary) properties as provided in the IEC CDD (Common Data Dictionary) along the life cycle periods without the need to define additional (dictionary) properties or to redefine such supporting economic engineering and data management.

NOTE 1 As the referred data dictionary of IEC 61360 is quite different from a dictionary, the term "data dictionary" is consistently used within this document.

NOTE 2 Such a data dictionary is available as a data base application to be found under http://std.iec.ch/iec61360 [retrieved 2016-05-03].




* Developed by Product Committees, Consortia or other Organizations, e.g. for lifting cranes, capacitors, resistors, power transformers

** Filled with product specific data at a specified time in the life cycle process of a power transformer; used in a defined business scenario among industrial partners, e.g. seller,buyer

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**Figure 1 – Context of generic specification for information on products**

Figure 2 shows a business scenario about the usage of a detail specification (based on the generic specification) for information on products between business parties.

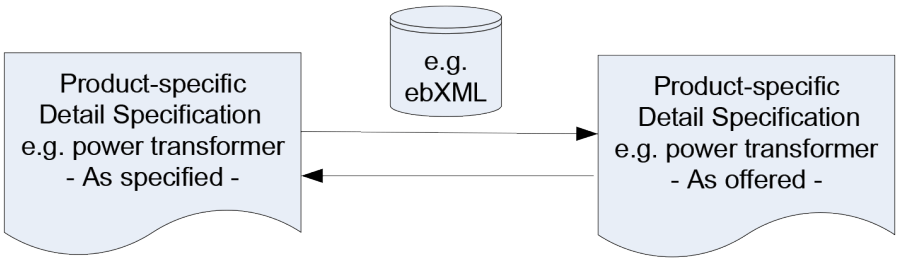



**Figure 2 – Business scenario between parties**

If a specification for information in the form of an electronic template is associated with a schema for data exchange, for example an XML schema or any other tagged electronic file format, the content of the product-specific detail specification can be easily used for import and export of data values in conjunction with data bases for material management systems. See Figure 3.

A specification template can also be imported for the setting up of the internal structures within a data base without having the need to import associated values.

Conversely, detail specifications can be generated to export data using a predefined template based on the generic specification for information on products.

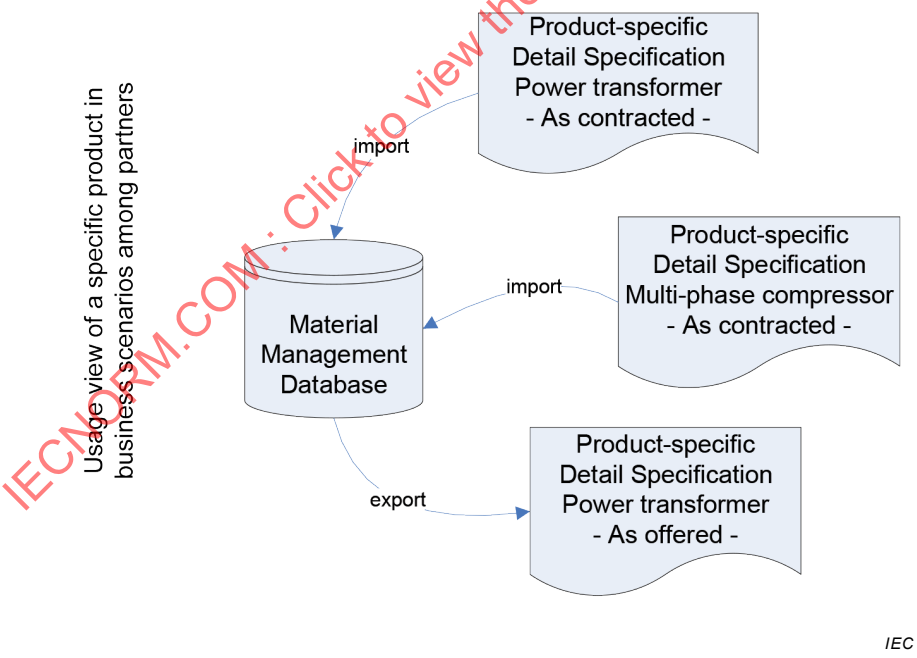



**Figure 3 – Import and export possibilities using tagged formats**

# GENERIC SPECIFICATION OF INFORMATION ON PRODUCTS BY PROPERTIES –

# Part 1: Principles and methods

## 1 Scope

The IEC 62569 series defines principles and methods for the specification of objects by object properties, for example in data sheets, by utilizing predefined and internationally standardized (dictionary) properties residing in the data dictionary of IEC 61360.

The IEC 62569 series is being developed to transfer the former paper-based applications of blank detail specifications or product descriptions towards supporting electronic business allowing the evaluation and management of described items by computers.

This part of IEC 62569 specifies several qualifiers to be used with object or (dictionary) properties and their values indicating life cycle and other aspects of the property. It is a prerequisite for the usage of the other parts of IEC 62569.

## 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 61360-1:—[1], *Standard data element types with associated classification scheme for electric components – Part 1: Definitions, principles and methods*

IEC TS 62720, *Identification of units of measurement for computer-based processing*

## 3 Terms, definitions and abbreviated terms

### 3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

**3.1.1**
**attribute**
data element for the computer-sensible description of a property, a relation or a class

Note 1 to entry: An attribute describes only one single detail of a property, of a class or of a relation.

[1] Under preparation. Stage at time of publication: IEC CDV 61360-1:2016.

EXAMPLE The names of a property, the code of a class, the measure unit in which values of a property are provided.

[SOURCE: ISO/IEC Guide 77-2:2008, 2.2, modified – Editorial correction in the example.]

**3.1.2**
**class**
abstraction of a set of similar *products*

[SOURCE: ISO/IEC Guide 77-2:2008, 2.3, modified – The second preferred term "class of products" is omitted.]

**3.1.3**
**enumeration**
list of named constants called enumerator

Note 1 to entry: Within an enumeration the names of the enumerators shall be unique.

[SOURCE: IEC 61360-1:—, 3.1.13]

**3.1.4**
**life cycle**
<of a *product specimen*> consecutive and interlinked stages of a product or system, from raw material acquisition or generation of natural resources to final disposal

[SOURCE: ISO 14040:2006, 3.1, modified – Specific context information is added.]

**3.1.5**
**life cycle**
<of a *product type*> consecutive and interlinked stages of a *product type* from conception to phasing out

**3.1.6**
**life cycle**
<of a component *occurrence* in a *product*> consecutive and interlinked stages of a component *occurrence* in a *product* or system from identification of need over implementation with a product specimen, replacement, etc., to final disposition

Note 1 to entry: The life cycle concept in this document is focused on the period of the operational use of a product.

**3.1.7**
**object**
entity treated in a process of development, implementation, usage and disposal

Note 1 to entry: The object may refer to a physical or non-physical “thing”, i.e. anything that might exist, exists or did exist.

Note 2 to entry: The object has information associated to it.

[SOURCE: IEC 81346-1:2009, 3.1]

**3.1.8**
**occurrence**
use of an object type for a specific function, as a specific component, or in a specific location within a plant or system

Note 1 to entry: This definition is taken from IEC 81346-1:2009, 4.8.

**3.1.9**
**product**
result of labour or of a natural or industrial process

[SOURCE: IEC 61360-1:—, 3.1.23]

**3.1.10**
**product specimen**
**product instance**
physical implementation of a *product type*

**3.1.11**
**product type**
result of a specific development process for a range of *products* belonging to the same *product class*

**3.1.12**
**product standard**
standard that specifies requirements to be fulfilled by a *product* or group of *products* to establish its fitness for purpose

Note 1 to entry: A product standard may include, in addition to the fitness-for-purpose requirements, directly or by reference, aspects such as terminology, sampling, testing, packaging and labelling and, sometimes, processing requirements.

Note 2 to entry: A product standard can either be complete or not, according to whether it specifies all or only a part of the necessary requirements. In this respect, one may differentiate between standards such as dimensional, material and technical delivery standards.

Note 3 to entry: This definition is taken from ISO/IEC Guide 2:2004.

**3.1.13**
**property**
**data element type**
defined parameter suitable for the description and differentiation of objects

Note 1 to entry: A property describes one characteristic of a given object.

Note 2 to entry: A property can have attributes such as code, version, and revision.

Note 3 to entry: The specification of a property can include predefined choices of values.

[SOURCE: ISO/IEC Guide 77-2:2008, 2.18, modified – Note 4 is omitted.]

**3.1.14**
**quantitative property**
*property* with a numerical *value* representing a physical quantity, a quantity of information or a count of *objects*

[SOURCE: IEC 61360-2:2012, 3.40, modified – The previous term data element type is replaced by the term property.]

**3.1.15**
**non-quantitative property**
*property* that identifies or describes an *object* by means of codes, abbreviations, names, references or descriptions

Note 1 to entry: Typical information content of non-quantitative properties is items such as codes, abbreviations, names, references, or descriptions.

[SOURCE: IEC 61360-2:2012, 3.28, modified – The previous term data element type is replaced by the term property.]

**3.1.16**
**condition property**
*property* information object that affects the value of another *property*

Note 1 to entry: A condition property has only a meaning when it is used in combination with another property.

Note 2 to entry: Within a specification there is normally a set of conditions (general or overall conditions) whose values are considered constant throughout the specification and which need to be considered, unless a property value is locally overwritten. Such set of conditions is normally provided in the header section of a specification.

Note 3 to entry: The value of a specific property may depend on one or many other property values; the latter ones serving as conditions influencing the value of the referred property. This kind of condition may appear throughout a specification and is independently managed from those conditions as described under Note 2.

Note 4 to entry: This definition is taken from IEC 61360-2:2012, 5.9.5.1.

**3.1.17**
**dependent condition property**
*property* whose value depends explicitly on the value(s) of some condition(s)

Note 1 to entry: This definition is taken from IEC 61360-2:2012, 5.9.5.2

**3.1.18**
**(object) property**
information element used to describe the characteristics of an object of interest

Note 1 to entry: The term information element is within this document understood in a generic sense providing information about something which is considered relevant, not limited for example to the strict description of an attribute of a property or conditions, etc., as is used for data modelling in IEC 61360-1.

**3.1.19**
**(dictionary) property**
predefined and standardized information element residing in a data dictionary, each described by a rigorous set of *attributes* and unambiguously identified, so that it can be referenced

**3.1.20**
**specification**
document that states requirements, functionally related characteristics, processes, or rules related to a unique quality that an in-process part, a finished part, or a *product* or service shall possess

**3.1.21**
**generic blank detail specification**
*object class* independent *specification* of the *properties* of an *object* by the use of *(dictionary) properties*

**3.1.22**
**blank detail specification**
*generic blank detail specification* adapted to a specific *product class*

Note 1 to entry: A product-class-specific specification is often used as a basis for the development of templates for use in engineering activities. Depending on the tools in use, different templates can be developed for the same purpose.

**3.1.23**
**product-type blank detail specification**
blank detail information adapted to a specific *product type*

**3.1.24**
**detail specification**
product-class-specific or product-type-specific specification with filled in *values* of the *properties*

**3.1.25**
**base quantity**
quantity in a conventionally chosen subset of a given system of quantities, where no quantity within the subset can be expressed in terms of the others

Note 1 to entry: The subset mentioned in the definition is termed the set of base quantities. The International System of Quantities (ISQ) is defined by a set of seven base quantities.

Note 2 to entry: Base quantities are referred to as being mutually independent since a base quantity cannot be expressed as a product of powers of the other base quantities.

Note 3 to entry: The quantity “number of entities” can be regarded as a base quantity in any system of quantities.

[SOURCE: IEC 60050-112:2010, 112-01-08]

**3.1.26**
**derived quantity**
quantity, in a system of quantities, defined in terms of the base quantities of that system

Note 1 to entry: For example, in a system of quantities having the base quantities length and mass, mass density is a derived quantity defined as the quotient of mass by volume (length to the third power).

[SOURCE: IEC 60050-112:2010, 112-01-10]

**3.1.27**
**value of a quantity**
**quantity value**
**value**
number and reference together expressing magnitude of a quantity

Note 1 to entry: For related examples see the full IEC 60050-112 reference.

[SOURCE: IEC 60050-112:2010, 112-01-28]

**3.1.28**
**unit of measurement**
**measurement unit**
**unit**
real scalar quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the second quantity to the first one as a number

Note 1 to entry: Units of measurement are designated by conventionally assigned names and symbols.

Note 2 to entry: Units of quantities of the same dimension may be designated by the same name and symbol even when the quantities are not of the same kind. For example joule per kelvin and J/K are respectively the name and symbol of both a unit of heat capacity and a unit of entropy, which are generally not considered to be quantities of the same kind. Another example is the unit ohm (Ω) for both electric resistance and electric impedance. However, in some cases special unit names are restricted to be used with quantities of specific kind only. For example, the unit second to the power minus one (1/s) is called hertz (Hz) when used for frequencies and becquerel (Bq) when used for activities of radionuclides. Another example is joule (J), used for energy, but never for moment of force, the unit of which is newton metre (N·m).

Note 3 to entry: Units of quantities of dimension one are numbers. In some cases, these units are given special names, e.g. radian (rad), steradian (sr), and decibel (dB), or are expressed by quotients such as millimole per mole (mmol/mol) equal to $10^{-3}$, and microgram per kilogram (µg/kg) equal to $10^{-9}$.

Note 4 to entry: For a given quantity, the short term “unit” is often combined with the quantity name, such as "unit of mass".

[SOURCE: IEC 60050-112:2010, 112-01-14]

**3.1.29**
**base unit**
unit of measurement that is adopted by convention for a base quantity

Note 1 to entry: In each coherent system of units, there is only one base unit for each base quantity. In the SI for example, the metre is the base unit of length. The centimetre and the kilometre are also units of length, but they are not base units in the SI. However, in the CGS systems, the centimetre is the base unit of length.

Note 2 to entry: A base unit may also serve for a derived quantity of the same dimension. For example, rainfall, when defined as volume per area (areic volume), has the metre as a coherent derived unit in the SI. The ampere, base unit of electric current, is also the coherent derived unit of scalar magnetic potential.

Note 3 to entry: For the quantity “number of entities”, the number one, symbol 1, can be regarded as a base unit in any system of units

[SOURCE: IEC 60050-112:2010, 112-01-18]

**3.1.30**
**derived unit**
unit of measurement for a derived quantity

Note 1 to entry: Some derived units in the International System of Units (SI) have special names, e.g. hertz for frequency and joule for energy, but others have compound names, e.g. metre per second for speed. Compounds including units with special names are also used, e.g. volt per metre for the electric field strength, and newton metre for torque. See in particular ISO 31 and International Standard 80000.

Note 2 to entry: Derived units can also be expressed by using multiples and submultiples. For example, the metre per second, symbol m/s, and the centimetre per second, symbol cm/s, are derived units of speed in the SI. The kilometre per hour, symbol km/h, is a unit of speed outside the SI but accepted for use with the SI, because the unit hour is accepted for use with the SI. The knot, equal to one nautical mile per hour, is a unit of speed outside the SI that is used by special interest groups.

[SOURCE: IEC 60050-112:2010, 112-01-19]

### 3.2 Abbreviated terms

DS detail specification

BDS blank detail specification

DS detail specification

GSIP generic specification of information for products

CDD common data dictionary

## 4 Specifications

Product class or product type specific specifications, often also known as functional specifications, device profiles or blank detail specifications, are used widely in industry. Such specifications apply predefined properties of products. The properties can be independent of any specific product specimen at the time of preparing the specification or may be based on characteristics inherent in a specimen that has demonstrated suitability for the application.

During the life cycle of a product, each property will be associated with specific values which are either specific to the referred product type or product specimen. The values of a property may be selected from a range of predefined values.

The first specification in the life cycle of a product (type) is usually based on functional aspects.

Depending on the size of the product to be specified, it is recommended to structure it into objects of interest. IEC 81346-1 provides methods to structure objects under functional, locational or product aspects. A specification under functional aspects provides requirements to an object looking only at those features that the object is designed to have. A functional specification may therefore include specifications for multiple product classes or product type specifications.

This document takes provisions in order to reuse the once defined properties of a referred product for different purposes at different points in time, e.g. starting with the inquiry, offer, contract, delivery, operation, maintenance, etc.

NOTE Functional specifications can play different roles in different contexts, for example in the integration of enterprise control systems, see IEC 62264, or in industrial–process measurement and control, see IEC 61987-10.

In the past, product class specific specifications were used mostly on paper or in electronic form intended for human reading only.

Today, such specifications need also to be made available as computer interpretable templates downloadable from a web server or other future web-based applications.

An electronic template is structured, grouping information in the form of sets of properties required for specification, procurement, engineering planning and construction, operation and maintenance along the life cycle of the referred product.

A generic structure should be applied for all specifications for products independent of their types in order to ease and accelerate the use of a template also by humans.

Due to occurring changes of the value(s) associated with the same property of the same product type in the development process, it is necessary to keep track of those changes made at the different stages in the life cycle. Therefore each change in such a specification and/or property shall be stored and clearly distinguished together with a time stamp. This allows to keep track of changes of values between different stages in the development process and to refer back to the originally required values. Such changes may be applied to a single property or to a set of properties.

This document provides generic methods with respect to content-related issues contained in product class specific specification.

It is of high industrial value to make the resulting electronic templates available for download by market stakeholders.

The IEC 62569 series establishes general requirements with respect to:

– the structural content of a specification independent of a specific product class;
– the specification of properties describing a specific product class;
– the reuse of existing specifications and existing properties along the life cycle of a described product;
– the general requirements with respect to a computer sensible evaluation of the data contained in such an electronic template independent of their visual presentation in a specification document;
– import and export requirements from and to data bases for the generation of electronic detail specifications.



## 5 Properties

### 5.1 Object properties versus dictionary properties

An object, abstract as well as concrete, can for the purpose of specification generally be described by a set of exposed properties.

NOTE 1 There can, however, be cases when this cannot be done due to lack of common agreement on the definitions of characteristic properties and/or clear expression of their value.

NOTE 2 There are kinds of properties that are used to characterize other properties as a “meta-property”. On the other hand there are properties which characterize the concept for example of a product, as its characteristics, which are also usually called properties, in other terms also known as product properties.

NOTE 3 It is not within the scope of this document to judge if a specific object property is applicable for inclusion in IEC CDD or not. When foreseen to be included in IEC CDD, the requirements in IEC 61360-1and IEC 61360-6 apply.

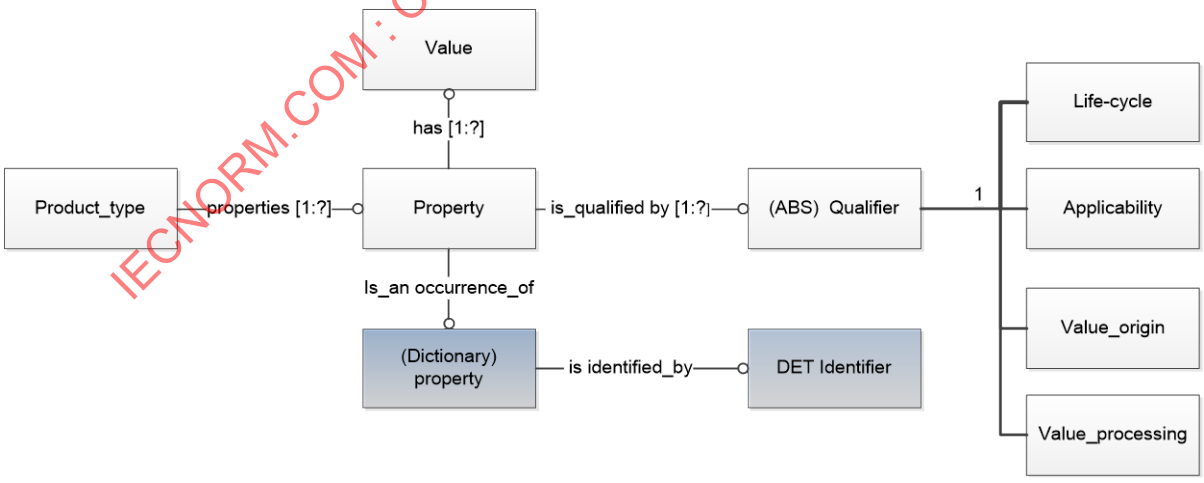
An object property is a named characteristic parameter that is assigned a quantitative, qualitative or conditional value.

During the life cycle of an object (e.g. a component, a product type, or product specimen) the value of such a parameter usually undergoes changes. It may therefore be necessary to qualify the value with regard to the conditions valid in the actual situation. For example, in a later phase of the life cycle it may be of interest to retrieve the value from an earlier phase. A prerequisite of such consideration is of course that the semantic integrity of a used property is kept along the life cycle, i.e. the semantic meaning is unchanged. Similar needs for qualification of a property may exist with regard to the processes for obtaining the value and the applicability of a property.

A (dictionary) property is a unit of information for which the identification, description, value representation and often also possible values have been specified. Defined (dictionary) properties and set of (dictionary) properties are contained in data dictionaries, for example IEC 61360 DB (IEC CDD) and ISO 13548-42 compliant data dictionaries. The elements in a data dictionary are intended to be used as reference for the establishment of specifications and descriptions.

An object property needed in a product specification can therefore be unambiguously expressed by means of a reference to a specific (dictionary) property, together with the relevant value, if available. This reference is independent of how the value is qualified in the actual context. In other words, an object property can be seen as an occurrence of a (dictionary) property in a specification context. This can be illustrated as shown in Figure 4.

NOTE 4 Figures 4, 5 and 6 use a simplified EXPRESS-G notation based on ISO 10303-11:2004. For a short reading introduction, see http://tc3.iec.ch/txt/xpress.pdf. The figures are not considered to serve as data models but for simple illustration.




IEC

**Figure 4 – Relation between the properties of a product type and the (dictionary) properties of a data dictionary used for their expression**

In a specification there may be many occurrences of the same (dictionary) property, differentiated by means of value qualifiers (or property designations). By studying the different occurrences of a specific (dictionary) property in a given specification, it is thus possible to study the development and quality of the values assigned to the property. Since (dictionary)

properties are rigorously defined in order to allow computer assisted interpretation, such a study can easily be performed by computer.

From the statement that an (object) property is an occurrence of a (dictionary) property follows that all attributes that define this (dictionary) property apply also to the (object) property. Note, however, that the name can be a “local” one, e.g. one of the possible synonyms, and that the values in practice can be restricted to just a part of the possible set of values.

The different value qualifiers for a property are described in Clause 6.

## 5.2 Sets of properties for specific purposes

Specifications are usually prepared to serve specific purposes (activities) in the life cycle of a product. Such purposes are often of a recurring and generic nature, and it may therefore be useful to describe the purposes for which such sets of properties are needed. Figure 5 illustrates the principle of how a set of object properties may be referenced by a set of available dictionary properties.

NOTE Within IEC 61360-1, sets of (dictionary) properties are defined using different class types.

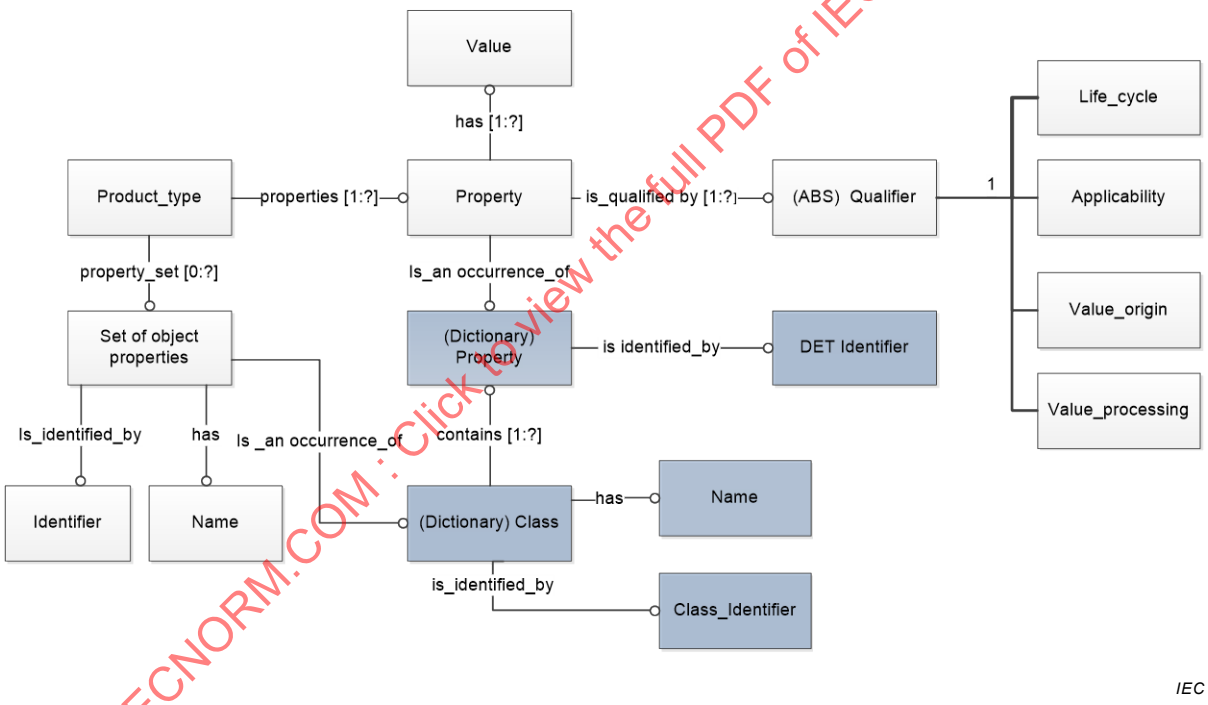



**Figure 5 – Inclusion of sets of properties**

Such sets of properties are further described in IEC 62569-2 and IEC 62569-3.

## 5.3 Properties of components

Properties are in many cases assigned to a product type seen as a whole unit, i.e. they are assigned to the product seen as a “black box”. In such cases, there is no need to care about the internal structure of the product type, and its possible components can be left unspecified in the actual situation.

In other cases, the properties can or need to be assigned to expected, planned or known components of the product type. In such cases the product should be structured, preferably in accordance with IEC 81346-1, with the goal to identify the components down to a level where no further decomposition is required for assignment of properties.

IEC 81346-1 can be applied to any planned or existing product or system type, and the structuring can be performed along the function, product, location or other aspects.

If a final structure (i.e. the complete set of applicable hierarchical structures) of the product type is already known at the time of preparation of a specification, this structure should be used for the definition of the components and the assigned reference designations used for their identification.

If a final structure is not known at the time of preparation of the specification, a structure can be created, together with expected components. Also such components can be identified with reference designations. IEC 81346-1 describes how this can be done, and gives also guidance on how such a structure may be converted into a “real” one at a later stage in the life cycle.

In any case the defined structure should then be used also for the structuring of the specification, so that all components are readily identified and the relations between them highlighted. Properties shall then be assigned to each of these components to the extent required. Figure 6 illustrates how the product type under consideration is composed of components, identified by reference designations in the context of this product. The components are in their turn occurrences of other product types defined and identified elsewhere, for example in a product catalogue.

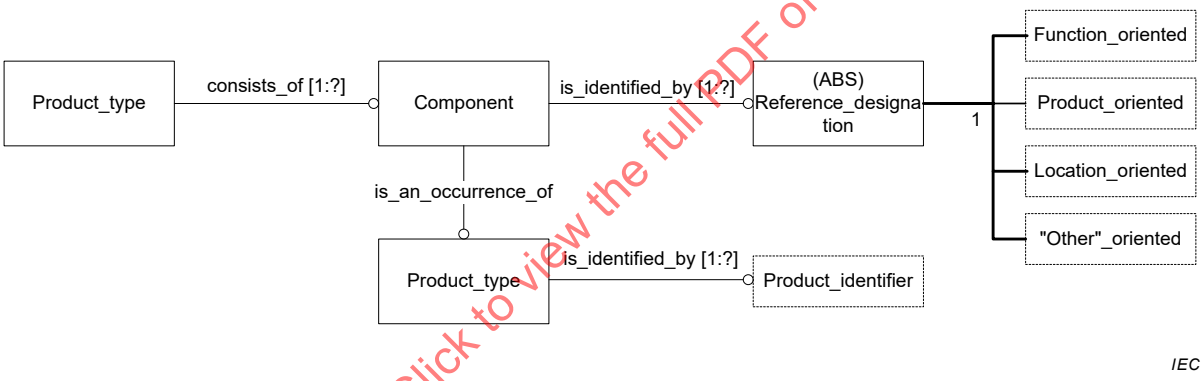



**Figure 6 – Relation between the components of a product type and the product type used for their implementation**



# 6 Property qualifiers

## 6.1 General

A qualifier to a property is a term that helps define and render the context of the property. It can be applied in different ways:

– as global qualifier; or

– as single qualifier.

If the qualifier is to be globally applicable, it shall be applied in the heading of the relevant specification document; its value is therefore implicitly associated with each property contained in that document. It provides the condition under which the values of all properties within a document are understood and applicable.

If the qualifier shall have local effect to a single property or a set of properties only, it shall be explicitly applied together with that particular property or set of properties. In this case, the globally defined value(s) of the qualifier(s) will be overruled by the existence of an explicitly defined local value.

If a property (of level type) is used, this may have one or more associated values, e.g. a minimum and maximum value, indicating a continuous range. In the case of multiple values, note that the chosen qualifiers will apply to all associated values of the referred property.

All defined qualifiers are non-quantitative properties.

## 6.2 Life cycle qualifier

### 6.2.1 General

In order to associate a property to the life cycle of a product within the being-in-service period, allowing a computer-supported value tracing and related processing, an explicitly given qualifier called life cycle qualifier shall be used in order to provide information about the life cycle aspect of a property at different stages in time. The value of the qualifier is either user-defined or predefined.

The predefined qualitative values of the life cycle qualifier are the following:

– SPE as specified;
– INQ as inquired;
– OFF as offered;
– CON as contracted;
– SUP as supplied;
– BUILT as built;
– OP as operated;
– DECOM as decommissioned.

If further values outside of this enumeration are needed, they shall be defined and agreed among the parties involved in an information exchange.

NOTE 1 The predefined enumeration is considered to be an open enumeration. In the context of the IEC 62569 series, the term open is to be understood indicating that further values can be included in the existing standardized enumeration, if being previously standardized and made publicly available.

NOTE 2 For different reasons, users can need to define in special cases for their bilateral applications values that are outside of any standardization considerations. These are called here user-defined and are outside of the scope of international standardization.

NOTE 3 For information on how such differentiation is indicated in the IEC CDD among open, closed or other kinds of enumerations, see IEC 61360-1:—.

NOTE 4 The predefined values of the life cycle qualifier are used within the domain of electric energy generation, distribution and transmission, and can be used in other domains as well.

NOTE 5 It is generally understood that at each stage of the life cycle, a date and time stamp need to be provided.

NOTE 6 IEC 62744:2014, Table 1, specifies generic operational states used during the operation of an object, not to be confused with the specified values in 6.2.

NOTE 7 ISO 8887-1:—, specifies life cycle stages of a product used in the design manufacturing, assembling, disassembling and end-of-life processing of products.

### 6.2.2 SPE

Property value as required from the planning process design.

### 6.2.3 INQ

Property value as requested in an inquiry directed to an organization asking for an offer.

### 6.2.4 OFF

Property value as given in a formal offer directed to an organization normally based on a previous inquiry of that organization.

### 6.2.5 CON

Property value as contractually guaranteed and agreed between both organizations.

### 6.2.6 SUP

Property value as manufactured and supplied to the customer.

NOTE It is generally understood that a product, when bought or sold without being explicitly marked, always comes with the qualifying value “as supplied”.

### 6.2.7 BUILT

Property value as put into service.

### 6.2.8 OP

Property value set and/or available under operation.

### 6.2.9 DECOM

Property value when being decommissioned.

### 6.2.10 Example of the use of the life cycle qualifier

The example shown in Table 1 indicates how the value of the property “body length” develops during the life cycle of the product in use by applying the life cycle qualifier and how the (dictionary) property “body length” is recursively used for all defined situations with the same unit.

**Table 1 – Example of the use of the life cycle qualifier**

| **Property: Body length** | | **Value** | |
|---|---|---|---|
| **Life cycle qualifier** | **Referenced (dictionary) property** | **Measure** | **Unit** |
| *as specified* | AAE019 body length (max) | 2,490 | m |
| *as inquired* | | 2,500 | |
| *as offered* | | 2,600 | |
| *as contracted* | | 2,600 | |
| *as supplied* | | 3,000 | |
| *as built* | | 2,600 | |
| *as operated* | | 2,600 | |
| *as decommissioned* | | 2,600 | |

Figure 7 shows the development over time in the process.

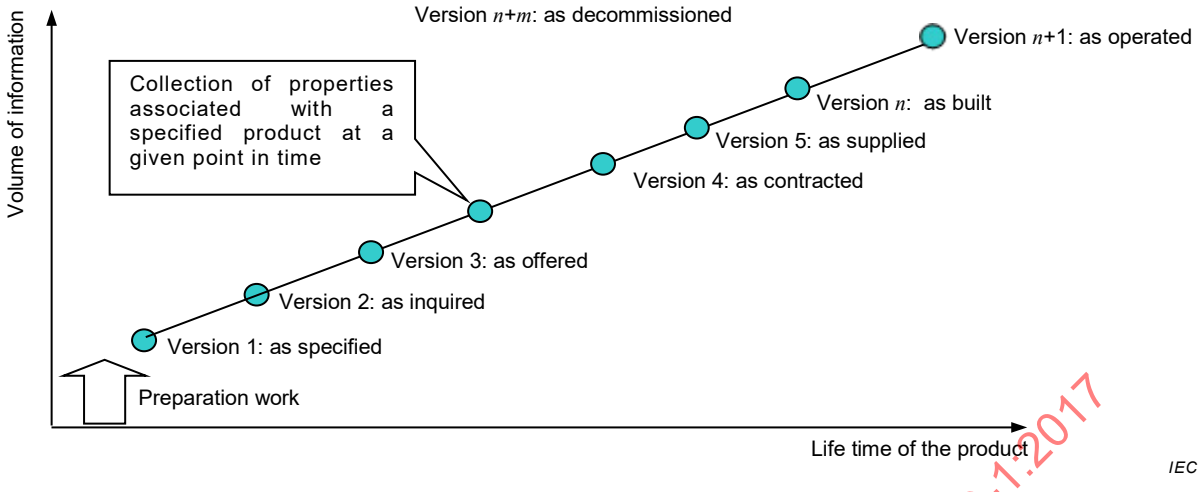



**Figure 7 – Development of life cycle qualifier over time**

### 6.2.11 Example of the use of life cycle qualifier associated with a single property within a transaction applying the XML notation

NOTE 1 The (dictionary) property identifiers used in the English language bound examples, their names and value codes refer to the IEC CDD at the time of preparing this standard. They can change over time.

NOTE 2 The quality of a property is not identical to the quality of a qualifier; the latter influences the meaning of the referenced property, providing implicitly an explanation of the context of the value.

NOTE 3 The provided examples represent one possible output of an XML notation.

<PROPERTY>

<PROPERTY_ID>AAE019</PROPERTY_ID>

<pref_name language=”en”>body_length</pref_name>

<body_length=2,600/>

<unit=”m”/>

<QUALIFIER>

<QUALIFIER_ID>AAF599</QUALIFIER_ID>

<pref_name language=”en”>life_cycle_qualifier</pref_name>

<value_code=”BUILT”/>

</QUALIFIER>

</PROPERTY>

## 6.3 Applicability qualifier

### 6.3.1 General

In order to cover a wide variety of possible application areas, predefined specifications (templates) may contain a variety of properties from which – in a specific context – not all may be applicable, or may be applicable but their corresponding values are not available and have to be assumed, or shall be processed in a specific way.

In order to support tracking of such properties and support semi-automatic or automatic routines in computer systems, it is required to know how a property or its current value(s) are to be processed. For this purpose the “applicability qualifier” shall be used. If the applicability qualifier is not used, a property is by default considered applicable and it is expected that associated value(s) are entered or given.

The value of the qualifier is either user-defined or predefined. The predefined non-quantitative value codes and the meaning of the applicability qualifier are the following:

– AVP applicable, value provided
– AVA applicable, value assumed
– AVN applicable, value not assigned
– NA not applicable

If further values outside of this enumeration are needed, they shall be defined and agreed among the parties involved in an information exchange.

NOTE The term "applicable" used here has no relation to the term applicable as used within ISO 13584-42 and IEC 61360-1:2009 in the context of setting up hierarchy class structures with (dictionary) properties.

#### 6.3.2 AVP

The associated property is considered to be applicable in a given context and a value shall be assigned to it, resulting in a mandatory entry. The value has been provided by a known specification.

#### 6.3.3 AVN

The associated property is considered to be applicable in a given context and a value shall be assigned to it, resulting in a mandatory entry. In this case, however, the value is not yet assigned.

If the value “AVN” of the applicability qualifier is given, the property will be processed. This allows a computing system to generate a warning with respect to missing data.

#### 6.3.4 AVA

The associated property is considered to be applicable in a given context and a value shall be assigned to it, resulting in a mandatory entry. Due to missing input, the value has been assumed.

If the value “AVA” of the applicability qualifier is given, the property will be processed with the assigned assumed value.

Assumed values should be confirmed by the responsible organization. A confirmed value would cause a change from “AVA” to “AVP”.

#### 6.3.5 NA

The associated property is considered to be not applicable in a given context.

If this value of the applicability qualifier is given, the property will not be considered in further processing, irrespective of possible existing values.

#### 6.3.6 Application example – Method A (implicit marking)

A property list is structured into several clauses; each clause with the properties applicable or not within a specific case.

In order to document how the properties in the relevant clause are dealt with, a local clause-bound data qualifier is defined and the following qualifier values apply:

a) If not applicable, select from the drop-down list the value ”Not applicable”; all property values are left empty.

b) If applicable but all required values not provided, select ”Applicable, value assumed”.

c) If applicable and values provided, select ”Applicable, value provided”; then fill in all values.

d) If applicable but data not assigned, select “Applicable, value not assigned”, then fill in the data according to the performance of the product you request or provide.

By this method, the relevant value is implicitly associated to each occurring property.

**Example – Method A**

| | | | |
|---|---|---|---|
| **I.I Cold and heat** | | **Applicable, value provided** | |
| Relative humidity [%] | min | | max |
| Absolute humidity [g/m$^3$] | min | typ | max |
| Rate of change of temperature [K/min] | | typ | max |
| **I.II Humidity** | | **Not applicable** | |
| Relative humidity [%] | min | | max |
| Absolute humidity [g/m$^3$] | min | | max |

NOTE The properties referenced here can be found in the IEC Reference collection IEC 61360-4 DB under the URL http://std.iec.ch/iec61360 within the class identifier AAA650 Environmental conditions.

### 6.3.7 Application example – Method B (explicit marking)

Whereas by method A the property is implicitly marked, method B provides an explicit marking applying the same qualifier values. Method B is independent of any structure in the specification.

Each single property may be associated with one of the same data values as provided in the list in 6.3.1.

With respect to data evaluation, both methods A and B show the same result.

## 6.4 Value origin qualifier

### 6.4.1 General

In order to support semi-automatic or automatic routines in computer systems, it is often required to know how current values of properties have originated or been gathered in the development process. For this purpose, the “value origin qualifier” shall be used.

The value of the qualifier is either user-defined or predefined. The predefined non-quantitative values of the value origin qualifier are the following:

– EST as estimated
– CAL as calculated
– MEA as measured
– SET as set

If further values outside of this enumeration are needed, they shall be defined and agreed among the parties involved in an information exchange.

#### 6.4.2 EST

Property value based on estimation.

#### 6.4.3 CAL

Property value gained from computation, e.g. derived from a three-dimensional model, or by any other calculation method.

#### 6.4.4 MEA

Property value gained from any kind of measuring devices.

#### 6.4.5 SET

Property value set during putting into operation, in operation or maintenance either by humans or via automatic controllers.

#### 6.4.6 Example of the use of the value origin qualifier

The example shown in Table 2 indicates how the value of the property “cable length” develops making use of the value origin qualifier and how the data element “overall length” is recursively used for all defined situations with the same unit.

**Table 2 – Example of the use of the value origin qualifier**

| Property: Cable length | | Value | |
|---|---|---|---|
| **Value origin qualifier** | **Referenced (dictionary) property** | **Measure** | **Unit** |
| *as estimated* | AAE581 overall length (max) | 2 500 | mm |
| *as calculated* | | 2 560 | |
| *as measured* | | 2 600 | |



### 6.5 Value processing qualifier

#### 6.5.1 General

Very often it is important to know what kind of data is provided; as such information may lead to different conclusions.

It is for example important to know whether a value for a temperature is a single (measured) one, or originating from a series of single data, processed via a defined method and as such providing e.g. an arithmetic mean value.

In order to indicate whether a value of a property is an “original” value or a derived one, the “value processing qualifier” shall be used.

If the property is not associated with the value processing qualifier, the value is considered to be a single “original” one.

This possibility provides the following advantages:

– the values supplied represent what is expected by the sending organization;
– the receiving organization knows how the values have been gained;
– it raises the quality of submitted data;
– it can be optionally used.

The value is either user-defined or predefined. The predefined non-quantitative values of the value processing qualifier are the following:

– ARITHM arithmetic mean
– MED median
– MODE mode
– WARITHM weighted arithmetic mean
– GEOM geometric mean
– WGEOM weighted geometric mean
– HARM harmonic mean
– RMS root mean square

If a (dictionary) property is explicitly defined using such qualification within its definition, the value processing qualifier should not be used in order to avoid inconsistencies.

NOTE 1 The usage of the value processing qualifier is an economic solution to avoid the definition of a multitude of similar definitions.

If further values outside of this enumeration are needed, they shall be defined and agreed among the parties involved in an information exchange.

NOTE 2 The codes can be used as index in symbols for the quantity representing the property, e.g. $U_{\text{rms}}$.

### 6.5.2 ARITHM

Property value selected from a list of numbers, where the sum of all the members of the list is divided by the number of items in the list. The value is determined by using Formula (1):

$$\bar{x}_{\text{arithm}} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad (1)$$

where

$\bar{x}_{\text{arithm}}$ is the arithmetic mean;

$n$ is the number of items in the list;

$x_i$ is the number $i$ in the list.

NOTE The arithmetic mean is not to be confused with the median or the mode. The mean is the arithmetic average of a set of values or distribution; for skewed distributions, the arithmetic mean is not necessarily the same as the middle value (median) or the most likely (mode).

### 6.5.3 MED

Property value selected from a finite list of sequentially ordered numbers for which half the numbers are smaller and half are larger. If there are two middle numbers, the median is the arithmetic mean of the two middle numbers.

EXAMPLE 1: 1; 3; 7; 9; 12; 15; 25 Median = 9

EXAMPLE 2: 1; 3; 7; 9; 12; 15 Median = (7+9)/2 = 8

NOTE The median is a good choice to represent the centre of a distribution when the distribution is skewed or has outliers.

### 6.5.4 MOD

Property value that occurs most often in a list of numbers

EXAMPLE 2, 3, 3, 4, 5, 5, 5 Mode = 5

### 6.5.5 WARITHM

Property value that is processed by using Formula (2):

$$\bar{x}_{\text{warithm}} = \frac{\sum_{i=1}^{n} w_i \cdot x_i}{\sum_{i=1}^{n} w_i} \quad \text{with } w_i > 0 \tag{2}$$

where

$\bar{x}_{\text{warithm}}$ is the weighted arithmetic mean;

$n$ is the number of items in the list;

$x_i$ is the number $i$ in the list;

$w_i$ is the weighted factor of the item $i$.

### 6.5.6 GEOM

Property value of a collection of positive numbers that is defined as the $n$th root of the product of all the members of the set of numbers, where $n$ is the number of members. The value is processed by using Formula (3):

$$\bar{x}_{\text{geom}} = \sqrt[n]{x_1 \cdot x_2 \cdot \ldots x_n} \quad \text{with } x_i > 0 \tag{3}$$

where

$\bar{x}_{\text{geom}}$ is the geometric mean;

$n$ is the number of items in the list;

$x_i$ is the number $i$ in the list.

### 6.5.7 WGEOM

Property value that is processed by using Formula (4):

$$\bar{x}_{\text{wgeom}} = \exp\left(\frac{\sum_{i=1}^{n} w_i \cdot \ln x_i}{\sum_{i=1}^{n} w_i}\right) \tag{4}$$

where

$\bar{x}_{\text{wgeom}}$ is the weighted geometric mean;

$n$ is the number of items in the list;

$x_i$ is the number $i$ in the list;

$w_i$ is the weighted factor of the item $i$.

NOTE If all weights are equal, the weighted geometric mean is the same as the geometric mean.

### 6.5.8 HARM

Number of items in the list divided by the sum of the reciprocals of the members in the list. The property value is processed by using Formula (5):

$$\bar{x}_{\text{harm}} = \frac{n}{\sum_{i=1}^{n} \frac{1}{x_i}} \text{ with } x_i > 0 \quad (5)$$

where

$\bar{x}_{\text{harm}}$ is the harmonic mean;

$n$ is the number of items in the list;

$x_i$ is the number $i$ in the list.

NOTE For a given data set, the harmonic mean is always the least, while the arithmetic mean is always the greatest and the geometric mean is always in between.

### 6.5.9 RMS

The property value is processed by using Formula (6):

$$\bar{x}_{\text{rms}} = \sqrt{\frac{x_1^2 + x_2^2 + \ldots x_n^2}{n}} \quad (6)$$

where

$\bar{x}_{\text{rms}}$ is the root mean square;

$n$ is the number of items in the list;

$x_i$ is the number $i$ in the list.

## 6.6 Multiple qualifiers

The defined qualifiers expressing different aspects on the associated value are not mutually exclusive. Cases may therefore occur where more than one qualifier applies for a specific value. For example, a property qualified “as specified” may initially be “as estimated” and later “as calculated”. A property may therefore be qualified by more than one qualifier, see Table 3.

**Table 3 – Example of the use of multiple qualifiers**

| Property: Body length | | | Value | |
|---|---|---|---|---|
| **Life cycle qualifier** | **Value origin qualifier** | **Referenced (dictionary) property** | **Measure** | **Unit** |
| *as specified* | *as estimated* | AAE019 body length (max) | 2,600 | m |
| *as specified* | *as calculated* | | 2,578 | |

## 6.7 When to use a qualifier

A qualifier is intended to be used during user transactions among parties. It is therefore not intended to establish in the IEC reference data dictionary (IEC CDD) predefined references between a (dictionary) property and the qualifiers established by this document. The use of qualifiers is independent of any (dictionary) property and of any product class.

### 6.8 Example of the use of multiple qualifiers associated with a single property within a transaction applying, for example, the XML notation based on the example shown in 6.6

NOTE The identifiers used in the example, its names and value codes refer to the IEC CDD at the time of preparing this document. They can change over time.

<PROPERTY>

<PROPERTY_ID>AAE019</PROPERTY_ID>

<pref_name language=”en”>body_length</pref_name>

<body_length=2,578/>

<unit=”m”/>

<QUALIFIER>

<QUALIFIER_ID>AAF599</QUALIFIER_ID>

<pref_name language=”en”>life_cycle_qualifier</pref_name>

<value_code=”SPEC”/>

</QUALIFIER>

<QUALIFIER>

<QUALIFIER_ID>AAF582</QUALIFIER_ID>

<pref_name language=”en”>value_origin_qualifier</pref_name>

<value_code=”CALC”/>

</QUALIFIER>

</PROPERTY>



## 7 Property values

### 7.1 General

A property shall be assigned a value in accordance with the rules applicable for the referenced (dictionary) property.

### 7.2 How to deal with special values

The following rules are established in accordance with IEC 61360-1:2009:

a) The character COMMA SIGN (,) is defined as the applicable decimal marker in accordance with ISO 80000-1.

b) A negative value shall be always preceded with the character MINUS SIGN (−).

c) For expressing prefixes to numbers a signed value format is required as defined in IEC 61360-1, e.g. NR2 S..3.3.

d) A value representing by intention the physical quantity ZERO of property, shall be explicitly entered either by

   1) the character ZERO SIGN representing an integer type, or

   2) the character ZERO SIGN, followed by the decimal marker and at least one character ZERO SIGN representing a real type.

e) Properties having no explicit value assigned (NIL values) shall be considered as not applied and shall not be processed.

### 7.3 How to use the level type concept

The level type concept as given in IEC 61360-1 provides an economic way to provide a set of values (min, nom, typ, max ) using the same (dictionary) property indicating whether the values given are to be considered as a minimum, nominal, typical or maximum value. For more information, see IEC 61360-1:—, 10.4.6.

a) To indicate a range, always the minimum and the maximum values in this sequence shall be given.

b) To indicate a typical or nominal value only, only that value needs to be provided.

NOTE In product standards there is actually not a general consistent agreement between the semantic meaning of a rated value and a nominal value. Often nominal values are considered for the identification of, for example, a voltage level. Within IEC standards, a rated value in products with > 1,5 kV AC or > 1 kV DC is generally defined as the maximum design value, i.e. the value for which a product is designed and manufactured. Therefore any operating value is not allowed to exceed the maximum design value, i.e. the rated voltage.

### 7.4 Availability of values associated with (dictionary) properties

Depending on the domain of application and on the process stage for a specification, not all values of the (dictionary) properties are available at a given point in time. Therefore the values should be provided as soon they are available for further processing, see also 6.3.

### 7.5 Application of unit systems

Where possible, the properties shall be expressed preferably by applying the SI system for quantities, base and derived units as defined in IEC 60027, and International Standard 80000.

An overview of business relevant internationally used units with associated identification codes is listed in IEC TS 62720.

NOTE 1 The content of IEC TS 62720 has been converted into a database for maintenance reasons.

Presentation of a unit in clear text is the preferred notation for any presentation to humans.

For electronic communication purposes the XML notation, for example, intended for information processing may be used. In such a case, it is recommended to apply in interactions unambiguously defined code identifiers when using base units or derived units. This will allow an automated conversion or geographic localization of a given unit into a different unit of the same physical quantity (e.g. metres to inches or feet) using ISO 80000-9. If encoding of units is used, then the codes defined in IEC TS 62720 shall be used.

NOTE 2 The use of units is regulated by regional or national laws. Therefore the use of units is under the exclusive responsibility of the user in its business application; therefore IEC cannot be held liable.

### 7.6 Use of units in software applications

With respect to the (dictionary) properties listed in the IEC data dictionary IEC 61360-4, quantitative (dictionary) properties are preferably shown with their basic SI units (e.g. m, kg, s) or derived basic SI units (e.g. m/s, $kgm^2$) according to International Standard 80000 and IEC 60027, without any decimal prefix sign.