



SLOVENSKI STANDARD SIST EN ISO 19111:2005

01-april-2005

Geografske informacije - Lociranje s koordinatami (ISO 19111:2003)

Geographic information - Spatial referencing by coordinates (ISO 19111:2003)

Geoinformation - Raumbezug durch Koordinaten (ISO 19111:2003)

Information géographique - Systeme de références spatiales par coordonnées (ISO 19111:2003)

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ICS:

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

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ICS 35.240.70

English version

Geographic information - Spatial referencing by coordinates
(ISO 19111:2003)

Information géographique - Système de références
spatiales par coordonnées (ISO 19111:2003)

Geoinformation - Raumbezug durch Koordinaten (ISO
19111:2003)

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Foreword

The text of ISO 19111:2003 has been prepared by Technical Committee ISO/TC 211 "Geographic information/Geomatics" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 19111:2005 by Technical Committee CEN/TC 287 "Geographic Information", the secretariat of which is held by NEN.

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of an identical text or by endorsement, at the latest by July 2005, and conflicting national standards shall be withdrawn at the latest by July 2005.

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**Geographic information — Spatial
referencing by coordinates**

*Information géographique — Système de références spatiales par
coordonnées*

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Published in Switzerland

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Conformance requirements	1
3 Normative references	1
4 Terms and definitions	1
5 Conventions	5
5.1 Symbols and abbreviated terms	5
5.2 UML notation	6
6 Definition of the conceptual schema for coordinate reference systems	7
6.1 Introduction	7
6.2 Coordinate reference system	7
6.2.1 Type of coordinate reference system	7
6.2.2 Single coordinate reference system	8
6.2.3 Compound coordinate reference system	8
6.3 Datum	9
6.3.1 Types of datums	9
6.3.2 Datum description	10
6.3.3 Prime meridian	10
6.3.4 Ellipsoid	11
6.4 Coordinate system	11
6.5 Coordinate operation — coordinate conversion and coordinate transformation	12
6.5.1 General	12
6.5.2 Coordinate conversion (including map projection)	13
6.5.3 Coordinate transformation	14
6.5.4 Requirements for describing a coordinate operation	14
6.5.5 Concatenated coordinate operation	16
6.6 Citations	17
6.7 Accuracy and precision of coordinates, coordinate operations, and parameters	18
6.8 Attributes to describe a coordinate reference system	19
Annex A (normative) Conformance	22
Annex B (normative) UML schemas	24
Annex C (informative) Decision trees	27
Annex D (informative) Geodetic relationships	29
Annex E (informative) Examples	35

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 19111 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

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Introduction

Geographic information contains spatial references which relate the features represented in the data to positions in the real world. Spatial references fall into two categories:

- those using coordinates;
- those based on geographic identifiers.

This International Standard deals only with spatial referencing by coordinates. Spatial referencing by geographic identifiers is the subject of ISO 19112, *Geographic information — Spatial referencing by geographic identifiers*.

Coordinates are unambiguous only when the coordinate reference system to which those coordinates are related has been fully defined. A coordinate reference system is a coordinate system which has a reference to the Earth. This International Standard describes the elements that are necessary to define fully various types of coordinate systems and coordinate reference systems applicable to geographic information. The subset of elements required is partially dependent upon the type of coordinates. This International Standard also includes optional fields to allow for the inclusion of non-essential coordinate reference system information. The elements are intended to be both machine and human readable. A set of coordinates on the same coordinate reference system requires one coordinate reference system description.

In addition to describing a coordinate reference system, this International Standard provides for the description of a coordinate transformation or coordinate conversion between two different coordinate reference systems. With such information, geographic data referred to different coordinate reference systems can be merged together for integrated manipulation. Alternatively, an audit trail of coordinate reference system manipulations can be maintained.

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Geographic information — Spatial referencing by coordinates

1 Scope

This International Standard defines the conceptual schema for the description of spatial referencing by coordinates. It describes the minimum data required to define one-, two- and three-dimensional coordinate reference systems. It allows additional descriptive information to be provided. It also describes the information required to change coordinate values from one coordinate reference system to another.

This International Standard is applicable to producers and users of geographic information. Although it is applicable to digital geographic data, its principles can be extended to many other forms of geographic data such as maps, charts, and text documents.

2 Conformance requirements

This International Standard defines two classes of conformance, Class A for conformance of coordinate reference systems and Class B for coordinate operations between two coordinate reference systems. Any coordinate reference system claiming conformance to this International Standard shall satisfy the requirements given in Annex A, Clause A.1. Any coordinate operation claiming conformance to this International Standard shall satisfy the requirements given in Annex A, Clause A.2.

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3 Normative references [5a8cc4771db1/sist-en-iso-19111-2005](https://standards.iteh.ai/catalog/standards/sist/fd993a99-20a1-419b-8e4f-5a8cc4771db1/sist-en-iso-19111-2005)

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 1000, *SI units and recommendations for use of their multiples and of certain other units*

ISO/TS 19103:—¹⁾, *Geographic information — Conceptual schema language*

ISO 19113:2002, *Geographic information — Quality principles*

ISO 19114:—¹⁾, *Geographic information — Quality evaluation procedures*

4 Terms and definitions

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

4.1

Cartesian coordinate system

coordinate system which gives the position of points relative to n mutually perpendicular axes

¹⁾ To be published.

NOTE n is 1, 2 or 3 for the purposes of this International Standard.

**4.2
compound coordinate reference system**

coordinate reference system using two other independent coordinate reference systems to describe a position

EXAMPLE One coordinate reference system based on a two- or three-dimensional coordinate system and the other coordinate reference system based on a gravity-related height system.

**4.3
coordinate**

one of a sequence of n numbers designating the position of a point in n -dimensional space

NOTE 1 In a coordinate reference system, the numbers must be qualified by units.

NOTE 2 A coordinate operation is performed on coordinates in a source system resulting in coordinates in a target system.

**4.4
coordinate conversion**

change of **coordinates**, based on a one-to-one relationship, from one **coordinate system** to another based on the same **datum**

EXAMPLE Between geodetic and Cartesian coordinate systems or between geodetic coordinates and projected coordinates, or change of units such as from radians to degrees or feet to metres.

NOTE A coordinate conversion uses parameters which have constant values.

**4.5
coordinate operation**

change of **coordinates**, based on a one-to-one relationship, from one **coordinate reference system** to another

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NOTE Supertype of coordinate transformation and coordinate conversion.

**4.6
coordinate reference system**

coordinate system that is related to the real world by a **datum**

NOTE For geodetic and vertical datums, it will be related to the Earth.

**4.7
coordinate system**

set of mathematical rules for specifying how **coordinates** are to be assigned to points

**4.8
coordinate transformation**

change of **coordinates** from one **coordinate reference system** to another **coordinate reference system** based on a different **datum** through a one-to-one relationship

NOTE A coordinate transformation uses parameters which are derived empirically by a set of points with known coordinates in both coordinate reference systems.

**4.9
datum**

parameter or set of parameters that serve as a reference or basis for the calculation of other parameters

NOTE A datum defines the position of the origin, the scale, and the orientation of the axes of a coordinate system.

4.10 eastings

E

distance in a **coordinate system**, eastwards (positive) or westwards (negative) from a north-south reference line

4.11 ellipsoid

surface formed by the rotation of an ellipse about a main axis

NOTE In this International Standard, ellipsoids are always oblate, meaning that the axis of rotation is always the minor axis.

4.12 ellipsoidal height geodetic height

h

distance of a point from the **ellipsoid** measured along the perpendicular from the **ellipsoid** to this point positive if upwards or outside of the **ellipsoid**

NOTE Only used as part of a three-dimensional geodetic coordinate system and never on its own.

4.13 engineering datum local datum

datum describing the relationship of a **coordinate system** to a local reference

NOTE Engineering datum excludes both geodetic and vertical datums.

EXAMPLE A system for identifying relative positions within a few kilometres of the reference point.

4.14 flattening

f

ratio of the difference between the **semi-major axis** (*a*) and **semi-minor axis** (*b*) of an **ellipsoid** to the **semi-major axis**: $f = (a - b)/a$

NOTE Sometimes inverse flattening $1/f = a/(a - b)$ is given instead; $1/f$ is also known as reciprocal flattening.

4.15 geodetic coordinate system ellipsoidal coordinate system

coordinate system in which position is specified by **geodetic latitude**, **geodetic longitude** and (in the three-dimensional case) **ellipsoidal height**

4.16 geodetic datum

datum describing the relationship of a **coordinate system** to the Earth

NOTE In most cases, the geodetic datum includes an ellipsoid definition.

4.17 geodetic latitude ellipsoidal latitude

φ

angle from the equatorial plane to the perpendicular to the **ellipsoid** through a given point, northwards treated as positive

4.18
geodetic longitude
ellipsoidal longitude

λ

angle from the prime **meridian** plane to the **meridian** plane of a given point, eastward treated as positive

4.19
geoid

level surface which best fits mean sea level either locally or globally

NOTE "Level surface" means an equipotential surface of the Earth's gravity field which is everywhere perpendicular to the direction of gravity.

4.20
gravity-related height

H

height dependent on the Earth's gravity field

NOTE In particular, orthometric height or normal height, which are both approximations of the distance of a point above the mean sea level.

4.21
Greenwich meridian

meridian that passes through the position of the Airy Transit Circle at the Royal Observatory Greenwich, United Kingdom

NOTE Most geodetic datums use the Greenwich meridian as the prime meridian. Its precise position differs slightly between different datums.

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4.22
height

h, H

distance of a point from a chosen reference surface along a line perpendicular to that surface

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NOTE 1 See ellipsoidal height and gravity-related height.

NOTE 2 Height of a point outside the surface treated as positive; negative height is also called depth.

4.23
map projection

coordinate conversion from a **geodetic coordinate system** to a plane

4.24
mean sea level

average level of the surface of the sea over all stages of tide and seasonal variations

NOTE Mean sea level in a local context normally means mean sea level for the region calculated from observations at one or more points over a given period of time. Mean sea level in a global context differs from a global geoid by not more than 2 m.

4.25
meridian

intersection of an **ellipsoid** by a plane containing the **semi-minor axis** of the **ellipsoid**

NOTE This term is often used for the pole-to-pole arc rather than the complete closed figure.

4.26
northing

N

distance in a **coordinate system**, northwards (positive) or southwards (negative) from an east-west reference line

4.27**polar coordinate system**

coordinate system in which position is specified by distance and direction from the origin

NOTE In three dimensions also called spherical coordinate system.

4.28**prime meridian****zero meridian**

meridian from which the longitudes of other **meridians** are quantified

4.29**projected coordinate system**

two-dimensional **coordinate system** resulting from a **map projection**

4.30**semi-major axis**

a

longest radius of an **ellipsoid**

NOTE For an ellipsoid representing the Earth, it is the radius of the equator.

4.31**semi-minor axis**

b

shortest radius of an **ellipsoid**

NOTE For an ellipsoid representing the Earth, it is the distance from the centre of the ellipsoid to either pole.

4.32**spatial reference**

description of position in the real world [SIST EN ISO 19111:2005](https://standards.iteh.ai/catalog/standards/sist/fd993a99-20a1-419b-8e4f-11d77000000000000000)

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NOTE This may take the form of a label, code or set of coordinates.

4.33**vertical datum**

datum describing the relation of gravity-related **heights** to the Earth

NOTE In most cases the vertical datum will be related to a defined mean sea level based on water level observations over a long time period. Ellipsoidal heights are treated as related to a three-dimensional ellipsoidal coordinate system referenced to a geodetic datum. Vertical datums include sounding datums (used for hydrographic purposes), in which case the heights may be negative heights or depths.

5 Conventions**5.1 Symbols and abbreviated terms**

<i>a</i>	semi-major axis
<i>b</i>	semi-minor axis
CCRS	Compound coordinate reference system
<i>E</i>	easting
<i>h</i>	ellipsoidal height
<i>N</i>	northing
SC	Spatial referencing by Coordinates