BS EN ISO 16757-1:2019

BSI Standards Publication

Data structures for electronic product catalogues for building services

Part 1: Concepts, architecture and model

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National foreword

This British Standard is the UK implementation of EN ISO 16757-1:2019. It is identical to ISO 16757-1:2015. It supersedes BS ISO 16757-1:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/555, Construction design, modelling and data exchange.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Data structures for electronic product catalogues for building services - Part 1: Concepts, architecture and model (ISO 16757-1:2015)

Structures de données pour catalogues électroniques de produits pour les services du bâtiment - Partie 1: Concepts, architecture et modèle (ISO 16757-1:2015)

Datenstrukturen für elektronische Produktkataloge für Technische Gebäudeausrüstung - Teil 1: Konzepte, Architektur und Modelle (ISO 16757-1:2015)

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European foreword

The text of ISO 16757-1:2015 has been prepared by Technical Committee ISO/TC 59 "Buildings and civil engineering works" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 16757-1:2019 by Technical Committee CEN/TC 442 "Building Information Modelling (BIM)" the secretariat of which is held by SN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

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Endorsement notice

The text of ISO 16757-1:2015 has been approved by CEN as EN ISO 16757-1:2019 without any modification.

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Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Terms and definitions ... **2**
3 Requirements and fundamentals ... **4**
3.1 Content of a catalogue ... 6
3.2 Manufacture vs. user view of a catalogue ... 6
3.3 Parametric representation of catalogue data ... 7
3.4 Dynamic technical properties describing the behaviour of a product ... 8
3.5 Descriptive objects and representation objects ... 10
3.6 Purpose of Content Parts ... 10
3.7 Relationship to dictionary standards (ISO 13584, ISO 12006-3) ... 11
4 Product configuration and selection ... **11**
4.1 Configuration by referencing properties ... 11
4.2 Selection of specific products ... 13
4.3 Standardised and catalogue-specific properties ... 15
5 Technical properties ... **16**
5.1 Static properties ... 17
5.2 Dynamic properties ... 17
6 Accessories and composed products ... **18**
7 Representation objects and descriptive objects ... **21**
7.1 Article numbers ... 21
7.2 Geometry data ... 22
7.3 Product description ... 23
7.4 Descriptive objects ... 23
8 Requirements to implement ISO 16757 in engineering systems ... **23**
9 Data model ... **23**
9.1 Properties ... 24
9.1.1 Technical perspective of properties ... 24
9.1.2 Content perspective of properties ... 26
9.2 Selection properties and the selection property hierarchy ... 27
9.3 Technical properties ... 30
10 Embedding of product data of selected products into the building information model ... **31**
Bibliography ... **33**

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Full document details: BS EN ISO 16757-1:2019

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 59, *Buildings and civil engineering works,* Subcommittee SC 13, *Organization of information about construction works*.

ISO 16757 consists of the following parts, under the general title *Data structures for electronic building services product catalogues*:

— *Part 1: Concepts, architecture and model*

— *Part 2: Geometry*

The following parts are planned:

— *Part 3: Script language and functions*

— *Part 4: Cooperation with building information modelling standards*

— *Part 5: Product catalogue exchange format*

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Introduction

These Content Parts of this International Standard will define standardised properties for the product groups and the composition of the technical data model. Furthermore, they determine the specific programming function-interfaces to layout, calculate, and simulate the products.

There is a growing need for information about building services systems during the planning and design of buildings. The designers in building services have to execute detailed calculations and simulations to ensure saving of energy and to satisfy hygienic and comfort criteria in heating, ventilation, air conditioning, and sanitary plants. They have to provide better and better documentation to verify the compliance with these requirements. The resulting designs have to describe the complete plants without internal interference or intersection with the building.

These requirements can only be achieved with modern engineering applications like CAD- and CAE-systems, calculation programs, BIM tools, and management software. The software systems need exact data of the used plant components. Each component contributes to the performance data of the whole building.

There are many manufacturers, who provide products to certain sectors of building services (such as heating, ventilation, air conditioning, sanitary). Others provide only certain product groups (radiators, heaters, air condition equipment, air pipes, valves, devices).

Classical catalogues provide product data in tables and show the design algorithms in diagrams and design rules. In addition to the technical properties required for functional design and calculation (e.g. in the form of curve diagrams), such catalogues also contain the geometry data needed for dimensional design and construction (e.g. in the form of dimensional drawings with port details) and the descriptive objects serving for visualization (such as photos, video sequences, or acoustical sequences).

Additionally, nearly all big manufacturers provide their own software (mostly for free) as electronic catalogues to select, to design, and to calculate their products.

Unfortunately, none of these software solutions meets all the requirements of the planner. Needless to say, that each program contains only the product range of its manufacturer. So it is not possible to perform a continuous planning of the plant with products of different manufacturers.

Thus, it is desirable to provide engineering applications which are independent from the manufacturers. The next problem is that data files from different manufacturers — if available at all — are organized in different data formats, structures, and terminologies.

Independent CAD-systems and calculation software need to get data and algorithms in a uniform way. Only if product data and algorithms are automatically available, the calculation and simulation of a complete HVAC plant is possible.

Software providers cannot afford to provide all data from all product manufacturers in the format required by their system. Also, product manufacturers cannot provide current information about their products in the formats of all potential software systems. Thus, we have a typical situation where standardization is required to improve the exchange of information between business partners.

Within single product groups (e.g. radiators), national initiatives to standardize exchange formats have already been conducted. But there is a lack of unification of existing formats across all product groups.

Required is a uniform, internationally standardised definition for product catalogue data interchange.

Such a definition eliminates the need to manage different data formats and to use different software systems to deal with products of different manufacturers, and this leads to a significant reduction of costs for manufacturers and users. Integrating this data into BIM-systems (Building Information Modelling) allows data interchange between IT systems. In addition, to the benefit for planning, there will be an amount of advantages for other software solutions, e.g. facility management and life cycle management.

This International Standard offers for the first time an interface which allows the uniform handling of data about technical, commercial, maintenance, service, as well as geometry, images, video, and text information.

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ISO 16757 is a multi-part standard. Future parts will include:

— an overview of ISO 16757 and the rationale for its elements and organization;

— geometric elements which are used to represent the products in the catalogues of ISO 16757;

— definition of the script language used in ISO 16757 for various purposes;

— IDM descriptions for ISO 16757, including process descriptions for those processes which are to be supported by the standard and it comprises the rules for mapping of product and the property descriptions to IFC and for defining properties semantically with IFD;

— definition of an exchange format in XML by which electronic catalogues can be exchanged according to the definitions of ISO 16757. The exchange format will be specified as an XML Schema Definition (XSD).

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Data structures for electronic product catalogues for building services —

Part 1: Concepts, architecture and model

1 Scope

The primary purpose of this International Standard is the provision of data structures for electronic product catalogues to transmit building services product data automatically into models of building services software applications. This includes a meta model for the specification of product classes and their properties and a meta model for the product data which is exchanged in product catalogues. Product data has to follow the specifications for their product groups.

The standard series is split into two areas:

— Basic concepts like conceptual models, languages, geometry representations, and XML schemas for data exchange are provided in the Conceptual Parts of the standard series (Parts with a one digit number).

— Using these resources, the Content Parts of this International Standard define for various product groups of building services concrete models for the description and the exchange of products.

The basic concepts which are provided by the standard series include the following:

— resources for the specification of selection properties and a selection property tree guiding the selection process to identify the appropriate product variant from a parametric electronic catalogue;

— resources for the specification of dependent properties and their computational functions to compute their values in dependency from installation parameters;

— resources for the specification of composition relationships between products which can be used to model structures like bill of materials or accessory relationships;

— resources for a parametric constructed solid geometry (CSG) based geometry representation containing specific CSG elements geometrical elements which are typical for building services products.

This part of ISO 16757 specifies

— the underlying concepts,

— a generic model specifying the available modelling elements and their relationships, and

— a framework for the specification of the Content Parts by describing the elements which are to be provided by these Parts.

Not in scope of this part of ISO 16757 are the following:

— a detailed description of the used geometrical primitives;

NOTE Geometry is described in ISO 16757-2.

— a specification of the script language used to exchange algorithms for computing the values of dependent and computable properties;

NOTE The script language is described in ISO 16757-3.

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— a specification of the XML Schema specifying the data structures for the catalogue exchange;

NOTE The XML schema is described in ISO 16757-5.

— a description of the relationships to standards of the area of buildingSMART;

NOTE The relationships to standards of the area of buildingSMART is described in ISO 16757-4.

— definition of models for specific product groups.

NOTE 1 Definitions of models for specific product areas are described in ISO 16757-10 et. seq., the Content Parts of ISO 16757.

NOTE 2 All parts are still under development.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
accessory
product of the same or of different product groups, which can be attached to a product

Note 1 to entry: An accessory is not a different type of product, it plays an ancillary role to another product.

2.2
accessory hierarchy
representation of the dependencies between products and accessories

2.3
article number
manufacturer's reference number, GTIN, or other identifier identifying the product or constituents of a product

2.4
building information modelling
BIM
construction of a model that contains the information about a building for all phases of the building life cycle

Note 1 to entry: In many cases, the abbreviation BIM is also used for the result of the building information modelling, namely the building information model.

2.5
building services
utilities and installations supplied and distributed within a building such as electricity, gas, heating, water, and communications

[SOURCE: ISO 16484-2]

2.6
building services system
BSS
technical system that provides building services in a building

[SOURCE: ISO 16484-2]

2.7
BSS property
technical property that describes an aspect of the current state of a BSS

Note 1 to entry: A BSS property cannot get a value in a catalogue because the states of the building services system are not known and will vary according to the specific system and its various system states.

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EXAMPLE In the example given in 2.10, 'media volume flow' and 'media density' are BSS properties.

2.8
catalogue metadata
data in the catalogue which contains data about the catalogue itself

EXAMPLE Catalogue metadata include standard numbers, data for version management, the manufacturer's name, and global location number, as well as file check details.

2.9
descriptive object
object giving descriptive and/or visual information about the product

EXAMPLE Descriptive objects are pictures, descriptions, videos, etc.

2.10
dynamic property
technical property, that reflects the product's behaviour under the operating conditions of the building services system in which the product is installed

EXAMPLE The dynamic property 'pressure loss of a pipe elbow' is dependent of the 'media volume flow' and the 'media density'. In a catalogue, the manufacturer of a pipe elbow has to provide a means to allow the determination of the actual 'pressure loss' for various values of 'media volume flow' and 'media density'

Note 1 to entry: A dynamic property does not get a value from a product catalogue because the value of a dynamic property is dependent on the state of the building services system into which the product will be integrated. Therefore, the value may vary according to the state. The catalogue normally contains some means which allow the product user to determine the value of that property in a given state of the building services system.

2.11
facility management
FM
all the services before, during, and after utilisation of real estate properties and infrastructure based on a holistic (integral) strategy

[SOURCE: ISO 16484-2:2004]

2.12
function
formula
algorithms and formulas for the calculation of computable product properties

Note 1 to entry: The representation of functions and formulae follows a simple program script syntax.

2.13
Global Trade Item Number
GTIN
identifier for trade items used to look up product information in a database GS1

2.14
product
orderable, technical entity

2.15
product catalogue
compilation of information about products

Note 1 to entry: A product catalogue can be related by its article numbers to price lists.

2.16
product group
set of products described by common properties

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2.17
product index
compilation of references to all property values of a defined product, the product description, the product geometry, and the product article numbers

2.18
product series
types of products, defined by the manufacturer, which are commonly constructed and manufactured

2.19
property
defined parameter suitable for the description and differentiation of products

[SOURCE: ISO/TS 13399-5:2014]

Note 1 to entry: The description of a product is the description of its properties.

2.20
representation object
object that represents a product or a part of it as a whole

EXAMPLE Article numbers and geometry are representation objects.

2.21
static property
technical property that is independent of the operating conditions of the building services system in which the product is installed and which gets its fixed value from the catalogue

2.22
selection property
property which is used for the selection of a certain product from the product variants of the catalogue

2.23
technical property
property which is used to represent technical data and functions for designing, calculating, and simulating the product

Note 1 to entry: Technical properties comprise static and dynamic technical properties.

3 Requirements and fundamentals

The strategic interest of this International Standard is the provision of product data for design, calculation, and simulation of Building Services systems within engineering application models. This means it is necessary to exchange machine-readable product data from manufacturers to engineering applications and to building information models in an automatic way.

Basically, the products are described by three elements (see Figure 1):

— property values;

— representation objects (like geometry);

— descriptive objects (like text documents, pictures, etc.).

In addition, products can be supplemented by a number of accessories which can be optionally selected in addition to the product itself. Which and how many accessories belong to a product is described by specific rules.

The properties which are used to describe a product have to be defined in a standard (one exception are the catalogue-specific selection properties; see below). The purpose of the Content Parts of this International Standard is exactly the definition of these properties. In Figure 1, which gives a high-

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level overview about the modelling levels of this International Standard, the meta model on the left side specifies which kinds of properties can be defined for a product group. A Content Part of this International Standard for a product group has to specify which properties are required for the representation of products of this product group. Thus, it will define properties of the various kinds shown in Figure 1; technically speaking, it will provide an instance of the meta model. The various kinds of properties are described below.

On the right side of Figure 1, the elements are shown which make up an ISO 16757 product catalogue. All elements which belong to a product class are grouped under a ClassElements object which is related to the respective ProductClass (see Figure 1). The property values in the catalogue belong to a property which has been defined in the respective Content Part for the product group the product belongs to (not explicitly shown in Figure 1). Some (selection) properties are catalogue specific; their definition will be provided in the catalogue and they are only applicable for that catalogue.

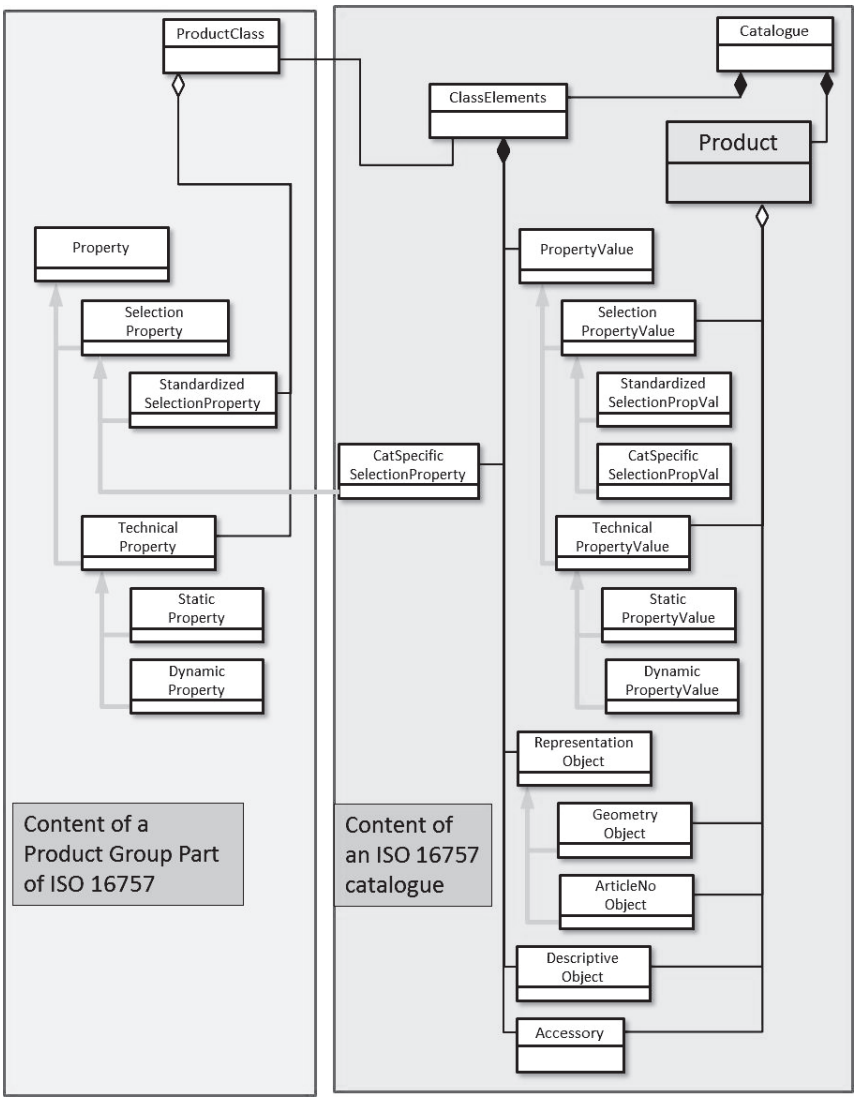

Figure 1 — Overview about the elements of a catalogue and the kinds of properties

The diagram in Figure 1, as well as the diagrams in a number of further figures, is drawn by use of the Unified Modelling Language (UML) class diagrams (see ISO/IEC 19505-1). The following semantics is assumed for the relationships:

Subclass relationship (is-a)

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