

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

Part 5: Extensions to the EXPRESS dictionary schema

The European Standard EN 61360-5:2004 has the status of a British Standard

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National foreword

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**Standard data element types
with associated classification scheme for electric components
Part 5: Extensions to the EXPRESS dictionary schema
(IEC 61360-5:2004)**

Types normalisés d'éléments de données
avec plan de classification
pour composants électriques
Partie 5: Extensions pour le schéma
d'un dictionnaire EXPRESS
(CEI 61360-5:2004)

Genormte Datenelementtypen mit
Klassifikationsschema für elektrische
Bauteile
Teil 5: Erweiterung des EXPRESS-
Datenmodells
(IEC 61360-5:2004)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 3D/128/FDIS, future edition 1 of IEC 61360-5, prepared by SC 3D, Data sets for libraries, of IEC TC 3, Information structures, documentation and graphical symbols, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61360-5 on 2004-06-01.

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Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61360-5:2004 was approved by CENELEC as a European Standard without any modification.

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

Part 5: Extensions to the EXPRESS dictionary schema

1 Scope and object

The scope of this part of IEC 61360 is the extension of the common ISO/IEC dictionary schema for the definition of concepts which are used in IEC 61360-1 but which are not addressed by the information models specified in IEC 61360-2.

The object of this standard is to provide a formal model for data according to the scope as given above, and thus to provide, with IEC 61360-2, a means for the computer-sensible representation and exchange of all data which comply with IEC 61360-1.

The common ISO/IEC dictionary schema as defined in IEC 61360-2 is the common ISO/IEC dictionary schema based on the intersection of the scopes of the two base standards:

- IEC 61360-1;
- ISO 13584-42.

and facilitates a harmonization of both.

Quotation of a relevant part from the scope and object of IEC 61360-1:

This part of IEC 61360 provides a firm basis for the clear and unambiguous definition of characteristic properties (data element types) of all elements of electrotechnical systems from basic components to subassemblies and full systems. Although originally conceived in the context of providing a basis for the exchange of information on electric/electronic components, the principles and methods of this standard may be used in areas outside the original conception such as assemblies of components and electrotechnical systems and subsystems

Quotation of a relevant part from the introduction of ISO 13584-42:

This part of ISO 13584 provides rules and guidelines for library data suppliers to create hierarchies of families of parts according to a common methodology intended to enable multi-supplier consistency. These rules pertain to the following: the method for grouping parts into families of parts to form a hierarchy; the dictionary elements that describe the families and properties of parts.

IEC 61360-2 provides 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.

This part of IEC 61360 provides a Library Integrated Information Model (liim) that, with resources from IEC 61360-2, ISO 13584 and ISO 10303, allows modelling and exchanging dictionary information compliant with IEC 61360-1.

2 Normative references

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

IEC 61360-1:2002, *Standard data element types with associated classification scheme for electric components – Part 1: Definitions – Principles and methods*

IEC 61360-2:2002, *Standard data element types with associated classification scheme for electric components – Part 2: EXPRESS dictionary schema*

IEC 61360-4:1997, *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*

ISO 10303-11:1994, *Industrial automation systems and integration – Product data representation and exchange – Part 11: Description methods: The EXPRESS language reference manual*

ISO 13584-1:2001, *Industrial automation systems and integration – Parts library – Part 1: Overview and fundamental principles*

ISO 13584-24:2003, *Industrial automation systems and integration – Parts library – Part 24: Logical resource: Logical model of supplier library*

ISO 13584-25, *Industrial automation systems and integration – Parts library – Part 25: Logical resource: Logical model of supplier library with aggregate values and explicit content*¹

ISO 13584-42:1998, *Industrial automation systems and integration – Parts library – Part 42: Description methodology: Methodology for structuring part families*

3 Terms and definitions and abbreviations

For the purposes of this document, the terms and definitions as given in IEC 61360-1, IEC 61360-2, ISO 13584-24 as well as the following apply. Some of these definitions are repeated for convenience.

NOTE Definitions copied verbatim from other standards are followed by a reference to the source standard in brackets. Definitions that have been adapted from other standards are followed by an explanatory note.

3.1

applicable property

a property that is defined for some family of parts and that shall apply to any part that belongs to this family of parts

[ISO 13584-24:2003, definition 3.3]

EXAMPLE For a generic family of screws, the threaded diameter is an applicable property. This characteristic applies to any screw.

¹ To be published.

3.2

basic semantic unit

BSU

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

[IEC 61360-2:2002, definition 2.1]

3.3

class extension

the set of all instances satisfying the class definition

[ISO 13584-24:2003, definition 3.13]

3.4

common dictionary schema

information model for a dictionary, using the modelling language EXPRESS

[IEC 61360-2:2002, definition 2.3]

NOTE The common dictionary schema is formally named ISO13584_IEC61360_dictionary_schema and is specified in IEC 61360-2:2002. This schema is duplicated in Annex D of ISO 13584-42:1998.

3.5

conformance class

a subset of a standard for which conformance may be claimed

[ISO 13584-24:2003, definition 3.17]

3.6

conformance requirement

a precise, text definition of a characteristic required to be present in a conforming implementation

[ISO 10303-1:1994, definition 3.2.13]

3.7

dictionary element

set of attributes that constitutes the dictionary description of certain objects of the application domain (for example classes, data element types)

[IEC 61360-2:2002, definition 2.2]

3.8

data element type

DET

unit of data for which the identification, description and value representation have been specified

[IEC 61360-1:2002, definition 2.3]

3.9

data type

set of allowed values of a data element type.

[IEC 61360-2:2002, definition 2.4]

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.

3.10

family of parts

a simple or generic family of parts

[ISO 13584-24:2003, definition 3.40]

3.11

functional model

the library data that represent one representation category of a part in an integrated library

[ISO 13584-1:2001, definition 3.1.3]

3.12

functional view

the data that represent one representation category of a part in product data

[ISO 13584-1:2001, definition 3.1.4]

NOTE The structure of a functional view does not depend on the part it represents.

3.13

general model

the library data that carries the definition and identity of a part in an integrated library

[ISO 13584-1:2001, definition 3.1.5]

3.14

generic family of parts

a grouping of simple or generic families of parts done for purposes of classification or for factoring common information

[ISO 13584-24:2003, definition 3.44]

3.15

library delivery file

a population of EXPRESS entity instances conforming to a library integrated information model and represented according to one of the implementation methods specified in ISO 10303

[ISO 13584-24:2003, definition 3.68]

NOTE A library delivery file specifies the structure and the content of a supplier library. It may reference library external files.

3.16

library part

a part associated with a set of data that represents it in a library

[ISO 13584-1:2001, definition 3.1.13]

3.17

library part data

data that represent a part in a library

[ISO 13584-1:2001, definition 3.1.14]

3.18

library exchange context

the set of one library delivery file and zero, one or more library external files that represent together a supplier library

[ISO 13584-24:2003, definition 3.70]

3.19**library external file**

a file, referenced from a library delivery file, that contributes to the definition of a supplier library

[ISO 13584-24:2003, definition 3.71]

NOTE The structure and the format of a library external file is specified in the library delivery file that references it.

3.20**library integrated information model****LIIM**

an EXPRESS schema that integrates resource constructs from different EXPRESS schemas for representing supplier libraries for the purpose of exchange and that is associated with conformance requirements

[ISO 13584-24:2003, definition 3.72]

3.21**library specification of a class**

the explicit representation of a class extension in a supplier library

[ISO 13584-24:2003, definition 3.76]

NOTE 1 In the ISO 13584 series, every class is intentionally defined through a dictionary element. Only those classes of which the supplier desires to represent explicitly the possible instances are associated with a library specification.

NOTE 2 In ISO 13584-24, the library specification of a class consists of a set that contains all the different possible instances.

3.22**part**

material or functional element that is intended to constitute a component of different products

[ISO 13584-1:2001, definition 3.1.16]

3.23**property**

an information that may be represented by a data element type

[ISO 13584-42:1998, definition 3.4.10]

3.24**representation category**

an abstraction used to distinguish between various possible user requirements regarding a part representation

[ISO 13584-1:2001, definition 3.1.20]

NOTE In the model defined in the ISO 13584 standard series, this distinction is formally expressed in terms of a view logical name and in terms of the view control variables.

3.25**resource construct**

the collection of EXPRESS language entities, types, functions, rules and references that together define a valid description of data

[ISO 13584-24:2003, definition 3.97]

3.26

simple family of parts

a set of parts of which each part may be described by the same group of properties

[ISO 13584-24:2003, definition 3.98]

3.27

supplier library

a set of data, and possibly of programs, for which the supplier is defined and that describes in the standard format defined in ISO 13584 a set of parts and/or a set of representation of parts

[ISO 13584-1:2001, definition 3.1.22]

3.28

user library

information that results from the integration of one or more supplier libraries by the library management system and possibly from a later adaptation performed by the user

[ISO 13584-1:2001, definition 3.1.23]

3.29

view exchange protocol

VEP

a part of ISO 13584 that describes the use of resource constructs and of representation transmission interfaces that satisfy the information requirement for the exchange of one representation category of parts

[ISO 13584-24:2003, definition 3.107]

3.30

visible property

a property that is defined for some family of parts and that may or not apply to the different parts of this family of parts

[ISO 13584-24:2003, definition 3.109]

EXAMPLE For a generic family of screws, the non-threaded length is a visible property: it is clearly defined for any screw, but only those screws with a non-threaded part have a value for this property.

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

3.31

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'

[IEC 61360-2:2002, definition 2.5]

3.32

applicable data element type

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

[IEC 61360-2:2002, definition 2.6]

3.33

visible data element type

data element type that is defined for some 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.

4 Structure of IEC 61360-5

IEC 61360-5 has two main parts:

- the generic resource part provides resource constructs for representing aggregate data types. Aggregate data types and values are modelled in total conformance with the EXPRESS language.
- the library integrated information model gathers the above resource construct with other generic resource constructs from IEC 61360-2 and from different parts of ISO 13584 and ISO 10303 into one single schema for representing dictionaries that may include aggregate data types.

4.1 Generic resource

The generic resource contains the

ISO13584_IEC61360_dictionary_aggregate_extension_schema EXPRESS schema.

This schema provides resource constructs that are generic in nature. It may be used outside the IEC 61360 series and particularly in all the applications that use a data dictionary compliant with the IEC 61360 series

It provides the resource constructs needed to describe data types corresponding to aggregate data types as defined in the EXPRESS language. It defines resources to describe array, bag, list and set data types. These data types extend the data types already defined in the **ISO13584_ISO61360_dictionary_schema** published in IEC 61360-2:2002.

4.2 Library integrated information model

4.2.1 General

The library integrated information model specified in this part of IEC 61360, gathers the generic resource constructs defined in this part of IEC 61360 with other generic resource constructs from IEC 61360-2 and various other parts of ISO 13584 and ISO 10303 into a single schema for representing dictionaries for the purpose of exchange. The library integrated information model was jointly developed between ISO and IEC. For the purpose of exchanging dictionary information compliant with IEC 61360-1, only four kinds of exchange are applicable for IEC 61360-5 and are defined below. Other kinds of exchange are defined in ISO 13584-25.

- Dictionaries that define hierarchies of classes of items, that may be parts, materials or other items, with aggregate-structured properties using only the EXPRESS resource constructs defined in the ISO/IEC common dictionary schema or in the **ISO13584_IEC61360_dictionary_aggregate_extension_schema** defined in this part of IEC 61360 correspond to conformance class 1;
- Dictionaries that define hierarchies of classes of items, that may be parts, materials, features or other items, using the extension of the ISO/IEC common dictionary schema defined in ISO 13584-24, but without description of item representations and of representation categories of items, and without aggregate-structured properties, correspond to conformance class 2;
- Dictionaries that define hierarchies of classes of items, of item representations, and of representation categories of items, with aggregate-structured properties, correspond to conformance class 3;
- Dictionaries with the same scope as conformance class 3 but with no more than two levels nesting for aggregate-structured properties, correspond to conformance class 4;

Each of the above kinds of exchange context corresponds to one conformance class of the library-integrated model 'ISO13584_25_IEC61360_5_liim_schema'. Each conformance class specifies the conformance requirements for implementations that claim conformance to this conformance class. In this part of IEC 61360, each subset that defines a conformance class is defined by means of a list of entities. An implementation that claims conformance to any conformance class shall support all the entities listed for this conformance class and related constructs.

The library integrated model 'ISO13584_25_IEC61360_5_liim_schema' is defined by means of a set of entities, types and associated constructs that addresses the requirements of both ISO Technical Committee 184/Subcommittee 4/Working Group 2 and IEC Subcommittee 3D and is therefore broader than just the IEC conformance class.

4.2.2 Conformance class 1: minimal dictionaries

Conformance class 1 supports the information requirements for exchanging definitions of hierarchies of item classes, where items may be parts or materials. It allows the exchange of all dictionary elements from the ISO/IEC dictionary schema (IEC 61360-2) and those dictionary elements that may have aggregate-structured values according to Annex A of this part of IEC 61360. Conformance class 1 is associated with implementation methods for the library delivery file. Conformance requirements to conformance class 1 are defined in B.3.1 of this part of IEC 61360.

4.2.3 Conformance class 2: dictionaries of items classes

Conformance class 2 supports the information requirements for exchanging definitions of hierarchies of item classes, where items may be parts, materials or features, whose properties may not have aggregate-structured values. Conformance class 2 is associated with a set of standard data that defines the formats of library external files that may be referenced by a library delivery file conforming to conformance class 2, and with implementation methods for the library delivery file. Conformance requirements for conformance class 2 are defined in B.3.2 of this part of IEC 61360.

4.2.4 Conformance class 3: complete dictionaries

Conformance class 3 supports the information requirements for exchanging definitions of hierarchies of item classes, where items may be parts, materials or features, together with definitions of representations of such item classes, and with definitions of representation categories of such item classes. Properties of all these classes may have aggregate-structured values. Conformance class 3 is associated with a set of standard data that defines the formats of library external files that may be referenced by a library delivery file conforming to conformance class 3, and with implementation methods for the library delivery file. Conformance requirements for conformance class 3 are defined in B.3.3 of this part of IEC 61360.

4.2.5 Conformance class 4: complete dictionaries with limited nested aggregate values

Conformance class 4 supports the information requirements corresponding to conformance class 3 with a restriction. The aggregate values involved in conformance class 4 shall not be nested more than twice. Conformance requirements for conformance class 4 are defined in B.3.4 of this part of IEC 61360.

Based on the same library integrated model 'ISO13584_25_IEC61360_5_liim_schema' five additional conformance classes are defined for the exchange of libraries and/or instances of parts. Those definitions can be found in ISO 13584-25.

5 Requirements

The requirements of this standard shall be fulfilled by compliance with the appropriate Clauses and Annexes from ISO 13584-25.

For convenience these Clauses and Annexes are reproduced below as informative Annexes to this standard as follows:

Annex A:

EXPRESS information model for the aggregate data type; [Clause 6 of ISO 13584-25]

Annex B:

Definition of the library integrated model 'ISO13584_25_IEC61360_5_liim_schema', and the definition of the conformance classes; [Clause 8 of ISO 13584-25]

Annex C:

Library integrated information model 'ISO13584_25_IEC61360_5_liim_schema', expanded listing; [Annex C of ISO 13584-25]

Annex D:

Standard data requirements for library integrated information model 'ISO13584_25_IEC61360_5_liim_schema' [Annex D of ISO 13584-25]

Annex E:

Implementation requirements for the library integrated information model 'ISO13584_25_IEC61360_5_liim_schema', defining this part of IEC 61360-5; [Annex E of ISO 13584-25]

Annex F:

EXPRESS diagram for aggregate data types. [Annex F1 of ISO 13584-25].

Annex A (informative)

ISO13584_IEC61360_dictionary_aggregate_extension_schema

A.1 General

This Annex defines the requirements for the **ISO13584_IEC61360_dictionary_aggregate_extension_schema**. The following EXPRESS declaration introduces the **ISO13584_IEC61360_dictionary_aggregate_extension_schema** and identifies the necessary external references.

EXPRESS specification:

```
*)
SCHEMA ISO13584_IEC61360_dictionary_aggregate_extension_schema;

REFERENCE FROM ISO13584_IEC61360_dictionary_schema (
    data_type,
    entity_instance_type);

(*
```

NOTE The schema referenced above can be found in the following documents:
ISO13584_IEC61360_dictionary_schema IEC 61360-2:2002
(which is duplicated for convenience in informative Annex D of ISO 13584-42:1998.)

A.2 Introduction to the ISO13584_IEC61360_dictionary_aggregate_extension_schema

The **ISO13584_IEC61360_dictionary_aggregate_extension_schema** provides the information model for the extension to the ISO/IEC common dictionary schema which allows the use of lists, sets, bags, arrays and sets of subsets of simple or complex data types.

This extension is achieved in two steps.

- the **entity_instance_type_for_aggregate** entity provides the means to reference EXPRESS-defined entities that specify aggregate data types. The **entity_instance_type_for_aggregate** is a subtype of the **entity_instance_type** entity;

NOTE The **entity_instance_type** entity is defined in the IEC 61630-2 and duplicated in ISO 13584-42.

- then, entities that specify aggregate data types are modelled by the **aggregate_type** entity and its specializations.

A.3 ISO13584_IEC61360_dictionary_aggregate_extension_schema entity definitions

The following entity type definitions describe the necessary resources needed to encode aggregate types.

A.3.1 Aggregate_entity_instance_type entity

The **entity_instance_type_for_aggregate** entity provides for referencing definitions of data types that may be expressed as lists, sets, bags or arrays of simple or complex values. It is defined by referencing an **aggregate_type** defined in this schema.

EXPRESS specification:

```

*)
ENTITY entity_instance_type_for_aggregate
SUBTYPE OF (entity_instance_type);
    type_structure: aggregate_type;
WHERE
    WR1: SELF\entity_instance_type.type_name =
        ['ISO13584_IEC61360_DICTIONARY_AGGREGATE_EXTENSION_SCHEMA'
        + '.AGGREGATE_TYPE'];
END_ENTITY;
(*

```

Attribute definition:

type_structure: the **aggregate_type** referenced and carried by the **entity_instance_type**.

Formal propositions:

WR1: the **type_name** attribute of the **entity_instance_type** shall contain the string 'ISO13584_IEC61360_DICTIONARY_AGGREGATE_EXTENSION_SCHEMA.AGGREGATE_TYPE'.

A.3.2 Aggregate_type entity

The **aggregate_type** entity provides for the definition of data types that may be expressed as lists, sets, bags or arrays of simple or complex values.

EXPRESS specification:

```

*)
ENTITY aggregate_type
ABSTRACT SUPERTYPE OF (ONEOF (
    list_type,
    set_type,
    bag_type,
    array_type, set_with_subset_constraint_type ));
    bound_1: OPTIONAL INTEGER;
    bound_2: OPTIONAL INTEGER;
    value_type: data_type;
WHERE
    WR1: bound_1 <= bound_2;
END_ENTITY;
(*

```

Attribute definition:

value_type: is the type of value (simple or complex) which is used for each element of the aggregate.

bound_1: the optional integer that defines the low bound of the defined aggregate type.

bound_2: the optional integer that defines the upper bound of the defined aggregate type.

Formal propositions:

WR1: **bound_1** cannot be greater than **bound_2**.

A.3.3 List_type entity

The **list_type** entity provides for the definition of data types that may be expressed as ordered lists of values in which duplication may or may not be allowed.

EXPRESS specification:

```
*)
ENTITY list_type
SUBTYPE OF (aggregate_type);
    uniqueness: BOOLEAN;
WHERE
    WR1: EXISTS(bound_1) OR NOT(EXISTS(bound_2));
    WR2: NOT(EXISTS(bound_1)) OR (bound_1 >= 0);
END_ENTITY;
(*
```

Attribute definition:

uniqueness: a flag to indicate whether all elements of the list must be unique (true) or whether duplicates are allowed (false).

Formal propositions:

WR1: if the upper bound **bound_2** of the defined list optional attribute exists, it implies that the lower bound **bound_1** optional attribute of the defined list exists as well.

WR2: if the lower bound **bound_1** of the defined list optional attribute exists then it is greater or equal to 0.

A.3.4 Set_type entity

The **set_type** entity provides for the definition of data types that may be expressed as unordered collections of values in which no duplication can occur.

EXPRESS specification:

```
*)
ENTITY set_type
SUBTYPE OF (aggregate_type);
WHERE
    WR1: EXISTS(bound_1) OR NOT(EXISTS(bound_2));
    WR2: NOT(EXISTS(bound_1)) OR (bound_1 >= 0);
END_ENTITY;
(*
```

Formal propositions:

WR1: if the upper bound **bound_2** of the defined list optional attribute exists, it implies that the lower bound **bound_1** optional attribute of the defined list exists as well.

WR2: if the lower bound **bound_1** of the defined list optional attribute exists then it is greater or equal to 0.

A.3.5 Bag_type entity

The **bag_type** entity provides for the definition of data types that may be expressed as unordered collections of values in which duplication may occur.

EXPRESS specification:

```
*)
ENTITY bag_type
SUBTYPE OF (aggregate_type);
WHERE
    WR1: EXISTS(bound_1) OR NOT(EXISTS(bound_2));
    WR2: NOT(EXISTS(bound_1)) OR (bound_1 >= 0);
```