BS EN ISO 16757-2:2019

BSI Standards Publication

Data structures for electronic product catalogues for building services

Part 2: Geometry

National foreword

This British Standard is the UK implementation of EN ISO 16757-2:2019. It is identical to ISO 16757-2:2016.

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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2019

ISBN 978 0 580 99055 7

ICS 91.010.01

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2019.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 16757-2

May 2019

ICS 91.010.01

English Version

Data structures for electronic product catalogues for building services - Part 2: Geometry (ISO 16757-2:2016)

Structures de données pour catalogues électroniques de produits pour les services du bâtiment - Partie 2: Géométrie (ISO 16757-2:2016)

Datenstrukturen für elektronische Produktkataloge der Technischen Gebäudeausrüstung - Teil 2: Geometrie (ISO 16757-2:2016)

This European Standard was approved by CEN on 19 May 2019.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN ISO 16757-2:2019 E

European foreword

The text of ISO 16757-2:2016 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 16757-2:2019 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.

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

After the finalization of ISO 16757-2 and during the process of its adoption as a European standard, CEN/TC 442 has started to develop standards about the "level of information need" which include the "level of geometry". Throughout the lifecycle of a built asset, e.g. for a building, different levels of geometric information about the products are needed.

The product catalogue permits information to be exchanged in accordance with the required level of information need.

The various geometric levels of ISO 16757-2 support the inclusion of products in an information container according to a required level of geometry.

ISO 16757-2, 6.2, defines methods of providing multiple levels of geometry which, in accordance with industry experience, should be available in a product catalogue. For a clearer description of detail and the extent of geometry, users are advised to apply the upcoming standards that are being drafted by CEN/TC 442 as well:

prEN 17412 *Building Information Modelling - Level of Information Need - Concepts and principles*

prEN ISO 23386 *Building information modelling and other digital processes used in construction - Methodology to describe, author and maintain properties in interconnected dictionaries*

prEN ISO 23387 *Building Information Modelling (BIM) - Data templates for construction objects used in the life cycle of any built asset - Concepts and principles*

There are two planned parts of ISO 16757 which are also closely related to current projects of CEN/TC 442:

— Part 4 will describe the use of dictionaries for capturing the properties of products. Part 4 will be based on ISO 12006-3 and on the European standards EN ISO 23386 and EN ISO 23387 which are being developed in CEN/TC 442/WG 4.

— Part 5 will describe the catalogue exchange format. This format will be based on the work in CEN/TC 442/WG 2 to use IFC for the exchange of product data.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 16757-2:2016 has been approved by CEN as EN ISO 16757-2:2019 without any modification.

Contents

Page

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 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 59, *Buildings and civil engineering works*, Subcommittee SC 13, *Organization of information about construction works*.

A list of all the parts in the ISO 16757 series can be found on the ISO website.

Introduction

There is a growing need for electronic, machine-readable, digital information about building services. 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. Designers must have access to more complete and more accurate documentation to address these needs. The resulting designs have to describe the complete building services system without internal interference to avoid collision with other systems and components and the building structure.

These requirements can only be achieved with modern building services applications such as computer-aided design (CAD) and computer-aided engineering (CAE) systems, calculation programmes, BIM tools, and management software. The software systems need exact data of the used plant components because each component contributes to the performance of the whole building.

Thus, an international standard is required to provide the models and definitions for product catalogue data exchange.

Such a standard eliminates the need to manage different data formats or to use different manufacturer-specific software systems to deal with products of different manufacturers. The standard will lead to a significant reduction of costs for manufacturers and users. Integrating this data into building information modelling (BIM) systems allows data interchange between information technology (IT) systems. In addition to the benefits of planning, there will be further advantages for other software solutions, such as facility management and life-cycle management.

This part of ISO 16757 offers for the first time an interface which allows the uniform handling of data about technical, maintenance and service, as well as geometry, images, video and text information.

The objectives of this part of ISO 16757 are to facilitate

— automatic integration of catalogue data of all manufacturers in engineering applications such as CAD, CAE, dimensioning and calculation systems,

— uniform product selection across manufacturers,

— dimensioning of products using manufacturers' algorithms,

— possibility to recalculate and re-simulate the whole system with data of all building services components as often as required, and

— standardized representation of technical data for data exchange and life-cycle management.

This part of ISO 16757 specifically provides definitions and specifications for modelling and exchanging geometric information of building services components.

ISO 16757-1 gives the overview about the standard and the rationale for its elements and organization. This document defines the geometric elements which are used to represent the products in ISO 16757 catalogues. ISO 16757-3 defines the script language used in ISO 16757 (all parts) for various purposes. ISO 16757-4 contains IDM descriptions for ISO 16757 (all parts), 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. ISO 16757-5 defines an exchange format in XML by which electronic catalogues can be exchanged according to the definitions of ISO 16757 (all parts). The exchange format will be specified as an XML Schema Definition (XSD). The content parts of ISO 16757 will define standardized properties for the product groups and the composition of the technical data model. Furthermore, the content parts of ISO 16757 determine the specific programming function-interfaces to layout, calculate and simulate the products.

INTERNATIONAL STANDARD ISO 16757-2:2016(E)

Data structures for electronic product catalogues for building services —

Part 2: Geometry

1 Scope

This part of ISO 16757 describes the modelling of building services product geometry. The description is optimized for the interchange of product catalogue data and includes

— shapes for representing the product itself,

— symbolic shapes for the visualization of the product's function in schematic diagrams,

— spaces for functional requirements,

— surfaces for visualization, and

— ports to represent connectivity between different objects.

The shape and space geometry is expressed as Constructive Solid Geometry (CSG) based on geometric primitives concatenated to boundary representations by Boolean operations. This part of ISO 16757 uses the applicable primitives from ISO 10303-42 and from ISO 16739 and adds primitives which are required for the special geometry of building services products. For symbolic shapes, line elements are also used.

This part of ISO 16757 neither describes the inner structure and internal functionality of the product nor the manufacturing information because this is typically not published within a product catalogue.

Building services products can have millions of variant dimensions. To avoid the exchange of millions of geometries, a parametric model is introduced which allows the derivation of variant-specific geometries from the generic model. This is necessary to reduce the data to be exchanged in a catalogue to a manageable size. The parametric model will result in smaller data files, which can be easier transmitted during data exchanges.

The geometry model used does not contain any drawing information such as views, line styles or hatching.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 16757-1, *Data structures for electronic product catalogues for building services — Part 1: Concepts, architecture and model*

ISO 6707-1,*Buildings and civil engineering works — Vocabulary — Part 1: General Terms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16757-1 and ISO 6707-1 and the following 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

3.1
product shape
geometric representation of the space defined by the product's external boundaries

3.2
product surface
coloured and textured outer boundary of the product's shape whose rendered appearance responds to relative lighting and viewing angles

3.3
port
located, oriented and directed feature of the product's geometry model (1) for connecting the product with other ports to transfer media or (2) to fasten the product to other products, accessories, walls, ceilings, floors, etc. or (3) for executing control

3.4
solid model
complete representation of the nominal shape of a product such that all points in the interior are connected and that any point can be classified as being inside, outside or on the boundary of a solid.

[SOURCE: ISO 10303-42:2014, 6.4.1]

3.5
parametrizable primitive solid
model of a defined primitive solid, e.g. a block, cylinder, sphere or cone whose dimensions are represented by parameters to generate variants

3.6
constructive solid geometry
CSG
type of geometric modelling in which a solid is defined as the result of a sequence of regularised Boolean operations operating on solid models

[SOURCE: ISO 10303-42]

3.7
clipping
operation applied to a geometric model to remove parts of the model beyond a defined boundary

4 Catalogue structure and catalogue information

All kinds of product data in the scope of ISO 16757 can be transmitted in a product catalogue data file.

The catalogue structure which is explained in more depth in ISO 16757-1 is depicted in Figure 1.