IEC/TS 62656-2

Edition 1.0 2013-09

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

colour inside

Standardized product ontology register and transfer by spreadsheets – Part 2: Application guide for use with the IEC common data dictionary (CDD)

Enregistrement d'ontologie de produits normalisés et transfert par tableurs – Partie 2: Guide d'application pour l'utilisation avec le Dictionnaire de données communes de la CEI (le CEI CDD)

IEC/TS 62656-2:2013

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STANDARDIZED PRODUCT ONTOLOGY REGISTER AND TRANSFER BY SPREADSHEETS –

Part 2: Application guide for use with the IEC common data dictionary (CDD)

FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62656-2, which is a technical specification, has been prepared by subcommittee 3D, Product properties and classes and their identification, of IEC technical committee 3: Information structures, documentation and graphical symbols.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
3D/202/DTS	3D/213/RVC

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

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

A list of all the parts of the IEC 62656 series under the general title *Standardized product ontology register and transfer by spreadsheets* can be found on the IEC website.

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

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- withdrawn,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

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INTRODUCTION

The IEC 62656 series entitled *Standardized product ontology register and transfer by spreadsheets* defines the means and methods for registering and exchanging product ontology(ies) expressed in spreadsheet forms.

IEC 62656 consists of the following parts:

– Part 1: Logical structure for data parcels[1];
– Part 2: Application guide for use with the IEC common data dictionary (IEC CDD);
– Part 3: Interface for common information model[2].

1 To be published.

2 To be published.

STANDARDIZED PRODUCT ONTOLOGY REGISTER AND TRANSFER BY SPREADSHEETS –

Part 2: Application guide for use with the IEC common data dictionary (CDD)

1 Scope

This part of IEC 62656 provides an application guide for the data parcels specified in IEC 62656-1 and used for the definition of a domain data dictionary that may be imported from and exported to the IEC common data dictionary, or IEC CDD for short, maintained as the IEC 61360-4 database [1][3]. This part of IEC 62656 provides instructions for the interpretation and use of the technical specification defined in IEC 62656-1 within a software application, to avoid misuse of the data constructs available in IEC 62656-1.

This application guide contains the following items:

- principal information for implementing data parcels for data dictionaries from/to the IEC CDD,
- typical examples of how to implement typical features on data parcels,
- extension of conformance classes for implementation of parcel-based systems to import/export data parcels from/to the IEC CDD.

The following items are outside the scope of this part of IEC 62656:

- procedures for building IEC 61360 compliant domain data dictionaries,
- semantics of a standard data dictionary itself,
- theoretical explanation of the logical structure of data parcels, which is considered in IEC 62656-1,
- interface for the common information model (IEC 61970-301 [2]), which is considered in IEC 62656-3 [3].

2 Normative references

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

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

IEC 61360-2, *Standard data element types with associated classification scheme for electric components – Part2: EXPRESS dictionary schema*

IEC 61987-10:2009, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 10: List of properties (LOPs) for industrial-process measurement and control for electronic data exchange – Fundamentals*

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3 Numbers in square brackets refer to the Bibliography.

IEC 62656-1:—[4], *Standardized product ontology register and transfer by spreadsheets – Part 1: Logical structure for data parcels*

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

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

ISO/IEC Guide 77-2:2008, *Guide for specification of product properties and classes – Part 2: Technical principles and guidance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62656-1:—, as well as the following apply.

3.1
cardinality
minimum and maximum number of occurrences of elements within a collection

3.2
classification tree
inheritance tree
is-a tree
acyclic graph of classes and relations as nodes and edges, where each node represents a concept and each edge represents a specialization, or so called “is-a” relationship between the two concepts connected by the edge

3.3
composition tree
has-a tree
acyclic graph of classes and relations as nodes and edges, in which each node represents a concept and each edge represents a part-whole relationship, or so called “has-a” relationship between the two concepts connected by the edge

Note 1 to entry: A composition tree allows a node to contain several sub-nodes and is also called an aggregation.

3.4
condition property
property whose value affects a value decision of another property

3.5
ontological element
artifact instantiated by a meta class, that serves as metadata and is used to clarify the semantics of a property or class, or to add information to it

Note 1 to entry: In general, the notion of ontological element subsumes properties within; however, it often refers to the artifacts other than the properties, such as enumerations, data types, documents, units of measurement, terms, relations, etc.

Note 2 to entry: In this part of IEC 62656, all occurrences of “meta class” are replaced by “parcel sheet” for ease of understanding.

3.6
polymorphism
pattern that allows substitution of a single concept in the same context by a different concept

[4] To be published.

[SOURCE: IEC 61987-10:2009, 3.1.21, modified — "more specific (specialized)" and the notes to entry have been deleted.]

4 Overview

4.1 General

This part of IEC 62656 is an application guide for parcel users such as:

– domain experts who implement data parcels for their domain data dictionary, for registration in the IEC CDD online database by parcelling tools,
– users who download a (piece of) data dictionary from the IEC CDD online database,
– users who edit or exchange a (piece of) data dictionary,
– application vendors who develop a parcelling tool, such as an editor, viewer or equivalent.

A typical use scenario of the IEC 62656 series for the IEC CDD is depicted in Figure 1.

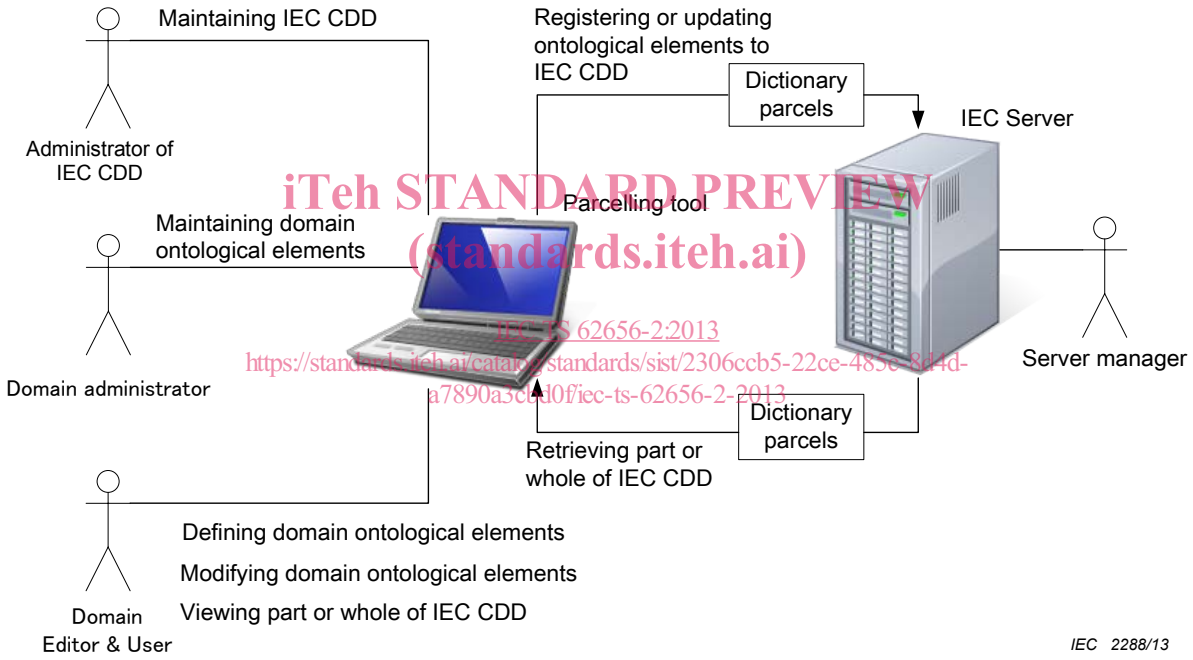

Figure 1 – Typical use scenario

For ease of reading of this part of IEC 62656, “parcel” and “attribute” are used instead of “meta-class” and “meta-property”, respectively. For example, “class meta-class” is reworded as “class parcel”.

4.2 Data dictionary

ISO/IEC Guide 77-2 recommends that each data dictionary should conform to the ISO 13584-42/IEC 61360-2 common dictionary model. In the ISO 13584-42/IEC 61360-2 common dictionary model, each data dictionary is represented by a set of classes and their associated characteristic properties. The IEC CDD is a data dictionary maintained as a database that defines an ontology of products and services, including components, materials, systems, and concepts, that are essential in electro-technical domains.

For a data dictionary, classes and properties are fundamental elements. A class is a concept embodied as a data structure for representing a real world object, such as a product, material, etc., while a property is a concept embodied as another data structure for characterizing a

class or classes. A class has a set of characteristic properties (though in extreme cases it only has one property) and shall be clearly distinguishable from other classes by the member properties in the set. In other words, if two classes have exactly the same sets of properties, those two classes are not distinguishable in a machine sensible manner. However, such a style of class modelling is not recommended in IEC 61360-1.

If there are classes which conceptually share some characteristics in common, a generalized class of those classes may be defined. Such a generalized class is called a “superclass” of those grouped classes, and each of the grouped classes is called a “subclass” with respect to the superclass. Such a relationship between a superclass and a subclass is called more familiarly an “is-a” relationship. Note that in accordance with the ISO 13584-42/IEC 61360-2 common dictionary model, each class may have one class as its superclass and each class may have multiple subclasses. For a number of classes, if there is no apparent superclass, a virtual class called a “universal class” will be assumed to exist, acting as a single common superclass. As a result, the entirety of relationships among the classes forms a tree (to be exact, an acyclic graph) structure.

If there are characteristics which are shared among several classes, such characteristics are modelled as “properties” and they shall be defined at a general class of the classes, and then inherited into its subclasses.

Figure 2 gives a simple example of a data dictionary. In this figure, the concepts of “Gasoline-powered vehicle” and “Electric vehicle” are two different kinds of vehicles, so their superclass “Vehicle” may be defined with common properties, i.e. those named “product name”, “manufacturer“ and “tyre” are defined at this level in the class tree. Likewise, “Vehicle” and “Computer” are different kinds of product concepts, so their superclass “Product” is defined with common properties, i.e. those named “product name” and “manufacturer” are defined at this level. As a consequence, the data dictionary containing those classes comprises a tree structure, as illustrated in Figure 2.

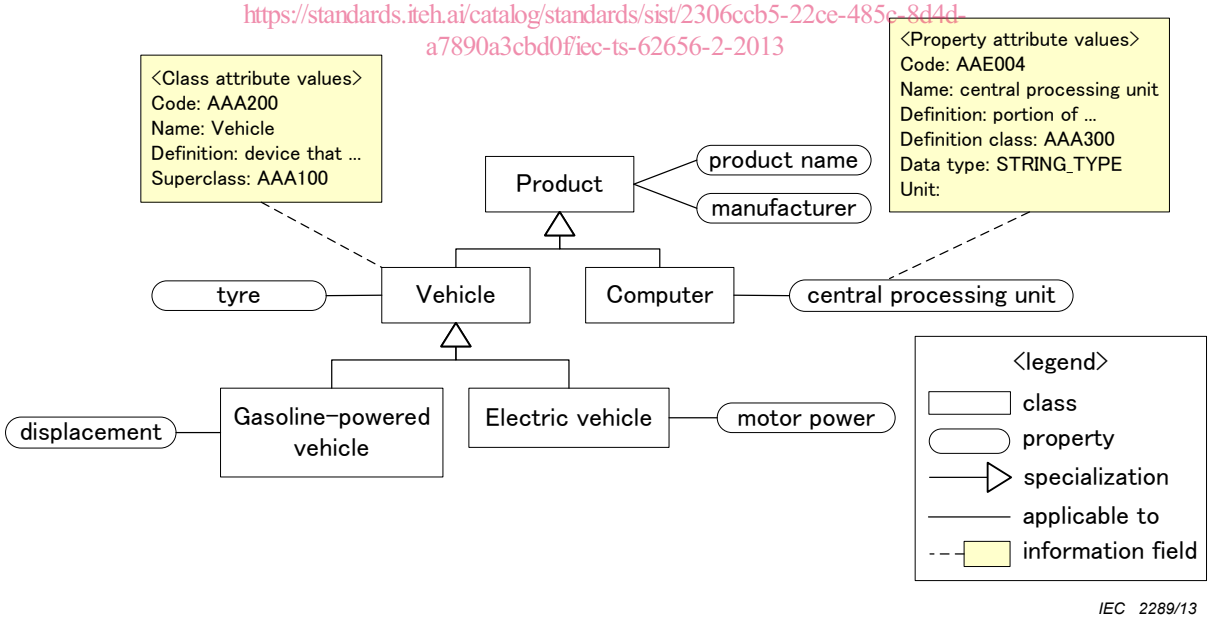

Figure 2 – Data dictionary

In accordance with the ISO 13584-42/IEC 61360-2 common dictionary model, each entity has its own unique identifier, containing structural information, to make the entity distinguishable from others. For example, a class has information fields such as name, definition, superclass, respectively, while a property has information fields such as name, definition, definition class, data type, and unit. The boxes linked by the dashed lines in Figure 2 are examples of information fields contained in a class and a property.

4.3 Data parcel

IEC 62656-1, sometimes referred to as the “parcel standard”, defines a set of containers for product ontology information, (i.e. a tree of product families and their characteristics), by sorting the information into a few homogeneous data collections, such as a list of classes, a list of properties, and a list of enumerations. Every such collection is called a “data parcel”. To be precise, a data parcel may be used not only for defining a data dictionary, but also for representing a library or catalogue of products with specific values of individual products. However, for the readers of this document, the primary interest lies in the use of data parcels to represent a product ontology. In this context, the readers are expected to see that each of the data parcels carries a homogeneous collection of product ontology. A typical form for implementation of such a data collection is a sheet within a spreadsheet, often used in day to day engineering. Thus in the rest of this Technical Specification, a data parcel will be rephrased as a “parcel sheet” to visually represent the likely form of implementation.

A class parcel (i.e. class meta-class) is for designing and instantiating classes. The class parcel has attributes (i.e. meta-properties) for describing the characteristics of a class, such as its class code, preferred name, definition and superclass. Likewise, a property parcel (i.e. property meta-class) is for designing properties. The property parcel has attributes for describing property information such as property code, preferred name, definition, definition class, data type and unit. In order to implement a data dictionary within homogeneous data collections in parcels, a few spreadsheets should be prepared, each implementing only one category of the overall parcel. For example, in the case depicted within Figure 2, a sheet for class parcel and another for property parcel are required (as shown in Figure 3).

property meta-class sheet

MDC_P001_6 Code	MDC_P004_1.en Preferred name	MDC_P005.en Definition	MDC_P021 Definition class	MDC_P022 Data type	MDC_P023_1 Unit in text
AAE001	product name	name of …	AAA100	STRING_TYPE	
AAE002	manufacturer	name of …	AAA100	STRING_TYPE	
AAE003	tyre	covering that…	AAA200	STRING_TYPE	
AAE004	central processing unit	portion of …	AAA300	STRING_TYPE	
AAE005	displacement	measurand …	AAA400	REAL_MEASURE	cc
AAE006	motor power	measurand …	AAA500	REAL_MEASURE	kW

class meta-class sheet

MDC_P001_5 Code	MDC_P004_1.en Preferred name	MDC_P005.en Definition	MDC_P010 Superclass	MDC_P014 Applicable properties
AAA100	Product		UNIVERSE	{AAE001,AAE002}
AAA200	Vehicle	device that …	AAA100	{AAE003}
AAA300	Computer		AAA100	{AAE004}
AAA400	Gasoline-powered vehicle		AAA200	{AAE005}
AAA500	Electric vehicle		AAA200	{AAE006}

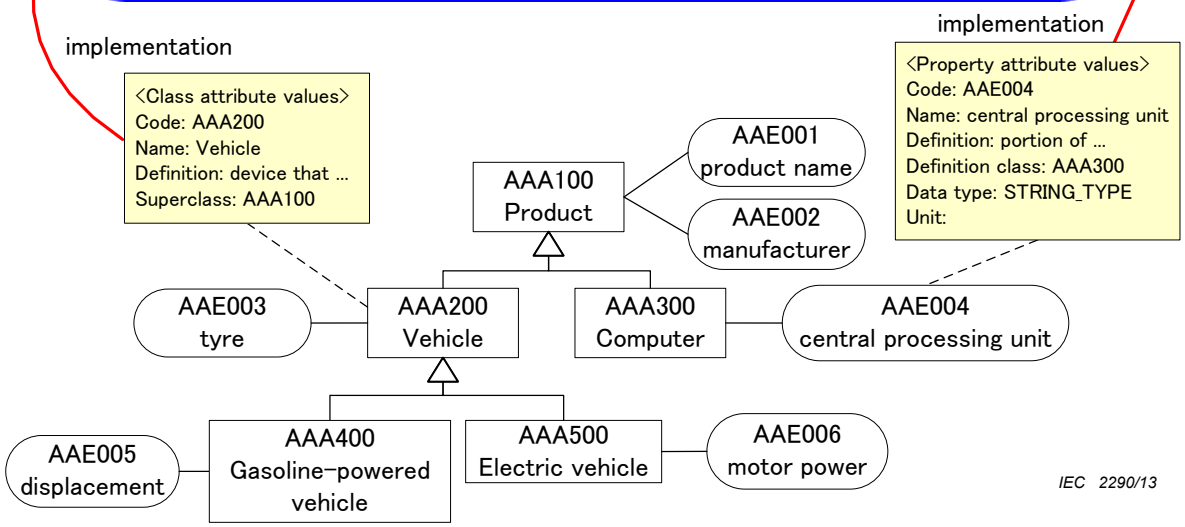

Figure 3 – Spreadsheet implementation

Figure 4 shows the basic structure of a parcel sheet. Each parcel sheet consists of its header section and data section.

The header section further consists of the class header section and schema header section. In the class header section, the information contained in the parcel sheet is described, e.g. the identifier of the data parcel and the default values which may be applied to any attribute of the parcel in the header section (see 5.2). In the schema header section, which contains metadata for describing values in the data section, each attribute of the parcel is specified in each cell column.

In the data section, each ontological element is described in each row. In each cell, the value of the attribute, which is specified in its corresponding column, is described for defining such an ontological element.

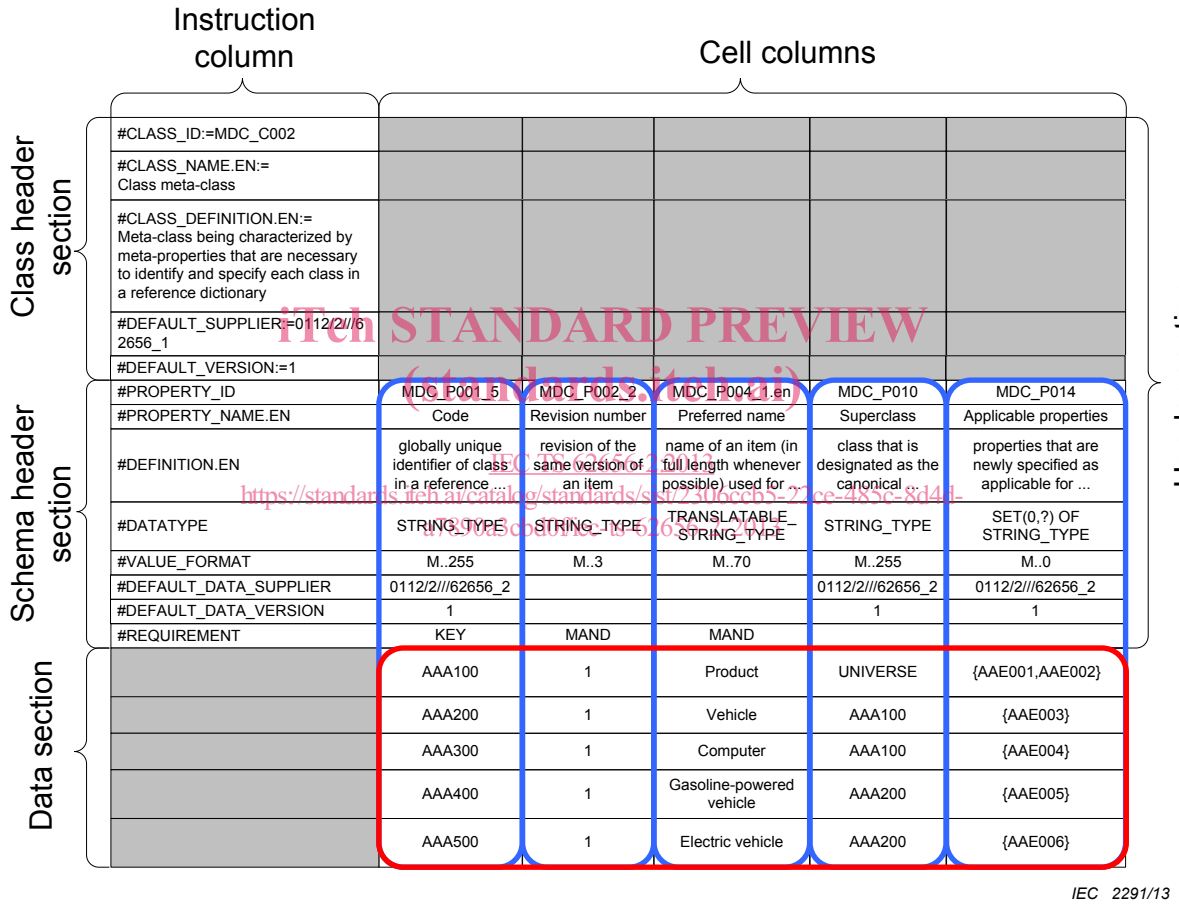

Figure 4 – Parcel sheet

4.4 Blank parcel sheets

Blank parcel sheets for editing a data dictionary from scratch will be obtained from:

– IEC CDD website at the following URL: <http://std.iec.ch/iec61360>

or can be generated by:

– a parcelling tool.

In Annex E, a list of tools that conform to this Technical Specification is given.

Four sheets comprising dictionary, class, property and supplier sheets, are mandatory for implementing a data dictionary. The other sheets are optional and they are prepared only

when they are required in the process of completing the information described in the four mandatory sheets.

5 Common cases for defining ontological elements

5.1 Semantics

In the IEC 62656 series and ISO 13584/IEC 61360 series, principal concepts of products are represented by classes, and their characteristics are modelled by properties. Some attributes of the classes and properties require the use of other parcels, such as data type, enumeration and term parcels. Thus, in many cases, determining the semantics of each ontological element modelled by the corresponding parcel will be the first step for describing the data dictionary by the data parcels. The aforementioned parcels have a basic set of attributes for describing the names and meanings of their ontological elements.

For describing names, there are 3 kinds of attributes defined in IEC 62656-1, i.e. MDC_P004_1 (Preferred name), MDC_P004_2 (Synonymous name), MDC_P004_3 (Short name). Likewise, for describing the meaning of an ontological element, or for clarifying the meaning, there are 3 kinds of attributes, i.e. MDC_P005 (Definition), MDC_P007_1 (Note) and MDC_P007_2 (Remark).

The above attributes except MDC_P004_2 are defined as TRANSLATABLE_STRING_TYPE for localization of the content which is described in a language specified as the source language. These attributes may comprise multiple columns which are identified by a specified language code (which may be combined with a country code to show a language variant, if needed). For example, if there are names in two languages, English and French, appearing in a parcel sheet, then columns identified by "MDC_P004_1.en" and "MDC_P004_1.fr" shall be prepared for describing preferred names in the sheet.

By contrast, the attribute MDC_P004_2 is defined as SET(0,?) OF LIST(2,2) OF STRING_TYPE. Therefore, only one column is provided and a synonymous name in any language shall be described as a value of this attribute. In each field of this attribute, a set containing the combination of a name and a language code (and with country code, if needed) in order is expected as a valid value. For example, if "battery" in English and its French translation "batterie" are given as the synonymous names of an ontological element, then the value will be described as "{(battery,en),(batterie,fr)}" or "{(batterie,fr),(battery,en)}".

In each parcel sheet, there is an optional instruction #SOURCE_LANGUAGE which specifies the language in which the original semantic content in the parcel is prepared. For example, if there is a description "#SOURCE_LANGUAGE:=en" in the instruction column of a parcel, English content shall be the source and the content in the other languages shall be considered as a translation from the English content in the sheet. If no language is specified in the field, or the instruction cannot be found in the parcel sheet, by default, English shall be assumed as the source language for the sheet.

NOTE The description of values of the above attributes follows IEC 61360-6 [4].

Figure 5 gives an example of a class parcel sheet which only comprises the attributes describing the semantics of ontological elements. There are three classes described in the data section, i.e. a capacitor and its subclasses, which can be actually found in the IEC CDD.