

INTERNATIONAL STANDARD

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First edition
1998-04

Standard data element types with associated classification scheme for electric components –

Part 2: EXPRESS Dictionary schema

*Types normalisés d'éléments de données
avec plan de classification
pour composants électriques –*

*Partie 2:
Schéma d'un dictionnaire EXPRESS*



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*Types normalisés d'éléments de données avec plan
de classification pour composants électriques –*

*Partie 2:
Schéma d'un dictionnaire EXPRESS*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

STANDARD DATA ELEMENT TYPES WITH ASSOCIATED CLASSIFICATION SCHEME FOR ELECTRIC COMPONENTS –

Part 2: EXPRESS Dictionary schema

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61360-2 has been prepared by subcommittee 3D: Data sets for libraries, of IEC technical committee 3: Documentation and graphical symbols.

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

FDIS	Report on voting
3D/53/FDIS	3D/58/RVD

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

IEC 61360 consists of the following parts under the general title Standard data element types with associated classification scheme for electric components:

Part 1: Definitions - Principles and methods

Part 2: EXPRESS Dictionary schema

Part 3: Maintenance and validation procedures

Part 4: IEC reference collection of standard data element types, component classes and terms.

Annexes A and B are for information only.

STANDARD DATA ELEMENT TYPES WITH ASSOCIATED CLASSIFICATION SCHEME FOR ELECTRIC COMPONENTS –

Part 2: EXPRESS Dictionary schema

1 General

1.1 Scope and object

The scope of this part of IEC 61360 is the common ISO/IEC dictionary schema based on the intersection of the scopes of the two base standards:

- IEC 61360-1, *Standard data element types with associated classification scheme for electric components - Part 1: Definitions - Principles and methods*, and
- ISO 13584-42, *Methodology for structuring part families*

The presented EXPRESS model represents a common formal model for the two standards and facilitates a harmonization of both.

Relevant parts of their scope clauses are cited below.

From IEC 61360-1:

" This part of IEC 61360 specifies the principles to be used for defining technical data element types with associated classification schemes needed to describe fully electric components, including electronic and electromechanical components and materials used in electro-technical equipment and systems."

From ISO 13584-42:

" This part of ISO 13584 specifies:

- the attributes that shall be provided by library suppliers to describe the families and properties of parts. These attributes are part of the content of their parts library and shall be stored in the dictionary of the user library;
- the specifications of these attributes in the EXPRESS information model that provides for the exchange of such dictionary data".

The object of this standard is to provide a formal model for data according to the scope as given above, and thus to provide a means for the computer-sensible representation and exchange of such data.

The intention is to provide a common information model for the work of both committees, thus allowing for the implementation of dictionary systems dealing with data delivered according to either of the standards elaborated by both committees.

Two schemas are provided in this part of IEC 61360 defining the two options that may be selected by an implementation. Each of these options is referred to as a conformance class.

- The **ISO13584_IEC61360_dictionary_schema**¹ provides for modelling and exchanging technical data element types with associated classification scheme but without modelling the definitions of the terms used in the data element type definitions. It constitutes conformance class 1 of this part of IEC 61360.
- The **IEC61360_extended_dictionary_schema** provides for modelling and exchanging technical data element types with associated classification scheme together with modelling definitions of and references to the terms used in the data element type definitions. It constitutes conformance class 2 of this part of IEC 61360.

¹ All the names that stand for items, formally defined within the EXPRESS model, are presented in **bold face**.

When used together with ISO 10303-21, each schema defines one single exchange format.

The exchange format defined by conformance class 1 is fully compatible with the ISO 13584 series.

The exchange format defined by conformance class 2 provides also for exchanging the definitions of the terms used in the definitions of data element types and their associated classification scheme when such an exchange is required, despite the lack of compatibility with implementations compliant with the ISO 13584 series.

Both committees agreed NOT to change and/or modify the presented EXPRESS model independent of each other in order to guarantee the harmonization and the reusability of the work from both committees. Requests for amendments should therefore be sent to both committees. These requests should be adopted by both committees before modifying the EXPRESS information model.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61360. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61360 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61360 (all parts),	<i>Standard data element types with associated classification scheme for electric components</i>
IEC 61360-1: 1995,	<i>Standard data element types with associated classification scheme for electric components - Part 1: Definitions - Principles and methods</i>
IEC 61360-4: 1997,	<i>Standard data element types with associated classification scheme for electric components - Part 4: IEC reference collection of standard data element types, component classes and terms</i>
ISO 31 (all parts),	<i>Quantities and units</i>
ISO 639: 1988,	<i>Code for the representation of names of languages</i>
ISO 843: 1997,	<i>Information and documentation - Conversion of Greek characters into Latin characters</i>
ISO 4217: 1995,	<i>Codes for the representation of currencies and funds</i>
ISO 6093: 1985,	<i>Information processing - Representation of numerical values in character strings for information interchange</i>
ISO 8601: 1988,	<i>Data elements and interchange formats - Information interchange - Representation of dates and times</i>
ISO 8859-1: 1987,	<i>Information processing - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No. 1</i>
ISO 8879: 1986,	<i>Information processing - Text and office systems - Standard Generalized Markup Language (SGML)</i>
ISO 9735: 1988,	<i>Electronic data interchange for administration, commerce and transport (EDIFACT) - Application level syntax rules</i>

ISO 10303-11: 1994,	<i>Industrial automation systems and integration - Product data representation and exchange - Part 11: Description methods: The EXPRESS language reference manual</i>
ISO 10303-21: 1994,	<i>Industrial automation systems and integration - Product data representation and exchange - Part 21: Implementation methods: Clear text encoding of the exchange structure</i>
ISO 10303-41: 1994,	<i>Industrial automation systems and integration - Product data representation and exchange - Part 41: Integrated generic resources: Fundamentals of product description and support</i>
ISO 10303-42: 1994,	<i>Industrial automation systems and integration - Product data representation and exchange - Part 42: Integrated generic resources: Geometric and topological representation</i>
ISO 12083: 1994,	<i>Information and documentation - Electronic manuscript preparation and markup</i>
ISO 13584 (all parts),	<i>Industrial automation systems and integration - Parts library²</i>
ISO 13584-42:---,	<i>Industrial automation systems and integration - Parts library - Part 42: Description methodology: Methodology for structuring part families³</i>

2 Definitions

For the purpose of this part of IEC 61360, the following definitions apply.

2.1

Basic Semantic Unit (BSU)

entity that provides an absolute and universal identification of certain objects of the application domain (e.g. classes, data element types)

2.2

dictionary element

set of attributes that constitutes the dictionary description of certain objects of the application domain (e.g. classes, data element types)

2.3

common dictionary schema

information model for a dictionary, using the information modelling language EXPRESS

2.4

data type

set of allowed values of a data element type

NOTE – Within IEC the **data_type** that is either a unit of measure or a value domain is defined separately for each data element type.

2.5

IEC root class

class that is the superclass of all the classes defined in IEC 61360-4; its class code is 'AAA000' and its version is '001'

² To be published.

³ To be published.

2.6

applicable data element type

data element type that is defined for a component class and that applies to any component that belongs to this component class

2.7

visible data element type

data element type that is defined for a component class and that may or may not apply to the different components of this component class

NOTE 1 The code of the class where a data element type is defined as visible is part of the identification of this data element type.

NOTE 2 Within IEC all data element types are defined as visible at the level of the root class, that is the superclass of both the component class and the material class.

3 Abbreviations

In this standard the following abbreviations are used:

- BSU: Basic Semantic Unit
- DET: Data Element Type
- ICS: International Classification of Standards
- SI: International System of Units

4 Overview of the common dictionary schema and compatibility with ISO 13584

In the following subclauses the architecture of the common dictionary schema will be presented and it will be explained how the same information model has to be used in the International Standards to ensure their compatibility.

The common dictionary schema combines the requirements of IEC 61360 and ISO 13584. Therefore, it contains resources to accommodate the specific requirements of both International Standards. These resources are provided either as optional capability or as subtypes of the types defined to fulfil the common requirements.

4.1 Use of the common dictionary schema to exchange IEC 61360-1 compliant data

- a) The ISO 13584 specific extensions shall not be used for the exchange of dictionary elements defined according to IEC 61360-1.
These extensions are **present_translations**, **translated_label** and **translated_text** that provide for multilingual capabilities.
- b) The fixed length of some strings is greater than the size defined in IEC 61360-1. When, however, these strings are exchanged using the common dictionary schema, they shall be padded as follows:
 - **code** of a component class: the six character long IEC code shall be left justified in the fourteen character long exchange format that shall be padded with eight underscores ('_');
 - **code** of a data element type: the six character long IEC code shall be left justified in the fourteen character long exchange format that shall be padded with eight underscores ('_');
 - **value code** of the value of a data element type: the variable character length of the IEC code shall be left justified in the eighteen character long exchange format that shall be padded with underscores ('_');
 - **coded name** of a component class: the variable character length of the IEC code shall be left justified in the eighteen character long exchange format that shall be padded with underscores ('_');
 - **revision number**: the two character long IEC code shall be right justified and shall be padded with one zero ('0').
- c) If a component class has a superclass, the **coded_name** shall be defined as a **value_code** in the **domain** of the classifying data element type of the superclass.
- d) If a classifying data element type exists within a specific component class, for each **value** in its **domain** a subclass and a **term** shall be defined.

- e) A classifying data element type, optional in conformance class 2 in the common dictionary schema, shall always be provided for the component classes defined according to IEC 61360-1.
- f) Only SI units shall be used although the common dictionary schema enables the use of many kinds of system units. When using this schema however for the exchange of IEC 61360 compliant data, only SI units shall be used for quantitative data element types.

4.2 Compatibility with ISO 13584-42

An implementation compliant with this part of IEC 61360 shall support all the entities, types and associated constraints that belong to the conformance class it claims to support.

Therefore, conformity with conformance class 1 of this part of IEC 61360 requires that all the entities, types and associated constraints defined in the common dictionary schema be supported. ISO 13584 data conforming to the common dictionary schema may thus be processed by an IEC 61360 implementation, whether it conforms to conformance class 1 or to conformance class 2 that includes all the features of conformance class 1.

In ISO 13584, a specific conformance class⁴ is intended to contain all the entities, types and associated constraints defined in the common dictionary schema. An ISO 13584 compliant implementation conforming to this conformance class shall therefore be able to support IEC data that belongs to conformance class 1 of this part of IEC 61360.

4.3 Naming correspondence between IEC 61360-1 and IEC 61360-2

Due to specific application restrictions - e.g. the EXPRESS language allows no spaces in names -, a number of similar 'EXPRESS names' are created by replacing the blank in a name by an underscore (e.g. preferred name is presented as **preferred_name**).

At other places names are used in the EXPRESS model that deviate from those used in IEC 61360-1. This is a consequence of the effort to reach one common EXPRESS information model together with parts libraries.

The table below offers a guide for matching the names used in the two parts of IEC 61360.

X-REFERENCE table

Naming in 61360-2	Naming in 61360-1
component_class	Component class
condition_DET	Condition data element type
dependent_P_DET	Data element type
det_classification	Data element type class
(DER)dic_identifier	Identifier
dic_value	Value
material_class	Material class
meaning	Value meaning
non_dependent_P_DET	Data element type
preferred_symbol	Preferred letter symbol
revision	Revision number
source_doc_of_definition	Source document of data element type definition
source_doc_of_definition	Source document of component class definition
source_doc_of_definition	Source document of term definition
synonymous_symbols	Synonymous letter symbol
unit	Unit of measure
value_code	Value code
version	Version number

⁴ This conformance class is defined as conformance class 0 in ISO 13584-24.

4.4 Main structure of the common dictionary schema

This subclause explains the main resource constructs provided by the common dictionary schema.

- **dictionary_element** is any element defined in the dictionary;
- **supplier_element** captures the data of suppliers of dictionary elements (classes, properties, data types);
- **class** models the dictionary element of classes (families) which are described by properties;
- **property_DET** is the dictionary element of a property;
- **data_type** specifies the type of a property.

These parts of the dictionary schema are presented in more detail in clause 5: ISO13584_IEC61360_dictionary_schema.

In the presentation of the common dictionary schema, some overview diagrams are provided as planning models (figures 1 to 11). These planning models use the EXPRESS-G graphical notation for the EXPRESS language.

For clarification of the diagrams, some of the relationships that are defined in the EXPRESS model are omitted. Figure 1 below outlines as a planning model the main structure of the common dictionary schema.

Most of these figures contain overview models (or planning models) but show only that level of detail which is appropriate at a certain place.

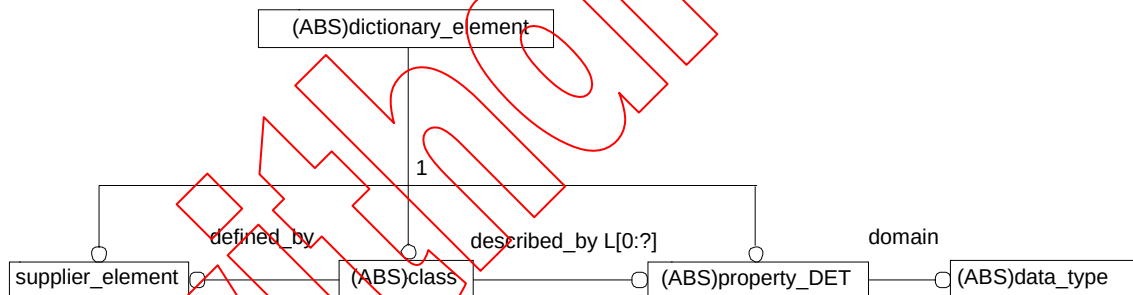


Figure 1 - Overview of the Dictionary Schema

5 ISO13584_IEC61360_dictionary_schema

This clause, which constitutes the main part of the common information model of ISO 13584-42 and IEC 61360, contains the full EXPRESS listing of the dictionary schema, annotated with comments and explanatory text. The order of text in this clause is determined firstly by the order imposed by the EXPRESS language, secondly by importance.

*)
SCHEMA ISO13584_IEC61360_dictionary_schema;
(*)

5.1 References to other schemata

This subclause contains references to other EXPRESS schemata which are used in the Dictionary Schema. Their source is indicated in the respective comment.

```

*)
REFERENCE FROM support_resource_schema (identifier, label, text);
    (*    from ISO 10303-41: STEP Part 41: "Fundamentals of Product
        Description and Support" *)
REFERENCE FROM person_organization_schema (organization, address);
    (*    from ISO 10303-41: STEP Part 41: "Fundamentals of Product
        Description and Support" *)
REFERENCE FROM measure_schema;
    (*    from ISO 10303-41: STEP Part 41: "Fundamentals of Product
        Description and Support" *)
REFERENCE FROM ISO13584_IEC61360_language_resource_schema;
    (*    see clause 6 "ISO13584_IEC61360_language_resource_schema" *)
(*)

```

5.2 Constant definitions

This subclause contains constant definitions used later in subclause 5.8 (basic type and entity definitions).

EXPRESS specification:

```

*)
CONSTANT
property_code_len:    INTEGER:= 14;
class_code_len:      INTEGER:= 14;
data_type_code_len:  INTEGER:= 14;
supplier_code_len:   INTEGER:= 18;
version_len:         INTEGER:= 3;
revision_len:        INTEGER:= 3;
value_code_len:      INTEGER:= 18;
pref_name_len:       INTEGER:= 30;
short_name_len:      INTEGER:= 15;
syn_name_len:        INTEGER:= pref_name_len;
DET_classification_len: INTEGER:= 3;
source_doc_len:      INTEGER:= 80;
value_format_len:    INTEGER:= 80;
sep_cv: STRING:= ' ';
sep_id: STRING:= ' ';
END_CONSTANT;
(*)

```

5.3 Basic Semantic Units: defining and using the dictionary

5.3.1 Requirements for exchange

In the exchange of dictionary and parts library data it is customary to partition the data. For example, a dictionary could be updated with some classes that specify their superclass by a reference to a pre-existing class, or when the content of a library is exchanged, dictionary elements are only referenced and not included every time. It must be possible to refer unambiguously and consistently to the dictionary data.

Thus, it is a clear requirement first, to be able to exchange pieces of data, and secondly, to have relationships between these pieces. This is depicted in figure 2.

Every one of these pieces corresponds to a Physical File (according to ISO 10303-21). EXPRESS (see ISO 10303-11) attributes can only contain references to data within the same Physical File. Thus it is impossible to use EXPRESS attributes directly to implement inter-piece references.

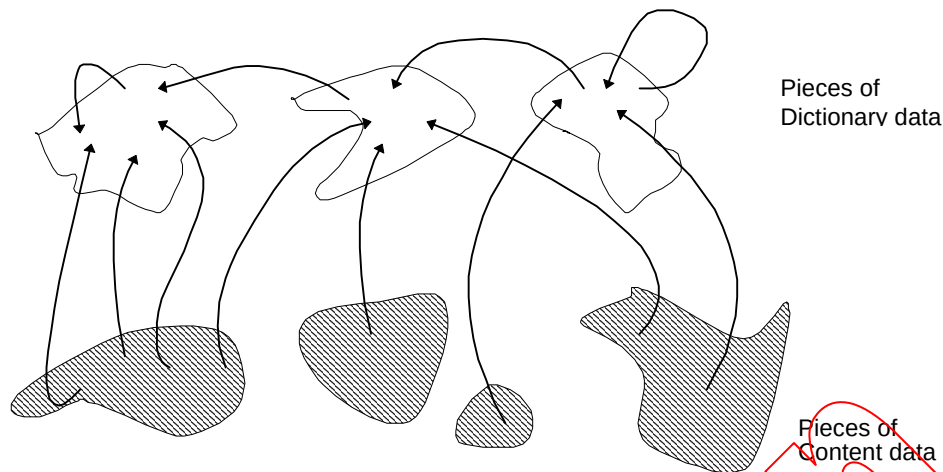


Figure 2 - Pieces of data with relationships

5.3.2 Three level architecture of the dictionary data

In this subclause the concept of **basic_semantic_unit** (BSU) is introduced as a means to implement these inter-piece references. A BSU provides a universally unique identification for dictionary descriptions. This is depicted in figure 3.

Assume that some piece of content (**content_item**) wants to refer to a certain dictionary description, e.g. to convey the value of a property of a component. It does this by referring to a Basic Semantic Unit through the attribute **dictionary_definition**.

A dictionary description (**dictionary_element**) refers to a Basic Semantic Unit through the attribute **identified_by**. From the correspondence of the absolute identifiers of the Basic Semantic Units this indirect relation is established.

Note that:

- both dictionary element and content item can be present in the same Physical File, but need not be;
- the dictionary element does not need to be present for the exchange of some Content Item referring to it. In this case it is assumed to be present in the dictionary of the target system already. Conversely, dictionary data can be exchanged without any content data;
- the basic semantic unit can be one single instance in the case where both dictionary element and content item instances are in the same Physical File;
- the same mechanism applies also to references between various dictionary elements (e.g. between a component class and the associated **property_DETs**).

A BSU provides a reference to a dictionary description in any place where this is needed, e. g. dictionary delivery, update delivery, library delivery, component data exchange. The data associated with a property could be exchanged as a couple (**property_BSU**, <value>).

Figure 3 outlines the implementation of this general mechanism.

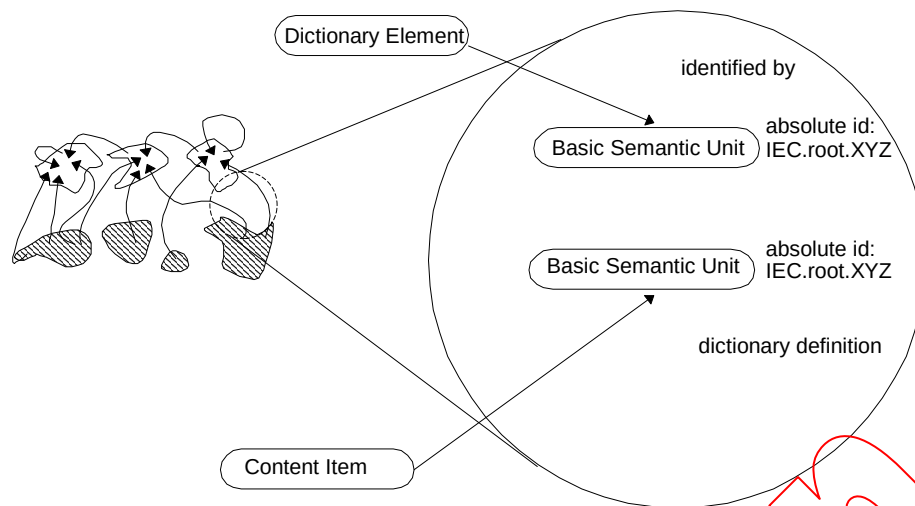


Figure 3 - Implementation of "inter-piece" relationships using basic semantic units

5.3.2.1 basic_semantic_unit

A **basic_semantic_unit** is a unique identification of a **dictionary_element**.

EXPRESS specification:

```

*)
ENTITY basic_semantic_unit
ABSTRACT SUPERTYPE OF ( ONEOF (
    supplier_BSU,
    class_BSU,
    property_BSU,
    data_type_BSU,
    supplier_related_BSU,
    class_related_BSU));
    code: code_type;
    version: version_Type;
DERIVE
    dic_identifier: identifier := code + sep_cv + version;
INVERSE
    definition: SET [ 0: 1 ] OF dictionary_element FOR
        identified_by;
    referenced_by: SET [ 0: 1 ] OF content_item FOR
        dictionary_definition;
END_ENTITY; -- basic_semantic_unit
( *
```

Attribute definitions:

code⁵: the code assigned to identify a certain dictionary element.

version⁶: the version number of a certain dictionary element.

dic_identifier⁷: the full identification, consisting of concatenation of code and version.

⁵ See IEC 61360-1 clauses 3.2.1 and 5.3.1 .

⁶ See IEC 61360-1 clauses 3.2.7 and 5.3.2 .

⁷ See IEC 61360-1 clauses 3.2.9 and 5.3.4 .

definition: a reference to the dictionary element identified by this BSU. If not present in some exchange context, it is assumed to be present in the dictionary of the target system already.

referenced_by: items making use of the dictionary element associated with this BSU.

5.3.2.2 dictionary_element

A **dictionary_element** is a full definition of the data required to be captured in the semantic dictionary for some concepts. For every concept a separate subtype shall be used. The **dictionary_element** is associated with a **basic_semantic_unit**, which serves to uniquely identify this definition in the dictionary.

Figure 4 presents a planning model of the relationship between the basic semantic unit and the dictionary element.

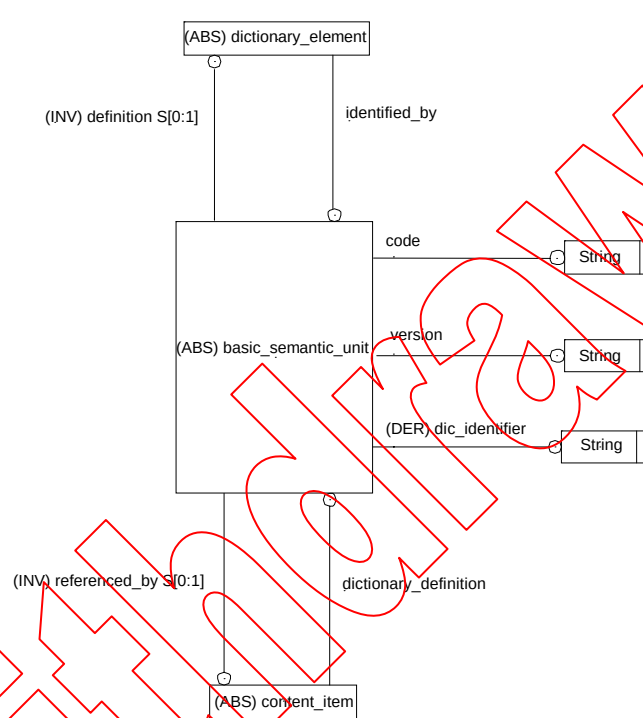


Figure 4 - Relationship between basic semantic unit and dictionary element

By including the version attribute in the **basic_semantic_unit** entity, it forms part of the identification of a dictionary element (in contrast to the **revision** and **time_stamps** attributes).

EXPRESS specification:

```

*)
ENTITY dictionary_element
ABSTRACT SUPERTYPE OF ( ONEOF (
    supplier_element,
    class_and_property_elements,
    data_type_element));
    identified_by: basic_semantic_unit;
    time_stamps: OPTIONAL dates;
    revision: revision_type;
END_ENTITY;
( *

```

Attribute definitions:

identified_by: the BSU identifying this dictionary element.

time_stamps: the optional dates of creation and update of this dictionary element.

revision⁸: the revision number of this dictionary element.

5.3.2.3 content_item

A **content_item** is a piece of data referring to its description in the dictionary. It shall be subtyped.

EXPRESS specification:

*)

ENTITY content_item

ABSTRACT SUPERTYPE;

dictionary_definition: basic_semantic_unit;

END_ENTITY;

(*

Attribute definitions:

dictionary_definition: the Basic Semantic Unit to be used for referring to the definition in the dictionary.

5.3.3 Overview of basic semantic units and dictionary elements

For every kind of dictionary data a pair of **basic_semantic_unit** and **dictionary_element** subtypes shall be defined. Figure 5 outlines, as a planning model, the Basic Semantic Units and Dictionary Elements defined later. Note that the relationship between BSUs and Dictionary Elements is redefined for each type of data, so that only corresponding pairs can be related. This is not graphically depicted here, however.

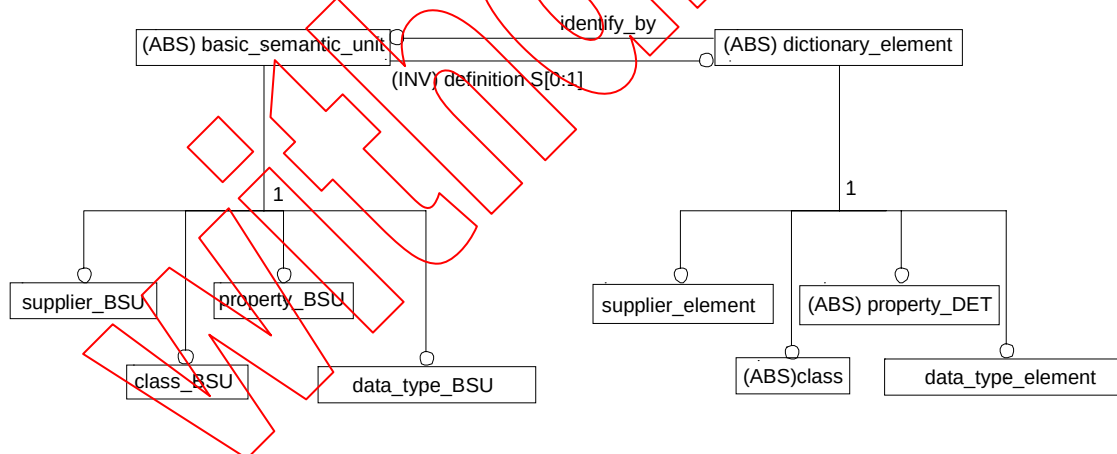


Figure 5 - Current BSUs and dictionary elements

Every kind of dictionary data is treated in one of the following subclauses:

- for suppliers, see 5.4 "Supplier data";
- for classes, see 5.5 "Class data";
- for properties / data element types, see 5.6 "Data element type / properties data";
- for data types, see 5.7 "Domain data: the type system".

⁸ See IEC 61360-1 clauses 3.2.8 and 5.3.3 .

5.3.4 Identification of dictionary elements: three-level structure

The absolute identification of basic semantic units is based on the following three-level structure:

- supplier (of dictionary data);
- class;
- class-related dictionary elements (any dictionary element defined in the context of a class; in this standard class-related dictionary elements are **property_DET** and **data_type_element**, but there are provisions to extend this mechanism to other items).

An absolute identification can be achieved by concatenation of the applicable code for each level.

This identification scheme is appropriate within a multi-supplier context. If, in a certain application area, only data of one single (data-) supplier are relevant, the corresponding parts of the identification, which are then constant, can be eliminated. For the purpose of exchange, however, all the levels must be present, to avoid clashes of identifiers.

This identification scheme is described formally in the ..._BSU entities, in 5.3 through 5.7, attribute **absolute_id**.

5.3.5 Extension possibilities for other types of data

The BSU - Dictionary Element mechanism is very general and not limited to the four kinds of data used here (see figure 5). This subclause specifies some facilities which allow for extensions for other kinds. Depending on whether the scope of the identifier is given by a class or a supplier, the corresponding _related_BSU entity has to be subtyped. It is necessary to redefine the **identified_by** attribute of the entity **dictionary_element** (as is done in 5.4 through 5.7 for the current kinds of data).

5.3.5.1 supplier_related_BSU

The **supplier_related_BSU** provides for the dictionary elements to be associated with suppliers, e.g. for the ISO 13584 series, program libraries.

EXPRESS specification:

```
*)
ENTITY supplier_related_BSU
ABSTRACT SUPERTYPE
SUBTYPE OF (basic_semantic_unit);
END_ENTITY;
(*
```

5.3.5.2 class_related_BSU

The **class_related_BSU** provides for the dictionary elements to be associated with classes, e.g. for ISO 13584 tables, documents, etc...

EXPRESS specification:

```
*)
ENTITY class_related_BSU
ABSTRACT SUPERTYPE
SUBTYPE OF (basic_semantic_unit);
END_ENTITY;
(*
```

5.3.5.3 supplier_BSU_relationship

The **supplier_BSU_relationship** is a provision for association of BSUs with suppliers.

EXPRESS specification:

```

*)
ENTITY supplier_BSU_relationship
ABSTRACT SUPERTYPE;
    relating_supplier: supplier_element;
    related_tokens: SET [ 1: ? ] OF supplier_related_BSU;
END_ENTITY;
(

```

Attribute definitions:

relating_supplier: the **supplier_element** which identifies the data supplier.

related_tokens: the set of dictionary elements associated with the supplier identified by the **relating_supplier** attribute.

5.3.5.4 class_BSU_relationship

The **class_BSU_relationship** entity is a provision for association of BSUs with classes.

EXPRESS specification:

```

*)
ENTITY class_BSU_relationship
ABSTRACT SUPERTYPE;
    relating_class: class;
    related_tokens: SET [ 1: ? ] OF class_related_BSU;
END_ENTITY;
(

```

Attribute definitions:

relating_class: the class which identifies the dictionary element.

related_tokens: the set of dictionary elements associated to the class identified by the **relating_class** attribute.

5.4 Supplier data

This subclause contains definitions for the representation of data about a supplier itself. In a multi-supplier environment it is necessary to be able to identify the source of a certain dictionary element. Figure 6 presents a planning model of the data associated with suppliers, followed by the EXPRESS definition.

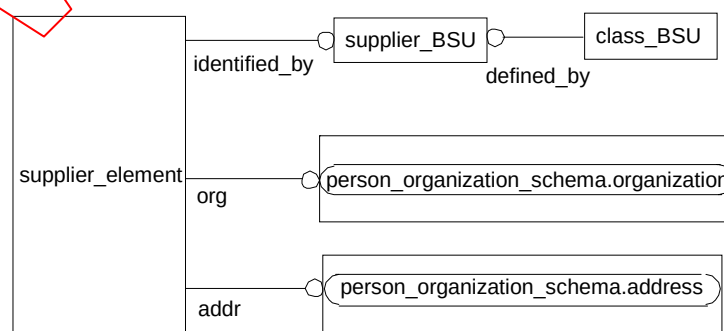


Figure 6 - Overview of supplier data and relationships

5.4.1 supplier_BSU

The **supplier_BSU** entity provides for unique identification of suppliers of dictionary data.

EXPRESS specification:

```
*)
ENTITY supplier_BSU
SUBTYPE OF (basic_semantic_unit);
    SELF\basic_semantic_unit.code: supplier_code_type;
DERIVE
    SELF\basic_semantic_unit.version: version_type:='001';
    absolute_id: identifier:= SELF\basic_semantic_unit.code;
UNIQUE
    UR1: absolute_id;
END_ENTITY;
(*
```

Attribute definitions:

code: the supplier's code assigned according to ISO 13584-26.

version: the version number of a supplier code shall be equal to 001.

absolute_id: the absolute identification of the supplier.

Formal propositions:

UR1: The supplier identifier defined by the **absolute_id** attribute is unique.

5.4.2 supplier_element

The **supplier_element** entity gives the dictionary description of suppliers.

EXPRESS specification:

```
*)
ENTITY supplier_element
SUBTYPE OF (dictionary_element);
    SELF\dictionary_element.identified_by: supplier_BSU;
    org: organization;
    addr: address;
INVERSE
    associated_items: SET [ 0: ? ] OF supplier_BSU_relationship
        FOR relating_supplier;
END_ENTITY;
(*
```

Attribute definitions:

identified_by: the **supplier_BSU** used to identify this **supplier_element**.

org: the organizational data of this supplier.

addr: the address of this supplier.

associated_items: allows access to other kinds of data via the BSU mechanism (e.g. program library in ISO 13584).

5.5 Class data

This subclause contains definitions for the representation of dictionary data of Classes.

5.5.1 General

Figure 7 outlines, as a planning model, the data associated with Classes and their relationship to other Dictionary Elements.

As indicated in figure 7 with the **its_superclass** attribute, classes form an inheritance tree. It is important to note that throughout this standard the terms "inheritance" and "to inherit" stand for this relationship between classes (defined in the dictionary), although EXPRESS has an inheritance concept, too. These shall be clearly distinguished to avoid misunderstandings.

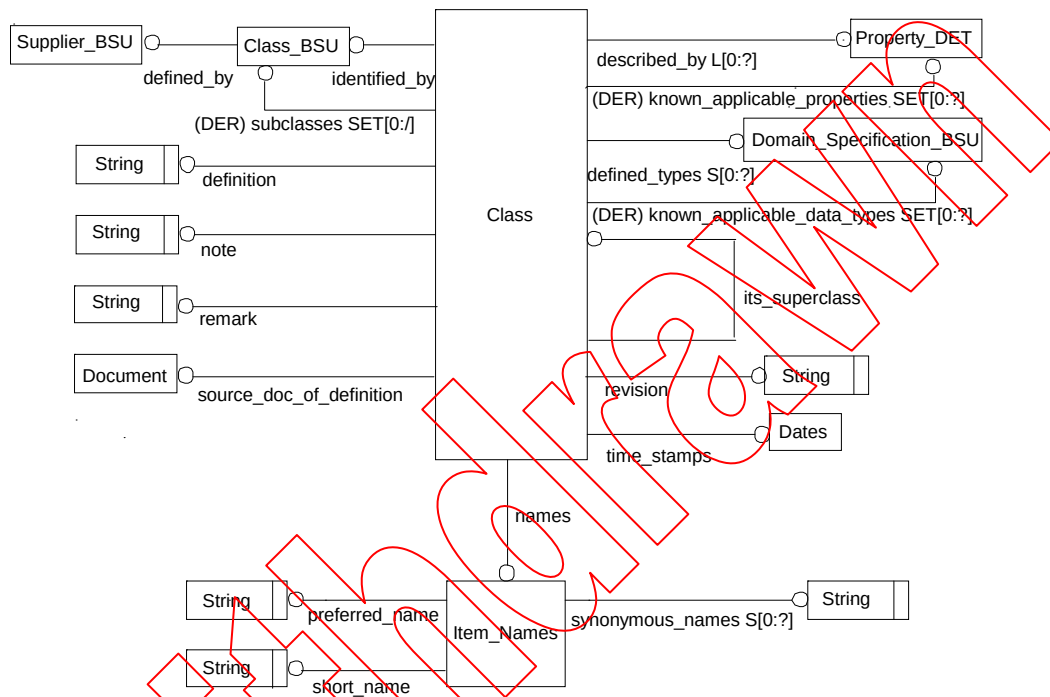


Figure 7 - Overview of class data and relationships

The dictionary data for Component Classes (as shown in figure 7) is spread over four inheritance levels:

- **class_and_property_elements** defines data common to both **classes** and **property_DETs**;
- **class** allows for other kinds of classes to be specified later (e.g. in ISO 13584-24);
- **item_class** is the entity to hold data of different classes of application domain objects (e.g. components, materials,...);
- **component_class** is the entity that models component classes and **material_class** is the entity that models classes of materials.

5.5.1.1 class_BSU

The **class_BSU** entity provides for the identification of classes.

EXPRESS specification:

```

*)
ENTITY class_BSU
SUBTYPE OF (basic_semantic_unit);
    SELF\basic_semantic_unit.code: class_code_type;
    defined_by: supplier_BSU;
DERIVE
    absolute_id: identifier:= defined_by.absolute_id + sep_id +
        dic_identifier;
    known_visible_properties: SET [0: ?]OF property_BSU
        :=compute_known_visible_properties(SELF);
    known_visible_data_types: SET [0: ?]OF data_type_BSU
        :=compute_known_visible_data_types(SELF);
INVERSE
    subclasses: SET [0: ?] OF class FOR its_superclass;
    added_visible_properties:SET [0: ?] OF property_BSU
        FOR name_scope;
    added_visible_data_types:SET [0: ?] OF data_type_BSU
        FOR name_scope;
UNIQUE
    UR1: absolute_id;
END_ENTITY; -- class_BSU
(*)
    
```

Attribute definitions:

code: the code assigned to this class by its supplier.

defined_by: the supplier defining this class and its dictionary element

absolute_id: the unique identification of this class.

known_visible_properties⁹: the set of **property_BSUs** that refer to the class as their **name_scope** attribute or to any known superclass of this class and that are therefore visible for the class (and any of its subclass).

known_visible_data_types¹⁰: the set of **data_type_BSUs** that refer to the class as their **name_scope** attribute or to any known superclass of this class and that are therefore visible for the class (and any of its subclass).

subclasses: the set of classes specifying this class as their superclass.

added_visible_properties¹¹: the set of **property_BSUs** that refer to the class as their **name_scope** and that are therefore visible for the class (and any of its subclass).

added_visible_data_types¹²: the set of **data_type_BSUs** that refer to the class as their **name_scope** and that are therefore visible for the class (and any of its subclass).

⁹ Within IEC all the data element types refer to the IEC root at their **name_scope** attribute. Therefore, all the data element types defined within IEC are visible for every IEC class.

¹⁰ The capability to define visible data types that may be reused for different data element types is not used in the current version of IEC 61360. Therefore, the **added_visible_data_types** attribute is empty for all classes.

¹¹ Within IEC all the data element types refer to the IEC root at their **name_scope** attribute. Therefore, the **added_visibility_properties** attribute is empty for all the other classes.

¹² The capability to define **data_types** that may be reused for different data element types is not used in the current version of IEC 61360.

Formal propositions:

UR1: The concatenation of supplier code and class code is unique.

5.5.1.2 class_and_property_elements

The **class_and_property_elements** entity captures the attributes which are common to both classes and **property_DETs**.

EXPRESS specification:

```

*)
ENTITY class_and_property_elements
ABSTRACT SUPERTYPE OF ( ONEOF (
    property_DET,
    class))
SUBTYPE OF (dictionary_element);
    names: item_names;
    definition: definition_type;
    source_doc_of_definition: OPTIONAL document;
    note: OPTIONAL note_type;
    remark: OPTIONAL remark_type;
END_ENTITY;
( *

```

Attribute definitions:

names¹³: the names describing this dictionary element.

definition¹⁴: the text describing this dictionary element.

source_doc_of_definition¹⁵: the source document of this textual description.

note¹⁶: further information on any part of the dictionary element, which is essential to the understanding.

remark¹⁷: explanatory text further clarifying the meaning of this dictionary element.

5.5.1.3 class

The **class**¹⁸ entity is an abstract resource for all kinds of classes.

EXPRESS specification:

```

*)
ENTITY class
ABSTRACT SUPERTYPE OF (ONEOF (item_class))
SUBTYPE OF (class_and_property_elements);
    SELF\dictionary_element.identified_by: class_BSU;
    its_superclass: OPTIONAL class_BSU;
    described_by: LIST [0: ?] OF UNIQUE property_BSU;
    defined_types: SET [ 0: ? ] OF data_type_BSU;

```

¹³ See IEC 61360-1 clauses 3.2.2, 3.2.3, 3.2.6 and 5.3.5 .

¹⁴ See IEC 61360-1 clauses 3.3.1 and 5.4.1 .

¹⁵ See IEC 61360-1 clauses 3.3.6 and 5.4.4 .

¹⁶ See IEC 61360-1 clauses 3.3.2 and 5.4.2 .

¹⁷ See IEC 61360-1 clauses 3.3.3 and 5.4.3 .

¹⁸ See IEC 61360-1 figure 12.

```

DERIVE
  subclasses: SET [0: ?] OF class:= identified_by.subclasses;
  known_applicable_properties: SET [ 0: ? ] OF property_BSU
    := compute_known_applicable_properties(
      SELF\dictionary_element.identified_by);
  known_applicable_data_types: SET [ 0: ? ] OF data_type_BSU
    := compute_known_applicable_data_types(
      SELF\dictionary_element.identified_by);
INVERSE
  associated_items: SET [ 0: ? ] of class_BSU_relationship FOR
    relating_class;
WHERE
  WR1: acyclic_superclass_relationship ( SELF.identified_by, [ ] );
  WR2: NOT all_class_descriptions_reachable (
    SELF\dictionary_element.identified_by)
    OR (list_to_set (SELF. described_by) <=
    SELF\dictionary_element.identified_by.known_visible_properties);
  WR3: NOT all_class_descriptions_reachable (
    SELF\dictionary_element.identified_by)
    OR (SELF. defined_types <=
    SELF\dictionary_element.identified_by.known_visible_data_types);
  WR4: list_to_set (SELF. described_by) *
    NVL (SELF.its_superclass.definition[1]
    .known_applicable_properties, [])= [];
  WR5: SELF.defined_types *
    NVL (SELF.its_superclass.definition[1]
    ;known_applicable_data_types, [])= [];
END_ENTITY;
( *

```

Attribute definitions:

identified_by: the **class_BSU** identifying this class.

its_superclass: reference to the class of which the current one is a subclass.

described_by: the list of references to the additional properties available for use in the description of the part within the class, and any of its subclasses.

defined_types¹⁹: the optional set of references to the types that can be used for various **property_DETs** throughout the inheritance tree descending from this class.

subclasses: the set of classes specifying this class as their superclass²⁰.

known_applicable_properties²¹: the **property_BSUs** that are referenced by the class or any of its known superclass by their **described_by** attribute, and that are therefore applicable to this class (and to any of its subclass).

known_applicable_data_types²²: the **data_type_BSUs** that are referenced by the class or any of its known superclass by their **defined_types** attribute, and that are therefore applicable to this class (and to any of its subclass).

¹⁹ The capability to define **data_types** that may be reused for different data element types is not used in the current version of IEC 61360.

²⁰ According to IEC 61360-1 a class shall have 0 or more than 1 subclass .

²¹ According to IEC 61360-1 subclause 5.1, the data element types that apply to some component classes apply also to all component classes at lower levels. This attribute gathers the data element types that apply to a class either by virtue of belonging to the **described_by** attribute or by inheritance.

²² This attribute gathers the **data_types** that may be referenced from a component class either by virtue of belonging to the **described_by** attribute or by inheritance. Note that the capability to define **data_types** that may be reused for different data element types is not used in the current version of IEC 61360.