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Fluid power — Specification of reference dictionary —

Part 1: General overview on organization and structure

Transmissions hydrauliques et pneumatiques — Spécification d'un dictionnaire de référence —

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

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 131, *Fluid power systems*, Subcommittee SC 1, *Symbols, terminology and classifications*.

Introduction

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

a) **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 steps is required; moreover, new additional information is generated. Numerous parties and processes are involved in or form part of the product lifecycle. Hence, information needs to be transferred to 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.

b) **Availability of new electronic media**

To take advantage of the economic potential of these new media, product information provided by various suppliers needs to 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 are:

— 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 fluid power systems, the situation that led to the decision to prepare ISO 18582 were:

a) available ISO Standards, such as the ISO 5598, provide some verbal definitions 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. CAD-Systems, ERP-Systems, Office Tools) use different interfaces and different internal data representation (e.g. measurement unit, reference value); 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.

On the basis of standardized and electronically available properties, data exchange between, and immediate use of transmitted data in, the 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 fluid power, the reference dictionary needs to include all relevant properties required for the full description of fluid power products and processes. Therefore, in addition to the properties that are peculiar to the field of fluid power systems, 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 “fluid power systems”, 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 fluid power elements, if they are not defined elsewhere (i.e. in ISO 23584) and so cannot be referenced.

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

Fluid power — Specification of reference dictionary —

Part 1:
General overview on organization and structure

1 Scope

This part of ISO 18582 provides the basis for the preparation of a reference dictionary of standardized product properties for the area of fluid power, and for the provision of this reference dictionary and its entire contents in electronic form.

This part of ISO 18582, based on ISO 13584-42 and ISO/IEC Guide 77-2, specifies a reference dictionary of standardized product properties for the area of fluid power.

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

ISO 80000 (all parts), *Quantities and units*

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

ISO/IEC Guide 77-2, *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 and ISO/IEC Guide 77-2 apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

NOTE Some basic definitions and principles given in ISO Guide 77-2 are provided in Annex A for information.

4 Principles of specification

4.1 Set of attributes for description of a property

Properties shall be described by attributes as given in Table 1.

NOTE The table contents are 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	Mandatory	Translation possible
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

4.2 Set of attributes for description of a class

Classes shall be described by attributes as given in Table 2.

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

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

Attribute	Mandatory	Translation possible
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

Table 2 *(continued)*

Attribute	Mandatory	Translation possible
Source document of definition	N	Y
Note	N	Y
Remark	N	Y
Superclass	N	N
Applicable properties	N	N
Applicable types	N	N
Figure	N	N
Subclass selectors	N	N
Class selector values	N	N

4.3 Basic structure of reference dictionary

4.3.1 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.

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 within the definition classes of the property dictionary can, 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 accordance with the data model of ISO 13584-42, apply.

4.3.2 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 18582 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 subclasses, 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.

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

In order to prevent contradicting properties’ definitions, basic quantities shall be defined as general as possible. For physical quantities, the specification of properties shall be in accordance with ISO 80000 (all parts) and the properties shall be allocated to the definition class “general terminology” in ICS 01.

If necessary, for a specific area of application, a refinement can be made starting from those properties for basic quantities available under the ICS 01 definition class. This can be done, for example, for the introduction of conditions, restriction of value range, etc. Such refinement leads to additional (new) properties.

4.3.4 Basic structure of the hierarchic order of the application classes

Application classes allow the description of physical objects by allocating to them (i.e. referencing) the relevant properties found in definition classes. These classes, together with their (referenced) properties, are 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 can be built-up by use of classifying properties and application of the rules of the data model of ISO 13584-42.

To facilitate the description of objects, where a specific set of functional or form elements 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 Basic structure of the reference dictionary for fluid power

5.1 General

The reference dictionary for fluid power 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 fluid power systems are:

— ICS 01, Generalities. Terminology. Standardization. Documentation

— ICS 07, Mathematics. Natural sciences

— ICS 13, Environment. Health protection. Safety

— ICS 17, Metrology and measurement. Physical phenomena

— ICS 21, Mechanical systems and components for general use

— ICS 23, Fluid systems and components for general use

— ICS 31, Electronics

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

The scheme given in Figure 1 depicts the top level (ICS classes) of reference hierarchy included in the reference dictionary for fluid power. See also 5.2, 5.3 and 5.4.

TC 131 Properties dictionary

+--- *Definition classes*

+--- *01 generalities, terminology, standardization, documentation*

+--- *07 mathematics, natural sciences*

+--- *13 environment, health protection, safety*

+--- *17 metrology and measurement*

+--- *21 mechanical systems and components for general use*

+--- *23 fluid systems and components for general use*

+--- *31 electronics*

+--- *37 image technology*

+--- *Properties*

+--- *A*

+--- *B*

… [(listing of all properties by a specific criterion, e.g. by alphabet)]

+--- *Application classes*

TC 131 terms

+--- *A*

+--- *B*

… [(listing of all terms by a specific criterion, e.g. by alphabet)]

Figure 1 — Scheme depicting the top level of the classification tree

5.2 Definition classes

Each property shall be 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 131 reference hierarchy.

NOTE The definition classes are attributed to top root classes based on the ICS classification. It is foreseen to define definition classes in further parts of ISO 18582.

5.3 Properties

In the structure element (node) "properties", a convenient "view" on the properties shall be provided. The properties are referenced from the definition classes and displayed in alphabetical order, like in a dictionary.

5.4 Application classes

Application classes reference properties that have been described within 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 physical objects and, hence, are usually 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 131 reference dictionary for fluid power systems:

— ISO/TC 131, Fluid power systems

— ISO/TC 131/SC 01, Symbols, terminology and classifications

— ISO/TC 131/SC 02, Pumps, motors and integral transmissions

— ISO/TC 131/SC 03, Cylinders

— ISO/TC 131/SC 04, Connectors and similar products and components

— ISO/TC 131/SC 05, Control products and components

— ISO/TC 131/SC 06, Contamination control

— ISO/TC 131/SC 07, Sealing devices

— ISO/TC 131/SC 08, Product testing

— ISO/TC 131/SC 09, Installations and systems

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

Annex A
(informative)

Basic definitions and underlying principles from ISO Guide 77-2

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 are grouped

Note 1 to entry: 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 to entry: 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 separates the glass type "BK7" from "air"; another one separates 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 to entry: A property describes one aspect of a given object.

Note 2 to entry: A property is defined by the totality of its associated attributes. The types and number of attributes that describe a property with high accuracy are defined in ISO/IEC Guide 77-2.

Note 3 to entry: The term "property" used here in ISO/IEC Guide 77-2 and the term "data element type" used in IEC 61360 (all parts) are synonyms.

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

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

Note 1 to entry: An attribute describes only one single detail of a property, of a class or of a relation.

[SOURCE: ISO/IEC Guide 77-2:2008, 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 can lead to different attributes:

— quantitative properties, their declaration of value being a quantity, leading to 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 can 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 A.3). Such a defined property can 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 subclasses. 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 shall 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 follows other structuring principles.

EXAMPLE "Spherical surfaces" are subdivided into "convex" and "concave".

Such differentiation is achieved by application of the property of "curvature" in conjunction with two values, positive and negative. This helps 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.

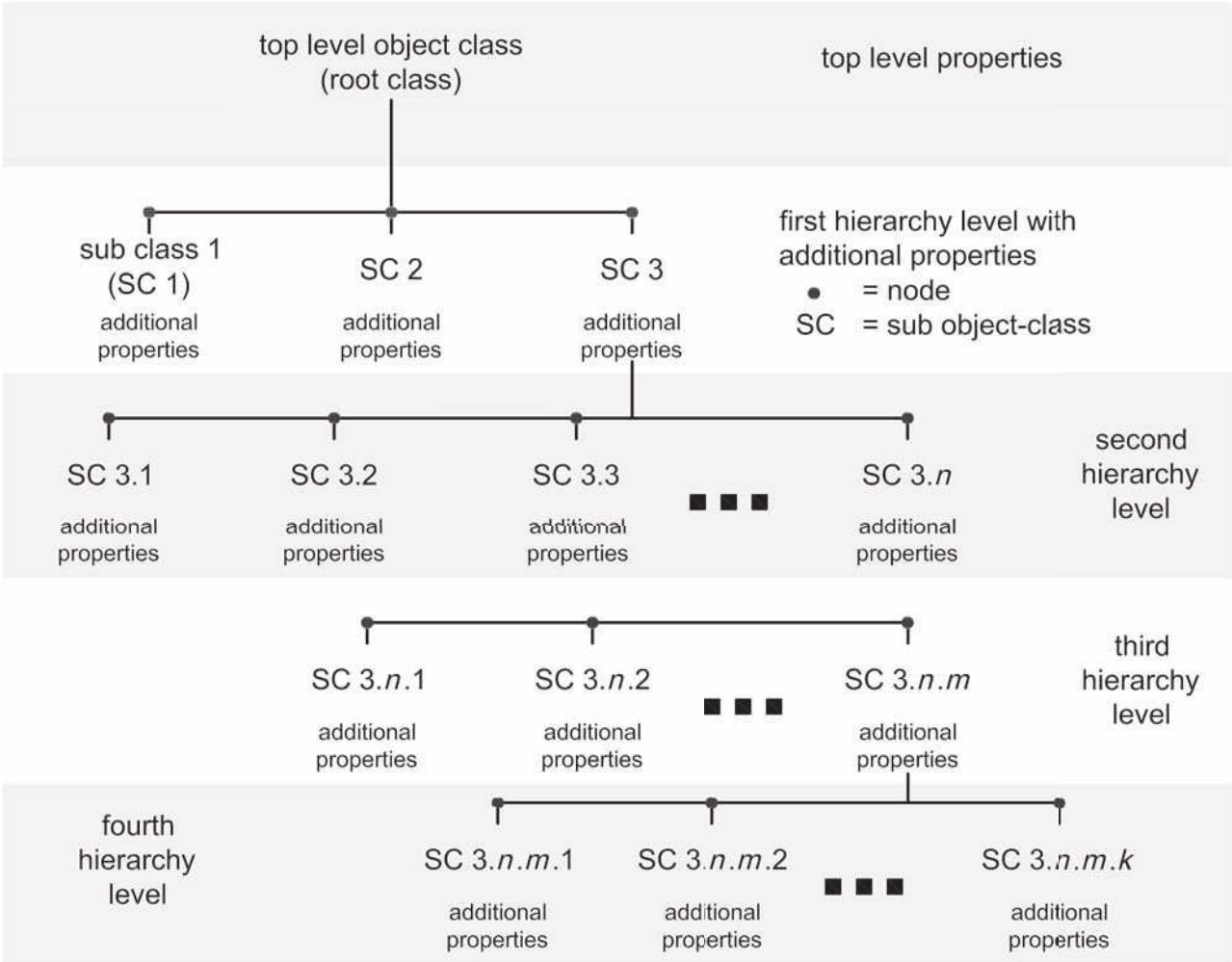
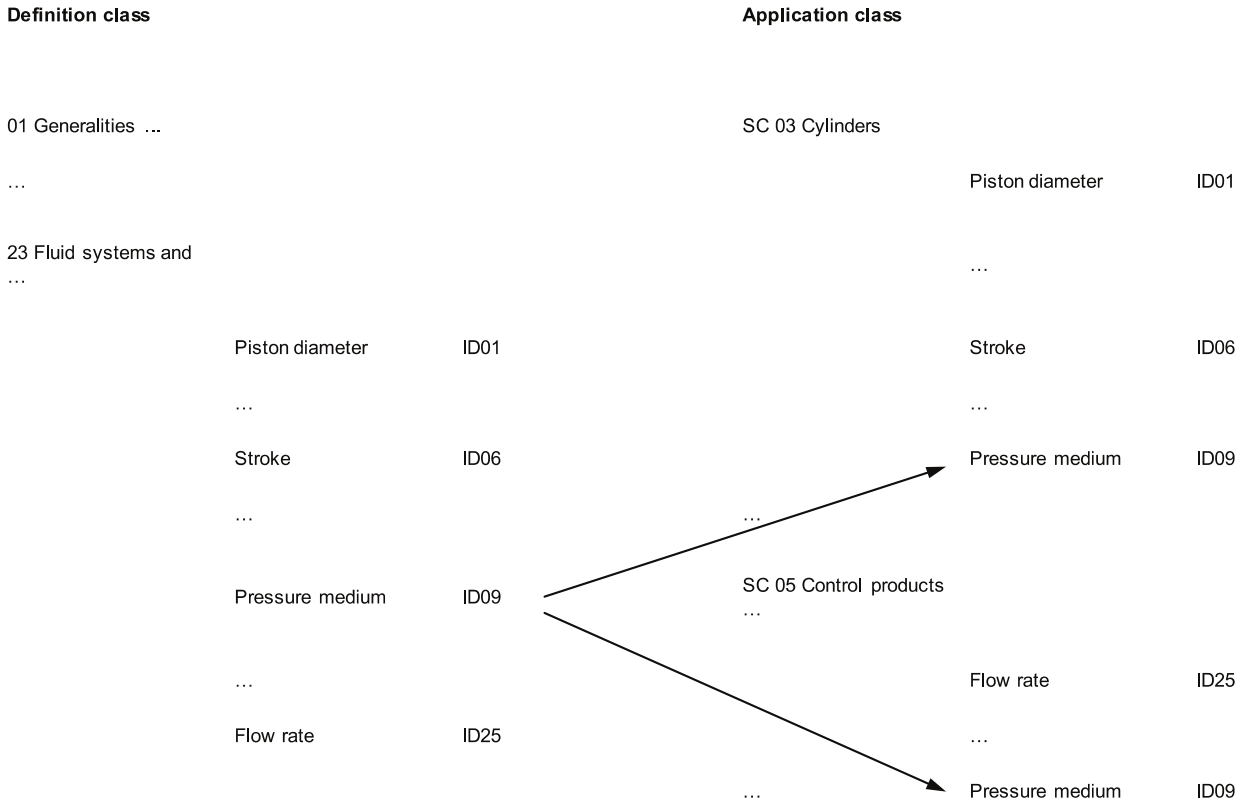


Figure A.1 — Family tree of object classes

Annex B
(informative)

Example for the classification of a cylinder to show the relation between application classes and definition classes

Properties of the definition class 23 (ICS 23) shall be used in fluid power application classes as far as applicable. One definition class can be used for different application classes (for example, pressure medium is used for SC 03 and for SC 05).



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