SLOVENSKI STANDARD
oSIST prEN ISO 6709:2021

01-februar-2021

Standardna predstavitev geografske točkovne lokacije s koordinatami (ISO/DIS 6709:2020)

Standard representation of geographic point location by coordinates (ISO/DIS 6709:2020)

Standarddarstellung für geographische Punkte durch Koordinaten (ISO/DIS 6709:2020)

Représentation normalisée de la localisation des points géographiques par coordonnées (ISO/DIS 6709:2020)

Ta slovenski standard je istoveten z: **prEN ISO 6709**

ICS:

07.040	Astronomija. Geodezija. Geografija	Astronomy. Geodesy. Geography
35.240.70	Uporabniške rešitve IT v znanosti	IT applications in science

oSIST prEN ISO 6709:2021 **en,fr,de**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 6709

ISO/TC **211**

Secretariat: **SIS**

Voting begins on:
2020-12-28

Voting terminates on:
2021-03-22

Standard representation of geographic point location by coordinates

Représentation normalisée de la localisation des points géographiques par coordonnées

ICS: 35.240.70

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 6709:2020(E)

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Published in Switzerland

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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.

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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 211 *Geographic information/Geomatics*.

This third edition cancels and replaces the second edition (ISO 6709:2008), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Harmonization with other recently revised ISO/TC 211 standards

— Clarification of normative requirements to maintain rigid backwards compatibility when required

— Correction of the issues contained in the 2009 Technical Corrigendum to ISO 6709:2008

— Correction of annexes that contained normative requirements but were labelled as informative

— Deletion of annexes and concepts which have changed and were no longer suitable for the revised edition

— Correction of instances where European numeric formatting conventions were incorrectly inserted during pre-publication editing. These conventions will no longer be recommended

— Clarification of editorial issues

Annex E presents detailed information on the differences between this and previous editions of ISO 6709.

Use of numeric formatting conventions:

In accordance with the ISO/IEC Directives, Part 2, 2018, *Rules for the structure and drafting of International Standards*, in International Standards the decimal sign is a comma on the line. However, the General Conference on Weights and Measures (*Conférence Générale des Poids et Mesures*) at its meeting in 2003 passed unanimously the following resolution:

"The decimal marker shall be either a point on the line or a comma on the line."

In practice, the choice between these alternatives depends on customary use in the language concerned. In the technical areas of geodesy and geographic information it is customary for the decimal point always to be used, for all languages. That practice is used throughout this document.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Geographic point location (GPL) is the description of a well defined geographic place using a single coordinate tuple. Efficient interchange of GPL data requires formats which are universally interpretable, and which allow identification of points on, above and below the earth's surface. Users in various disciplines may have different requirements. This is exemplified by the use of degrees and decimal degrees, as well as the traditional degrees, minutes and seconds, for recording latitude and longitude. Users may also require various levels of precision and may use latitude and longitude without height.

ISO 6709:1983 defined a specific format representation of latitude and longitude, and optionally altitude.

ISO 6709:2008 revised the format representation of the 1983 edition by:

— adding the ability to identify the CRS to which coordinates are referenced, without which location is ambiguous, and

— expanding the use of altitude to allow for any ellipsoidal or gravity-related height or depth.

Since the first edition of this document in 1983, the field of geodesy has undergone significant technological advances, along with the continued development of other related geodesy and geomatics standards.

The aim of this edition addresses these new advances and standards and revises the coordinate string suitable for digital representation (Clause 6) while continuing to support the requirements of the previous edition (Annex B).

Clause 7 defines a simpler structure for the unambiguous representation of GPL in a human-readable format.

In addition, a series of Annexes are provided with the following content:

— Annex A (normative) defines the abstract test suite used for conformance testing;

— Annex B (normative) defines the representation of latitude and longitude coordinates that maintain backwards compatibility with ISO 6709:2008;

— Annex C presents a description and examples of how the position of coordinates can appear ambiguous without the use of a CRS;

— Annex D presents a table of mathematical precision values of resolution for latitude and longitude;

— Annex E describes the changes in this document from the previous edition of ISO 6709.

Users of this document should be aware of the following options:

a) For all cases where backwards compatibility is not required, this document recommends using the methods and rules specified in Clause 6, GPL representation, or Clause 7, human-readable GPL representation;

b) However, in systems and environments where backwards compatibility with the previous edition of ISO 6709 is required, the methods and rules specified in Annex B may be used.

In addition, when using Annex B, it is recommended that suitable and comprehensive ancillary documentation, not defined within this document, or in previous editions of ISO 6709, should be prepared and accompany all instances of geographic point location text strings and human-readable representations claiming backwards compatibility.

The use of this International Standard:

— establishes an expanded point representation string format supporting the current concepts and standards of geodesy and geographic information;

— when required, continues to support the needs of established user communities by maintaining backwards compatibility with the previous edition of this standard;

— reduces the cost of interchange of data;

— reduces the delay in converting non-standard coding structures in preparation for interchange by providing advance knowledge of the standard interchange format; and

— provides flexible support for geographic point representation.

Standard representation of geographic point location by coordinates

1 Scope

This document specifies the representation of latitude and longitude and optionally height or depth compatible with previous editions of ISO 6709.

This document also supports the representations of other coordinate types and time that may be associated with those coordinates as defined through one or more coordinate reference systems (CRS).

This document describes a text string of coordinates, suitable for electronic data exchange, for one point including reference system identification to ensure that the coordinates unambiguously represent the position of that point. Files containing multiple points with a single common reference system identification are out of scope. This document also describes a simpler text string structure for coordinate representation of a point location that is more suitable for human readability.

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 8601-1, *Date and time — Representations for information interchange — Part 1: Basic rules*

ISO 8601-2, *Date and time — Representations for information interchange — Part 2: Extensions*

ISO/IEC 8859-1, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*

ISO 19111, *Geographic information — Referencing by coordinates*

ISO 19162, *Geographic information — Well-known text representation of coordinate reference systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
accuracy
closeness of agreement between a test result or measurement result and the true value

[SOURCE: ISO 3534-2:2006, 3.1.1, modified – The original notes have been deleted.]

3.2
altitude
height where the chosen reference surface is mean sea level

3.3
compound coordinate reference system
coordinate reference system using at least two independent coordinate reference systems

Note 1 to entry: Coordinate reference systems are independent of each other if coordinate values in one cannot be converted or transformed into coordinate values in the other.

[SOURCE: ISO 19111:2019, 3.1.3]

3.4
coordinate
one of a sequence of numbers designating the position of a point

Note 1 to entry: In a spatial coordinate reference system, the coordinate numbers are qualified by units.

[SOURCE: ISO 19111:2019, 3.1.5]

3.5
coordinate reference system
coordinate system that is related to an object by a datum

Note 1 to entry: Geodetic and vertical datums are referred to as reference frames.

Note 2 to entry: For geodetic and vertical reference frames, the object will be the Earth. In planetary applications, geodetic and vertical reference frames may be applied to other celestial bodies.

[SOURCE: ISO 19111:2019, 3.1.9]

3.6
coordinate set
collection of coordinate tuples referenced to the same coordinate reference system and if that coordinate reference system is dynamic also to the same coordinate epoch

[SOURCE: ISO 19111:2019, 3.1.10]

3.7
coordinate system
set of mathematical rules for specifying how coordinates are to be assigned to points

[SOURCE: ISO 19111:2019, 3.1.11]

3.8
coordinate tuple
tuple composed of coordinates

Note 1 to entry: The number of coordinates in the coordinate tuple equals the dimension of the coordinate system; the order of coordinates in the coordinate tuple is identical to the order of the axes of the coordinate system.

[SOURCE: ISO 19111:2019, 3.1.13]

3.9
datum
reference frame
parameter or set of parameters that realize the position of the origin, the scale, and the orientation of a coordinate system

[SOURCE: ISO 19111:2019, 3.1.15]

3.10
depth
distance of a point from a chosen vertical reference surface downward along a line that is perpendicular to that surface

Note 1 to entry: Note 1 to entry: The line direction may be straight or be dependent on the Earth's gravity field or other physical phenomena.

Note 2 to entry: Note 2 to entry: A depth above the vertical reference surface will have a negative value.

[SOURCE: ISO 19111:2019, 3.1.17]

3.11
ellipsoidal height
geodetic height
h
distance of a point from the reference ellipsoid along the perpendicular from the reference ellipsoid to this point, positive if upwards or outside of the reference ellipsoid

Note 1 to entry: Only used as part of a three-dimensional ellipsoidal coordinate system or as part of a three-dimensional Cartesian coordinate system in a three-dimensional projected coordinate reference system, but never on its own.

[SOURCE: ISO 19111:2019, 3.1.24]

3.12
geographic point location
well defined geographic place described by one coordinate tuple

[SOURCE: ISO 19145:2013, 4.1.11]

3.13
geographic point location representation
syntactic description of a geographic point location in a well known format

[SOURCE: ISO 19145:2013, 4.1.12]

3.14
gravity-related height
H
height that is dependent on the Earth’s gravity field

Note 1 to entry: This refers to, amongst others, orthometric height and Normal height, which are both approximations of the distance of a point above the mean sea level, but also may include Normal-orthometric heights, dynamic heights or geopotential numbers.

Note 2 to entry: The distance from the reference surface may follow a curved line, not necessarily straight, as it is influenced by the direction of gravity.

[SOURCE: ISO 19111:2019, 3.1.37]

3.15
height
distance of a point from a chosen reference surface positive upward along a line perpendicular to that surface

Note 1 to entry: A height below the reference surface will have a negative value.

Note 2 to entry: Generalisation of ellipsoidal height (h) and gravity-related height (H).

[SOURCE: ISO 19111:2019, 3.1.38]