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TECHNICAL REPORT

High voltage switchgear and controlgear -
Part 321: Product data and properties for information exchange - Catalogue data

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High-voltage switchgear and controlgear - Part 321: Product data and properties for information exchange - Catalogue data

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IEC TR 62271-321 has been prepared by the technical committee 17: High-voltage switchgear and controlgear. It is a Technical Report.

This document is a first step and is intended to be built upon in the near future. The scope of this work is being specified by TC17/ahG12.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
17/1187/DTR	17/1191/RVDTR

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

The language used for the development of this Technical Report is English.

A list of all parts in the IEC 62271 series, published under the general title *High-voltage switchgear and controlgear*, can be found on the IEC website.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

It is mainly large customers and regulations which confirm the need for data availability over the life cycle of the high-voltage switchgear and controlgear. For that digital standardized high-voltage switchgear and controlgear product descriptions and product properties are increasingly required to minimize data transfer, migration and re-formatting. This applies to all domains such as generation, transmission, distribution, consumption, and all life cycle phases such as design, planning, procurement, operation, maintenance, dismantling, etc.

Multiple associations or groups of actors have launched different initiatives, external to standardization bodies, to try to respond to this demand but, due to the lack of standardisation of device classes and properties, the situation is not satisfactory neither for customers, nor for manufacturers nor for recyclers and waste managers.

The works and associated documents aim to solve interoperability issues met during data migration as expected by IEC TC 17 standards and along a whole life cycle of a high-voltage switchgear and controlgear. They even influence the future lives of their used materials, by different stakeholders.

IEC TC 17, which deals with high-voltage switchgear and controlgear, decided to extend initial work to take into account consideration of required properties during enquiries, tenders and orders as shown in Figure 1.

Initial work by TC 17 highlighted inconsistencies between high-voltage switchgear and controlgear standards such as different names for the same property, different definitions for the same property, different units for the same property, and even several properties within summarized in one.

In subsequent work, the mapping was extended to the properties from all IEC TC 17 standards and any other useful standards dealing with high-voltage components implemented inside switching devices and assemblies. This mapping is no longer limited to the properties defined by the nameplates and considers properties for information exchanges during enquiries, tenders, and orders.

To harmonize product description, IEC TC 17 proposes a new consistent solution within this document.

The purpose of this document is to describe the process of the catalogue data from the mapping of IEC TC 17 standards to the data intended to be implemented in IEC Common Data Dictionary (IEC CDD) using ParcelMaker™ [1] tool, as follows:

– Create a spreadsheet database.
  - Review of properties of TC 17 standards and when possible associated standards.
    – Define source database (IEV, glossary, ISO OBP, etc).
    – Define device classes and properties for each high-voltage switchgear and controlgear standard.
    – Follow relevant attributes of properties for users as defined by IEC 61360.
– Create potential other digital representation supporting database verification and bringing awareness of available digital material awaiting the final stage IEC CDD for its maintenance.

[1] ParcelMaker is the trademark of a product supplied by Toshiba Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

– Feed ParcelMaker™ spreadsheet tool with the support of the IEC SC 3D to provide a basis for introduction of the high-voltage switchgear and controlgear classes and properties into the IEC 61360 database maintained by IEC/SC 3D (see http://std.iec.ch/iec61360).
– Raise awareness on value created by such catalogue data assuming to feed many digital twins along the whole life cycle of high-voltage switchgear and controlgear (see Annex C).

This document is not intended to establish a hierarchy of classes called classification.

The intended benefits of this document are to:

– solve interoperability issues;
– reuse digital properties defined by IEC TC 17 standards;
– reduce the costs, time and efforts of mapping data for each customer request;
– optimize the workflow of industrial stakeholders' exchanges;
– minimize duplication of articles in customer inventories and in databases;
– minimize losses and misinterpretation of data during exchanges;
– facilitate the selection of a product, especially regarding reliability and safety;
– give access to product data everywhere regardless of country, language and culture;
– provide product data related to environmental aspects such as material declaration;
– contribute to the fast growth of the e-business by simplifying the development of e-Catalogue allowing the differentiation of products performances, certificates, etc.;
– e-Commerce: use of electronic networks to exchange information, products, services and payments for commercial and communication purposes between individuals (consumers) and businesses, between businesses themselves.

1 Scope

This part of IEC 62271 relates to high-voltage switchgear and controlgear for all rated voltage levels above 1 kV AC and 1,5 kV DC and assemblies thereof and provides materials for the reference dictionary for all products covered by the IEC 62271 series.

This dictionary is a preliminary work which can be used to facilitate exchanges in digital format of data related to high-voltage switchgear and controlgear components, devices, equipment, and assemblies of the power systems.

Such a dictionary improves the interoperability of the power systems required for these data exchanges along the power system lifetime and over its life cycle.

Each property has an unambiguously defined meaning and name, and where relevant, a defined value list, a defined format, and a defined unit.

This document defines, digitalizes and then summarizes the properties related to high-voltage switchgear and controlgear nameplates and information usually exchanged during the enquiries, tenders, and orders life phases defined by IEC TC 17 standards of physical elements.

The intention is not to cover manufacturer specific features.

The intention is not to cover IEC TC 17 standards dealing only with assessment methodology (calculation, tests, rules, etc.).

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 61360-1:2017, *Standard data element types with associated classification scheme - Part 1: Definitions - Principles and methods*

3 Terms and definitions

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

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

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
attribute
data element for description of a property, a relation or a device class

EXAMPLE The name of a property, the code of a class, the measure unit of a property.

3.2
block (of properties)
collection of properties describing one common aspect of the device class

Note 1 to entry: A block is a feature class in the sense of IEC 61360-1 and ISO 13584-42 [67].

EXAMPLE Diagnostic functions, control circuit.

[SOURCE: IEC 62683:2017, 3.2]

3.3
cardinality
pattern defining the number of times a concept reoccurs within a description

Note 1 to entry: 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.

Note 2 to entry: Cardinality is defined by IEC 61987-10 [32].

3.4
classification
systematic division of a set of items into subsets according to their difference in some predetermined characteristics

3.5
class
abstraction of a set of similar products

Note 1 to entry: A product that complies with the abstraction defined by a class is called a class member.

Note 2 to entry: A class is an intentional concept that can take different extensional meanings in different contexts.

EXAMPLE The set of products used by a particular enterprise and the set of all ISO-standardized products are two examples of contexts. In these two contexts (the particular enterprise and ISO), the set of products that are considered as members of the single ball bearing class can be different, in particular because employees of each enterprise ignore a number of existing single ball bearing products.

Note 3 to entry: Classes are structured by class inclusion relationships.

Note 4 to entry: A class of products is a general concept as defined in ISO 1087-1. Thus, it is advisable that the rules defined in ISO 704 be used for defining the designation and definition attributes of classes of products.

Note 5 to entry: In the context of the ISO 13584 series, a class is either a characterization class, associated with properties and usable for characterizing products, or a categorization class, not associated with properties and not usable for characterizing products.

[SOURCE: IEC 61360-2:2012, 3.6]

3.6
device
material element or assembly of such elements intended to perform a required function

Note 1 to entry: In this document, a device corresponds to a high-voltage switchgear and controlgear.

[SOURCE: IEC 60050-151:2001 [3], 151-11-20, modified – Note replaced with a new note.]

3.7
device class
set of properties which gives a description of a device

Note 1 to entry: For this document device classes are represented by the devices covered by the TC 17 standards such as switching devices, assemblies, if any operating devices. A property can characterize functional aspect or physical aspect.

3.8
polymorphism
pattern that allows substitution of a single concept in the same context by a different more specific (specialized) concept

Note 1 to entry: A specialized polymorphic block of properties can replace a more generic one in the same context. A polymorphic operator (control property) can act in selecting between of various specializations.

Note 2 to entry: Polymorphism is defined by IEC 61987-10 [32].

3.9
property
defined parameter suitable for the description and differentiation of a specific characteristic describing an aspect of class

4 Normal and special service conditions

IEC 62271-1 [34] and its related product standards have been used to identify the properties of respective service conditions.

5 Ratings

IEC 62271-1 [34] and its related product standard have been used to identify the properties of ratings. The property name of a rating starts by “rated….”.

6 Design and construction

6.1 General

The attributes are in accordance with IEC 61360-1.

Based on the IEC 61360-1 data model, the structured data called cardinality and polymorphism can be used.

The IEC Common Data Dictionary (IEC CDD) comprises seven dictionaries (status as at 05/2025) over all IEC technical committees. Usually, those databases include the properties related to the design and the nameplate but not the full life cycle stage of the covered electrical equipment. Figure 1 mentions the clause numbers from the IEC 62271 series of standards [34] to [57], [63] and [64] for each life cycle stage.

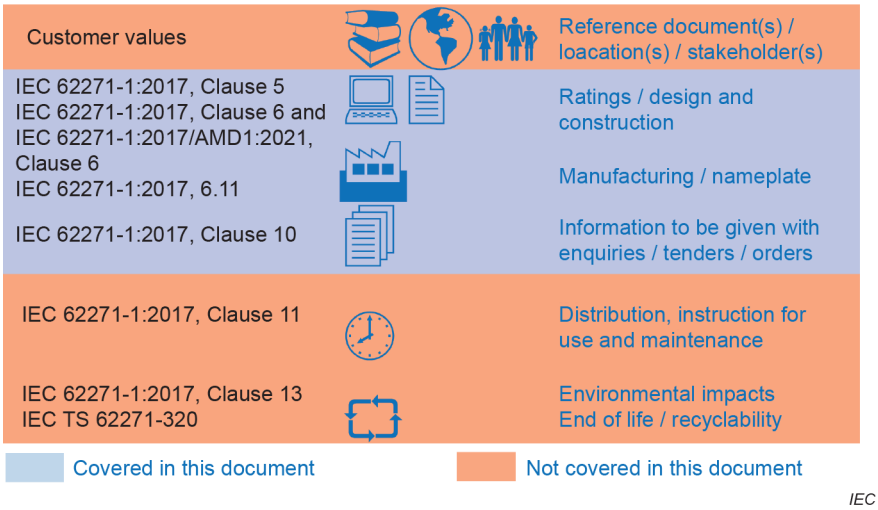

Figure 1 – Scope covered by this document

This Clause 6 deals with the actions carried out to identify and structure data for this document before, in a second step, looking at how the non-covered life phases would be addressed (Annex A).

The identified and structured properties from IEC TC 17, SC 32A, SC 36A, and TC 38 standards have been summarized in accordance with a structure shown in Figure 2 for better readability. Each condition when applicable has been considered.

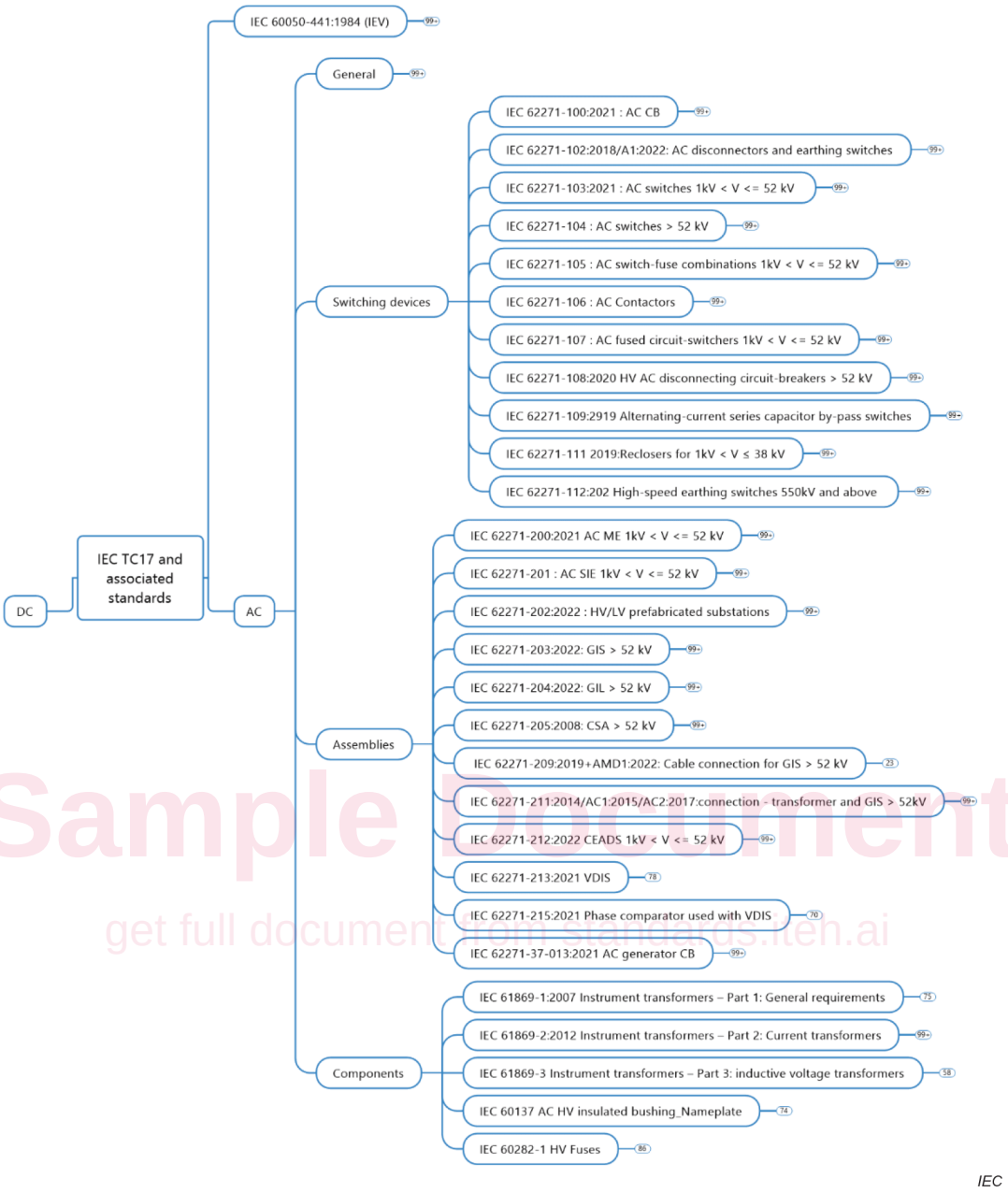

Figure 2 – List of IEC TC17, SC32A, SC36A, and TC38 standards used for this document

Figure 2 identifies several device classes such as:

– a device class of properties from the system;
– a device class for high-voltage equipment nameplate;
– a device class for information exchanges during procurement phases (Enquiries (E), Tenders (T), Orders (O));
– a device class if required differentiating the switching and operating devices.

The equipment of electrical power systems requires a lot of information for which the information from the switching device must be recalled for the assemblies. All IEC TC17 standards do not address this topic identically. Some of them clearly mentioned a list of properties from other standard(s) while others are mentioned if applicable.

The list of properties cannot refer to a specific list varying according to application and according to the bill of materials of the high-voltage equipment.

The delivered database aims to consider what is mentioned inside the IEC TC 17 standards of the switchgear and controlgear, and a few associated components used within switching devices and assemblies such as high-voltage fuses, measurements transformers and bushings.

A spreadsheet maps all TC17 properties with associated attributes as follows:

– Property name
– Identifier (ISO/IEC 6523-1 [71] IRDI starts with 0112/2///62271# and allocated codes by IEC SC 3D are from KKA000 to KKZ000)
– Acronym (IEC 61360-1)
– Digital interface (name identified within IEC 61850 [27], [28] and CIM series of standards)
– Preferedname (IEC 61360-1)
– Synonymous (IEC 61360-1)
– DefinitionEN (IEC 61360-1)
– DefinitionFR (IEC 61360-1)
– DefinitionDE (IEC 61360-1)
– DefinitionCN (IEC 61360-1)
– Source document (of the definition) (IEC 61360-1)
– Data_type (IEC 61360-1)
– Value_format (IEC 61360-1)
– Multiplier_of_unit
– Unit_of_measure (IEC 61360-1)
– Value_list (IEC 61360-1)

6.2 Process

Figure 3 details the general process mapping and structuring digital properties of the TC 17 standards, needing several digital formats up to “ParcelMaker™”, a Microsoft Excel®[2] plug-in for IEC Common Data Dictionary (CDD).

ParcelMaker™ feeding the IEC Common Data Dictionary (IEC CDD) is covered by IEC SC 3D. ParcelMaker™ is a plug-in software for Microsoft Excel®, structuring properties in a rigorous manner to upload the database automatically into the IEC CDD. At the time of writing of this document all properties from IEC TC 17 standards are within ParcelMaker™ (properties and respective definitions in four languages (EN, FR, DE, CN)), with, when identified and existing, their value list, acronym, unit, IEC 61850 [27] [28] logical node, ecl@ss IRDI. It is encouraged that terms and definitions in DE and CN be verified by native speakers. The data can be accessed through the following link: IEC CDD Test database.

(https://cdd.iec.ch/cdd/iec62271/cdddev.nsf/TreeFrameset)

[2] Microsoft Excel is the trademark of a product supplied by Microsoft Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

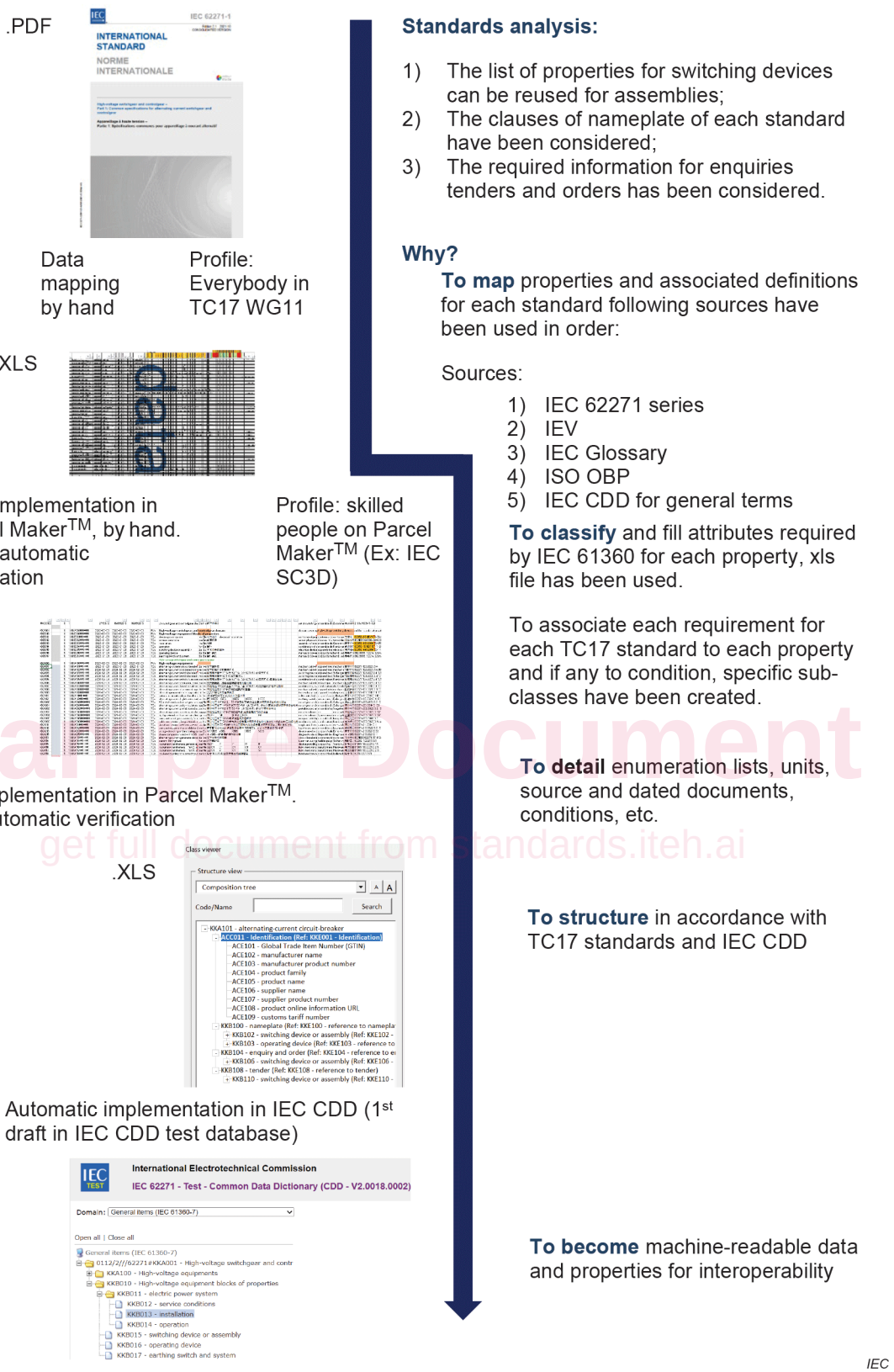

Figure 3 – General process from data mapping and drafting IEC CDD

6.3 Criteria for naming properties

To maintain consistency and clarity in the naming of properties, terms from product standards have been studied. When evidence of a similar meaning has been identified, the naming of properties has been harmonized otherwise both have been kept.

Very often Clause 10 of the IEC 62271 series specifies a property without an existing definition. This required the checking in other standards or databases as listed in the bibliography.

Synonymous names can be associated with the property name when well established terms are used on the market.

7 Block of properties

A property within a block describes one common aspect covered by the definition of this block.

The list of blocks of properties will be defined automatically when ParcelMaker™ is filled, considering specific block of properties defined for TC 17 as shown Table 1 and Table 2.

Table 1 – List of blocks of properties considered for all TC 17 standards

Blocks specialized	
KKB001##1###1	Nameplate specialized blocks
KKB002##1###1	Enquiry and order specialized blocks
KKB003##1###1	Tender specialized block

Table 2 – List of blocks of properties considered by nameplates or information to be given during enquiries, tenders and orders

KKA001##1###1		**High-voltage switchgear and controlgear domain**
KKB010##1###1		High-voltage equipment blocks of properties
	KKB011##1###1	electric power system
	KKB012##1###1	service conditions
	KKB013##1###1	installation
	KKB014##1###1	operation
	KKB015##1###1	switching device or assembly
	KKB016##1###1	operating device
	KKB017##1###1	earthing switch and system

8 Device classes

8.1 Device class attributes

The attributes of the device classes are in accordance with IEC 61360-1.

All device classes in this document have the following attributes:

– identifier,
– preferred name,
– definition,
– synonymous name,
– source document.