BRITISH STANDARD

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23584-1:2009

Optics and photonics — Specification of reference dictionary

Part 1: General overview on organization and structure

ICS 37.020

BSI
British Standards

National foreword

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Part 1: General overview on organization and structure

Optique et photonique — Spécification d'un dictionnaire de référence —

Partie 1: Aperçu général sur l'organisation et la structure

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23584-1 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*.

ISO 23584 consists of the following parts, under the general title *Optics and photonics — Specification of reference dictionary*:

— *Part 1: General overview on organization and structure*

— *Part 2: Classes' and properties' definitions*

Introduction

Modern business operations — known collectively as e-Business and including e-Marketplaces, e-Product catalogues and Lifecycle Management — are characterized by:

1) **Complex structures of the product lifecycle**

   In each step of the product lifecycle (ranging from the first idea through development, manufacture, distribution, use and disposal of the product) information from another step or other steps is required, moreover, new additional information in generated. Numerous parties and/or processes are involved in or form part of the product lifecycle. Hence information needs to be transferred to and/or exchanged between those parties and processes, across company internal interfaces and across interfaces to external business partners (such as other manufacturers, suppliers and customers).

   To ensure successful handling of these business operations it is essential that the communication between parties and processes involved be independent from individual agreements on data and that the data, once created, be readily usable by other parties and in other processes without a need for conversion mechanisms.

2) **Availability of new electronic media**

   Suppliers make efforts to provide such media and (potential) buyers are bombarded with this information, whilst missing transparency.

   To take advantage of the economic potential of these new media, product information provided by various suppliers must be clear and unambiguous (inter-comparable) for a potential buyer.

The requirement arising from both of these aspects is that the description of products and processes be:

— uniformly consistent and unambiguous;

— neutral (neither company-specific nor software-specific nor product-specific);

— available in electronic form for ready use without conversion.

This is generally true for any business area.

For the business area of optics and photonics, as regards optical data, the situation that led to the decision to prepare ISO 23584 was:

a) available ISO Standards such as the ISO 10110 series, describe the preparation of drawings and provide verbal definition of properties, but do not provide sufficient detail of information required for an unambiguous data exchange;

b) programs (i.e. software, either commercially available or custom-made) used in different areas of a single company or amongst business partners (e.g. Code V, Zemax, AutoCAD, HiCAD, MS Excel, SAP, etc.) use different interfaces and different internal data representation; any attempt to exchange data between them requires multi-directional conversion mechanisms or is associated with a risk of introducing errors or simply is impossible;

c) a consistent standardized terminology over the entire optics area does not exist.

On the basis of standardized and electronically available properties, data exchange between, and immediate use of transmitted data in, the programs (software) used in various departments or branches of one company

or at various business partners can be implemented. Use of standardized properties increases process comprehensiveness at companies and permits closer IT-based links between customers and suppliers in the areas of development and supply. This in turn leads to cost savings by way of cuts in the number of required parts and shorter product-development time frames.

Though limited to the field of optics and photonics, the reference dictionary must include all relevant properties required for the full description of optical products and processes. Therefore, in addition to the properties that are peculiar to the field of optics and photonics, the reference dictionary also includes, be it by specification or be it by reference from other dictionaries, properties being of universal nature rather than specific to “optics and photonics”, e.g. quantities and units or fundamental physical entities, and the required properties from other technical fields, e.g. mechanical components such as mountings for optical elements, if they are not defined elsewhere (i.e. in another PLIB standard) and so cannot be referenced.

In the interests of utmost effectiveness the reference dictionary and its entire content is made available in electronic form, ready for import into and use in a user's application system.

NOTE Ideally, the reference dictionary and its content will be available in the form of an online database. It is acknowledged, however, that the provision of ISO properties in an online database is a new approach in ISO and that no suitable ISO database is currently available to provide the content and to allow export and subsequent import into the application system of the user. Therefore, this part of ISO 23584 is made available in the conventional form, but is supplemented by the relevant data in processable form on CD-Rom or as a download.

INTERNATIONAL STANDARD **ISO 23584-1:2009(E)**

Optics and photonics — Specification of reference dictionary —

Part 1:
General overview on organization and structure

1 Scope

This part of ISO 23584 provides the basis for the preparation of a reference dictionary of standardized product properties for the area of optics and photonics, and for the provision of this reference dictionary and its entire contents in electronic form.

This part of ISO 23584, on the basis of the rules set forth in ISO 13584-42, IEC 61360-1 and in the ISO/IEC Guide 77-2 for specification of product properties and families, specifies a reference dictionary of standardized product properties for the area of optics and photonics.

The properties are determined on the basis of standardized attributes. To ensure optimum unambiguity the standardized properties are classified into definition classes forming a so-called standardized “reference hierarchy”.

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.

ISO 31 (all parts), *Quantities and units*

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

ISO 23584-2, *Optics and photonics — Specification of reference dictionary — Part 2: Classes' and properties' definitions*

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

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 ISO 13584-42, IEC 61360-1 and in the ISO/IEC Guide 77-2 apply.

NOTE Some basic definitions and principles of key importance for the understanding of this part of ISO 23584 are provided in Annex A for information.

4 Principles of specification

4.1 General

Clause 4 of this International Standard attempts to outline the basic principles of specification in a simple language. Comprehensive description is available in the ISO/IEC Guide 77-2.

4.2 Set of attributes for description of a property

Properties are described by attributes. The set of attributes describing a property is as given in Tables 1 and 2.

NOTE The table contents is in accordance with the data model specified in ISO 13584-42, expanded where required as per ISO/IEC Guide 77-2.

Table 1 — Set of attributes for description of a property (ISO/IEC Guide 77-2)

Attribute [a,b]	Mandatory	Translation
Code	Y	N
Version	Y	N
Definition class	Y	N
Revision	Y	N
Date of original definition	Y	N
Date of current version	Y	N
Date of current revision	Y	N
Preferred name	Y	Y
Synonymous name	N	Y
Short name	N	Y
Definition	Y	Y
Source document of definition	N	Y
Note	N	Y
Remark	N	Y
Preferred symbol	N	N
Synonymous symbol	N	N
Figure	N	N
Property type classification	N	N
Domain	Y	N
Formula	N	N
Depends on	N	N
Value format	N	N
Unit of measure	Y/N	N
Alternative unit	N	N

[a] The contents of this table have been taken over from ISO/IEC Guide 77-2:2008, Table 1, where, additionally, a description of the meaning of each attribute is given.

[b] Additional attributes are included in the ISO/TC 172 database, see Table 2.

Table 2 — Additional ISO/TC 172 attributes for description of a property

Attribute	Mandatory	Translation
ownerTCSC	Y	N
liaisonTCSC	N	N
ebXML URI	N	N
Classification to ICS	Y	N

4.3 Set of attributes for description of a class

Classes are described by properties.

In addition, for the purpose of identification, each class is described by a set of attributes. The set of attributes describing a class is given in Tables 3 and 4.

NOTE The table contents is in accordance with the data model specified in ISO 13584-42, expanded where required in accordance with ISO/IEC Guide 77-2.

Table 3 — Set of attributes for description of a class (ISO/IEC Guide 77-2)

Attribute [a,b]	Mandatory	Translation
Code	Y	N
Version	Y	N
Information supplier	Y	N
Revision	Y	N
Date of original definition	Y	N
Date of current version	Y	N
Date of current revision	Y	N
Preferred name	Y	Y
Synonymous name	N	Y
Short name	N	Y
Definition	Y	Y
Source document of definition	N	Y
Note	N	Y
Remark	N	Y
its superclass	N	N
Applicable properties	N	N
Applicable types	N	N
Figure	N	N
Subclass selectors	N	N
Class selector values	N	N

[a] The contents of this table have been taken over from ISO/IEC Guide 77-2:2008, Table 6, where, additionally, a description of the meaning of each attribute is given.

[b] Additional attributes are included in the ISO/TC 172 database, see Table 4.

Table 4 — Additional ISO/TC 172 attributes for description of a class

Attribute	Mandatory	Translation
ownerTCSC	Y	N
liaisonTCSC	N	N
ebXML URI	N	N
Classification to ICS	Y	N

4.4 Basic structure of reference dictionary

4.4.1 General

For an unambiguous specification, each property requires a defined context. In accordance with the data model this context is provided by allocation of each property to an associated definition class.

NOTE The definition class is one of the mandatory attributes of a property.

When strictly applying the rules of the data model specified in ISO 13584-42, it is impossible to end up with object classes that describe objects in all detail. Therefore a clear distinction shall be drawn between definition classes and application classes. The properties defined in the definition classes of the property dictionary may – in the sense of their definition class, i.e. in the sense of their defined context – be used in any application class.

Within the hierarchic structure of definition classes and within the hierarchic structure of application classes the rules of heredity, in acordance with the data model of ISO 13584-42, apply.

4.4.2 Basic structure of the hierarchic order of the definition classes

The basic structure of the hierarchic order of definition classes of this part of ISO 23584 is adapted from the ICS (International Classification of Standards).

To achieve compatibility with the data model of ISO 13584-42, ICS classes are given a verbal definition and are related to each other by introduction of appropriate classifying properties. The ICS structure is modified to eliminate classes such as “miscellaneous”.

On the top level order of the ICS, besides generalities/terminology/standardization (ICS 01), we have the sciences and the industry sectors. Properties shall always be allocated to the most general possible class (here, ICS class), that is, if a property cannot be allocated to ICS 01 and its sub-classes, consideration shall be given to its allocation to the relevant science class, and only if this is not possible shall it be allocated to the relevant industry sector class.

4.4.3 Allocation of properties for basic quantities within the hierarchic order of definition classes

In order to allow non-contradicting properties' definitions, basic quantities shall be defined as general as possible. For physical quantities the specification of properties shall be based on ISO 31 and the properties will be allocated to the definition class “general terminology” in ICS 01.

If necessary for a specific area of application, a specialization may then be made starting from those properties for basic quantities available under the ICS 01 definition class, e.g. for introduction of conditions, restriction of value range etc., and will thus lead to additional (new) properties.

4.4.4 Basic structure of the hierarchic order of the application classes

Application classes allow the description of concrete objects by allocating to them (i.e. referencing) the relevant properties found in definition classes. These classes together with their (referenced) properties will be used for data interchange between business partners (company internal or external).

The top level order of application classes does not dispose of a classifying property, which yields that in principle all objects can be allocated to the same level of hierarchy. If, however, there is similarity of objects to be specified in application classes, then a hierarchic order within an application class may be built-up by use of classifying properties and application of the rules of the data model of ISO 13584-42.

NOTE In the database, a search functionality will facilitate the search for classes.

To facilitate the description of objects, where a specific set of functional or form elements will repeatedly occur, provision is made of a property of the type “class type”, which allows referencing the entirety of all properties associated with one particular class to another class.

5 ISO/TC 172 database

5.1 General

As stated in the Introduction in the interests of utmost effectiveness the reference dictionary shall be made available in electronic database form, ready for import into and use in a user's application system.

The URL of the ISO/TC 172 database is: www.tc172-prodic.net

This database is used by ISO/TC 172 as the central working tool in the process of development and maintenance of the reference dictionary for optics and photonics.

Free reading permission for the ISO/TC 172 database will be granted to any ISO/TC 172 member body on request. Experts nominated to actively participate in the project and in the future maintenance of the database standard will be granted free reading and writing permission, in accordance with the applicable maintenance procedure, on receipt of their formal nomination.

5.2 Identification of database items and their status

5.2.1 Identifier of database items

5.2.1.1 General

In accordance with ISO 13584-42 every property shall be unambiguously identifiable. To fulfil this requirement every entity has its unique identifier (ID). For the purposes of ISO 23584, the identifier is divided up into four fields, as follows (see Figure 1).

5.2.1.2 Information supplier

Every database entity has exactly one supplier organization, who is responsible for this entity. This supplier is described with a worldwide unambiguous identification. The registration of the supplier code may be made through different organizations.

The supplier code for the entities specified in the properties dictionary according to ISO 23584 is 0112/1///23584_x_1. The letter “x” represents the part number of ISO 23584 and will consist of one or more digits, as applicable, e.g. “2” in the case of ISO 23584-2, or “101” in the case of ISO 23584-101, etc. In the user interface of the ISO/TC 172 database the non-speaking supplier’s code is replaced and represented by the speaking term ISOTC 172.

For all data elements it is necessary to define a unique responsible “official owner of content”. In ISO this is usually an ISO Technical Committee or Subcommittee. In the database, this will be specified in an attribute field. For all items forming part of the ISO 23584 reference dictionary for optics and photonics ISO/TC 172 is the “official owner”. For items under the responsibility of another TC, that other TC is the “official owner”.

5.2.1.3 Code

The code is unambiguous within an organization and its context (class; property; value included in a list of values). It is a language-independent unambiguous six-figure identification with three Latin capitals A to Z and three numbers 0 to 9 in the format AAA999. The code is assigned chronologically by the system and has no relation to the meaning of the entity.

NOTE This six-digit code (AAA999) is also called the external code; it is used for all entities that have been approved to be worked on and so will form part of the database standard once they have undergone all steps of the applicable procedure. For entities not (yet) having reached that stage, the use of an internal code (an eight-digit numeric string) can be specified. Both external and internal codes are unambiguous throughout the system.

5.2.1.4 Version

Every entity ID contains a version number. This version number consists of three numerals and is assigned in ascending order. The version number enables distinction between different versions of an entity during its lifecycle.

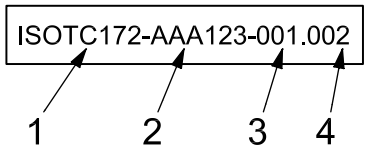
The version number characterizes every change of an entity, which affects its usability. A new version shall be created every time an attribute, value or condition change is made which affects the usability of the entity, while the meaning of the entity remains unchanged. The new version has to be actively applied by the individual making the change. A change that does not affect either the meaning or the usability of an entity will only yield a new revision number; a change of meaning will yield an entirely new entity.

A new version will also be applied by the system when the item changes its stage (see 5.2.3).

5.2.1.5 Revision

Every entity ID contains a revision number. This revision number consists of three numerals and is assigned in ascending order. The revision number enables distinction between different revisions within the same version of an entity. It is used for the administrative control of an entity. A new revision number is generated automatically every time an attribute of an entity is changed. This is only overruled if the individual making the change actively applies for a new version number or creates an entirely new entity.

NOTE Code, version and revision are mandatory attributes in accordance with the data model of ISO 13584-42.



Key

1 information supplier
2 code
3 version
4 revision

Figure 1 — Structure of the identifier

5.2.2 Stage designation for database items

In order to adopt a well-established and common “language” generally understood for standardization procedures and the results thereof, the ISO/TC 172 database relies on the application of the ISO/IEC harmonized stage code system. For details, refer to the applicable procedural document.

Each individual database item and each of its versions (see 5.2.3) will have an associated stage code.

5.2.3 Versions of database items

For the purposes of documentation of the standardization process and, e.g., to track obsolete versions of a database item in order to allow for backwards compatibility in practical applications, it is required to conserve entities (or an "archive copy" thereof) at several stages. The ISO/TC 172 database allows tracking of the main stages of the development and maintenance of the database standard.

NOTE In the database the search function allows use of version numbers and/or stage codes as search criteria. Pre-defined or individually-set filters are available. These functionalities enable the searching or viewing of the entirety of database contents including all existing versions for each individual database item.

5.3 Maintenance of the database portion of ISO 23584

The database portion, i.e. the "content" of the ISO 23584 series, basically is a "collection of items" (here, properties and classes) managed in a database and requires maintenance (addition or amendment) on a continual basis. Therefore, a maintenance mechanism relating to the individual items is adequate, rather than separate new work item proposals for each individual item. Refer to the applicable document detailing the maintenance procedure.

Annex ST of the ISO Supplement to ISO/IEC Directives specifies the maintenance mechanism for ISO database standards. For the maintenance of ISO 23584, ISO/TC 172 has decided to set up a maintenance agency and will approve a committee procedural document laying down further detail of the rules to be applied by the maintenance agency. Part of the task of the maintenance agency will be to assign responsibilities for each individual item forming part of ISO 23584 to its appropriate validation team. There are multiple validation teams that correspond to the TC 172 itself and to its various subcommittees. Provision is also made to register one or more liaison committees.

6 Basic structure of the reference dictionary for optics and photonics

6.1 General

The reference dictionary for optics and photonics is a database standard, i.e. a standard in database format for which the valid form of publication is the database, containing the standardized items that form separately managed parts thereof.

The main classes of the ICS classification used in the reference dictionary for optics and photonics are:

— ICS 01 generalities, terminology, standardization, documentation

— ICS 07 mathematics, natural sciences

— ICS 11 health care technology

— ICS 13 environment, health protection, safety

— ICS 17 metrology and measurement

— ICS 21 mechanical systems and components for general use

— ICS 31 electronics

— ICS 37 image technology

NOTE 1 The original ICS 37 is named "image technology", and hence this name is given. However, in the scope of ISO 23584, ICS 37 is used for "optics", since most items in optics are supposed to be included in this class.

The inclusion of the above ICS root classes does not imply that the entirety of properties potentially falling into them be specified by the reference dictionary for optics and photonics. Only those properties required for the area of optics and photonics would be included. Inclusion can either be by specification by the ISO/TC 172 properties dictionary itself, or by referencing (importing) them from another properties dictionary (or other properties dictionaries).

NOTE 2 The properties dictionary approach in general can be expanded to include any further ICS root class, if desired.

The scheme given in Figure 2 depicts the top level (ICS classes) of reference hierarchy included in the reference dictionary for optics and photonics. See also 6.2, 6.3, 6.4 and 6.5.

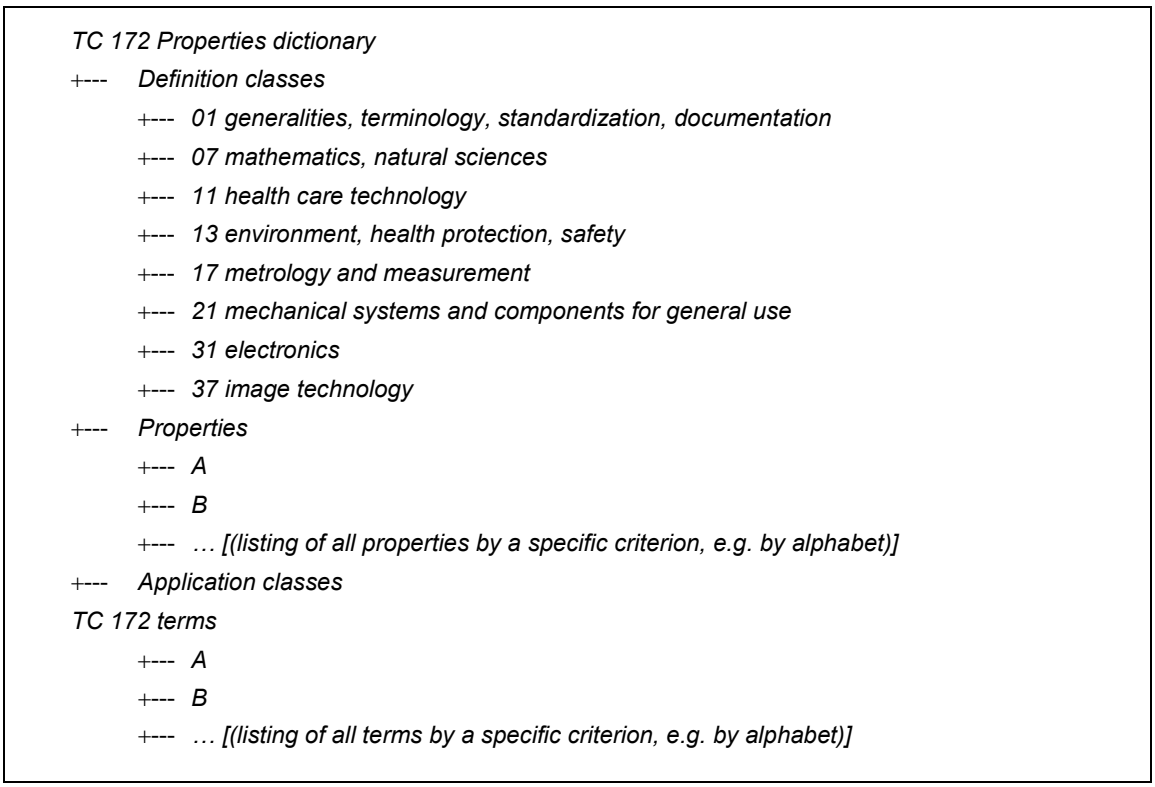


Figure 2 — Scheme depicting the top level of the classification tree

6.2 Definition classes

Each property is defined in a particular definition class, which defines the domain of all properties specified therein. Once defined (in their definition class) the properties can be referenced, i.e. used, in other classes, e.g. in (standardized) application classes or immediately in a user's system. The entirety of definition classes makes up the ISO/TC 172 reference hierarchy. The definition classes are attributed to top root classes based on the ICS classification. They are defined in ISO 23584-2.

The attribute information for these definition classes and their associated properties are given in ISO 23584-2 and can be viewed immediately in the ISO/TC 172 database.

NOTE More definition classes can be added in the future, as needs arise.

6.3 Properties

In this node a convenient “view” on the properties that have been defined in the definition classes is provided. The properties are referenced from the definition classes and displayed in alphabetical order, like in a dictionary.

6.4 Application classes

Application classes reference properties that have been defined in definition classes, or they reference classes (definition classes, e.g. feature classes or other application classes) that have been previously defined. Application classes allow the description of concrete objects and, hence, will usually be very dependent on the user's individual requirements. Therefore, the specification of application classes is essentially left to the discretion of the users of the properties dictionary. A folder structure for application classes by committee has been included to accommodate any committee's standardized application classes in the ISO/TC 172 reference dictionary for optics and photonics:

+--- ISOTC172 optics and photonics

+--- ISOTC172SC01 fundamental standards

+--- ISOTC172SC03 optical materials and components

+--- ISOTC172SC04 telescopic systems

+--- ISOTC172SC05 microscopes and endoscopes

+--- ISOTC172SC06 surveying instruments

+--- ISOTC172SC07 ophthalmic optics and instruments

+--- ISOTC172SC09 electro-optical systems

NOTE More application classes can be added in the future, as needs arise.

6.5 ISO/TC 172 terms

As can be seen from the scheme given in Figure 2, besides the reference dictionary itself, an additional node “TC 172 terms” has been added. This is included for information only and is intended as a working tool to enhance the use of already existing terms defined in International Standards by ISO/TC 172 and its Subcommittees in the development of properties and classes of the reference dictionary for optics and photonics.

NOTE 1 In this node, terms from all published International Standards by ISO/TC 172 and its Subcommittees are provided.

NOTE 2 The entities “terms” are neither properties nor classes as specified by the data model and this part of ISO 23584 .

Annex A
(informative)

Basic definitions and underlying principles

A.1 Terms and definitions

A.1.1
object class
prototype for all individual objects of a class in which all objects that are to be categorized and that share certain common **properties** (A.1.2) are grouped

NOTE 1 All individual members or objects share the same characteristics or properties. The object class is defined by the properties which are common to all objects of that class.

NOTE 2 The entity “object class” has the following synonyms: “subject class”, “subject group”.

EXAMPLE All optical surfaces share the common property that the surface separates two optical media. One specific optical surface may separate the glass type “BK7” from “air”, another one may separate the medium “water” from “PMMA” (acryl). These are two different objects of the abstract class “optical surfaces”.

A.1.2
property
defined parameter suitable for the description and differentiation of objects

NOTE 1 A property describes one aspect of a given object.

NOTE 2 A property is defined by the totality of its associated **attributes** (A.1.3). The types and number of attributes that describe a property with high accuracy are defined in ISO/IEC Guide 77-2.

NOTE 3 The term “property” used here in ISO/IEC Guide 77-2 and the term “data element type” used in IEC 61360 are synonyms.

[ISO/IEC Guide 77-2:2008, definition 2.18]

A.1.3
attribute
data element for the computer-sensible description of a property, a relation or a class

NOTE An attribute describes only one single detail of a property, of a class or of a relation.

[ISO/IEC Guide 77-2:2008, definition 2.2]

A.2 General principles

A.2.1 Properties and associated attributes

Any property is described by a number of specified attributes, with some of them being mandatory or conditional compulsory and others being optional. All attributes are intended for unambiguous identification, definition and management of properties and to facilitate their handling.

A description of properties is based on its definition, and its name is required to address it. A key identifier is needed for unambiguous identification of any individual property.

NOTE That is why only codes rather than names are used for identification.

A.2.2 Properties and associated values

Regarding applicable attributes, it should be considered that properties differ from each other by the associated types of values, which may call for different attributes:

— quantitative properties, their declaration of value being a quantity, calling for the addition of a unit;

— qualitative properties, their declaration of value being a conceptional or encoded quotation, having no unit.

A.2.3 Properties and conditions

No real world object class (and hence no real object) can be considered isolated from its environment. Properties, therefore, have to be related to context conditions. These conditions or dependencies of a property are part of its definition. It will be useful to reference them through the “conditions” attribute.

A.2.4 Definition of properties and associated object classes

The definition of a property is associated with a certain object class and thus requires a defined context (see Clause A.3). Such a defined property may be repeatedly used in a certain context.

A.3 Classification system for the definition of properties

A.3.1 General

The classification system is called reference hierarchy and is an essential prerequisite for unambiguous, non-contradicting definition of properties.

The set-up of such a reference hierarchy means structuring a certain amount of object classes and defining the system by which they are related to each other.

According to ISO 13584-42 or IEC 61360-1 the structuring of a reference hierarchy follows a monohierarchic order of upper classes and sub-classes. The applied order is an “is_a” relationship.

The order, accordingly, can be represented as sort of a family tree.

A.3.2 Monohierarchic order

— Monohierarchy, in this context, means that one and only one upward branch grows from each node of the tree.

— Each node corresponds to one object class, with the lower classes originating from the higher classes by the addition of further classification criteria (i.e. properties) thus being subsets of the higher classes.

— Different object classes exclude each other. They must differ from each other by at least one property.

— Object classes which are on one and the same level of the hierarchy are disjointed from one another.

A.3.3 Heredity of properties

The properties of an upper object class are continuously passed on to all subsequent lower object classes, i.e. they are known by all derivative object classes.

NOTE The lower an object class is placed in a hierarchy, the more properties are known by it.

A.3.4 Object class-specific properties (classifying property)

It is possible to define properties whose values are constant for one single object class. Such object class-specific properties should be created to facilitate both search processes and the use of defined properties in other application environments, e.g. for a classification which may follow other structuring principles.

EXAMPLE "Spherical surfaces" may be subdivided into "convex" and "concave".

Such differentiation may be achieved by application of the property of "curvature" in conjunction with two values, positive and negative. This will help to retrieve convex spherical surfaces without being familiar with the set-up of a given hierarchy. In this case, the sign of the property "curvature" is the classifying property.

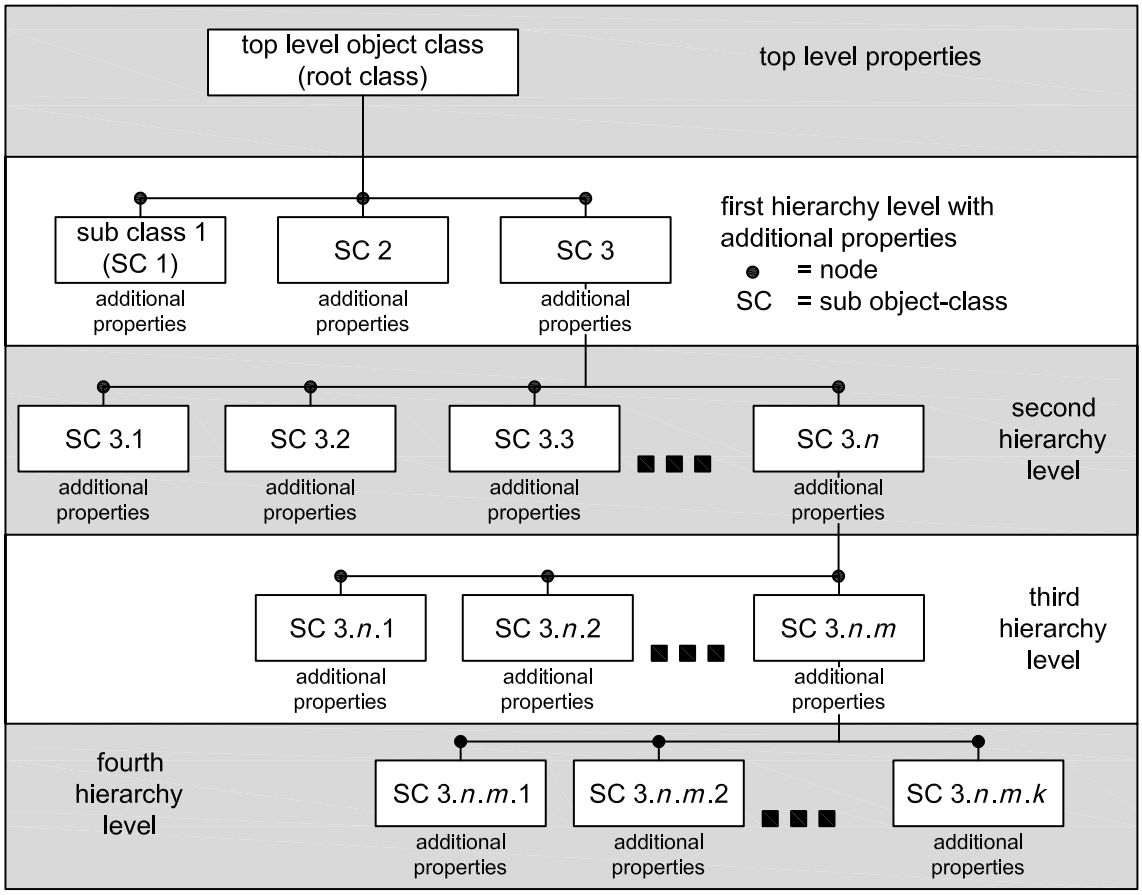


Figure A.1 — Family tree of object classes

A.4 Relations between classification systems

The methods so far described by which a reference hierarchy for definition of properties with heredity, in conjunction with specification of object classes by their properties is accomplished, leads to an application-neutral classification structure that can be generally used for referencing.

Other classification systems structured by ordering arguments for a specific application may reference to that hierarchy. Such reference hierarchy can thus be used to establish relations between classification systems of different structures.

Solutions, once prepared, can thus be equally used by all other parties, and duplication on the same subject can be avoided. Boundary-crossing processes, such as data exchange between all partners, are substantially facilitated, and tedious conversion mechanisms are no longer needed.

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