
Geographic information — Well-known text representation of coordinate reference systems

Information géographique — Représentation textuelle bien lisible de systèmes de référence par coordonnées



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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* in close collaboration with the Open Geospatial Consortium (OGC).

This second edition cancels and replaces the first edition (ISO 19162:2015), which has been technically revised.

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

- updates to reflect the changes made in ISO 19111:2019 from its previous edition ISO 19111:2007 to describe dynamic geodetic reference frames, three-dimensional projected coordinate reference systems, datum ensembles and coordinate metadata;
- remodelling of the descriptions of temporal coordinate reference systems, to reflect the changes made in ISO 19111:2019;
- the correction of minor errors.

Further details are given in [Annex D](#).

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

Well-known text (WKT) offers a compact machine- and human-readable representation of geometric objects. WKT may also be used for succinctly describing the critical elements of coordinate reference system (CRS) definitions.

WKT was described in the Open Geospatial Consortium implementation specifications 99-036 through 06-103r4 and ISO 19125-1:2004. The WKT representation of coordinate reference systems was subsequently extended in Open Geospatial Consortium implementation specification 01-009 "Coordinate Transformation Services" and this extension was later adopted in the Open Geospatial Consortium GeoAPI 3.0 implementation standard 09-083r3 and GeoPackage 1.0 implementation standard 12-128r10. The WKT representation of coordinate reference systems as defined in ISO 19125-1:2004 and OGC specification 01-009 is inconsistent with the terminology and technical provisions of ISO 19111:2007 and OGC Abstract Specification topic 2 (08-015r2), "Geographic information — Spatial referencing by coordinates".

The 2015 version of this document provided an updated version of WKT representation of coordinate reference systems that follows the provisions of ISO 19111:2007 and ISO 19111-2:2009. It extended earlier WKT to allow for the description of coordinate operations.

This document updates WKT for the extensions to ISO 19111 made through its 2019 revision:

- the description of dynamic geodetic and vertical coordinate reference systems;
- the change of coordinate values within a coordinate reference system due to point motion caused by tectonic deformation;
- the description of geoid-based vertical coordinate reference systems;
- the description of datum ensembles, groups of realizations of one terrestrial or vertical reference system that for low accuracy purposes may be merged ignoring coordinate transformation;
- a rigorous description of temporal coordinate reference systems;
- the removal (deprecation) of image coordinate reference systems; and
- the remodelling of scope and extent information.

This document defines the structure and content of well-known text strings. It does not prescribe how implementations should read or write these strings.

Geographic information — Well-known text representation of coordinate reference systems

1 Scope

This document defines the structure and content of a text string implementation of the abstract model for coordinate reference systems described in ISO 19111. The string defines frequently needed types of coordinate reference systems and coordinate operations in a self-contained form that is easily readable by machines and by humans. The essence is its simplicity; as a consequence there are some constraints upon the more open content allowed in ISO 19111. To retain simplicity in the well-known text (WKT) description of coordinate reference systems and coordinate operations, the scope of this document excludes parameter grouping and pass-through coordinate operations. The text string provides a means for humans and machines to correctly and unambiguously interpret and utilise a coordinate reference system definition with look-ups or cross references only to define coordinate operation mathematics. A WKT string is not suitable for the storage of definitions of coordinate reference systems or coordinate operations because it omits metadata about the source of the data and may omit metadata about the applicability of the information.

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/IEC 10646, *Information technology — Universal Coded Character Set (UCS)*

ISO 19111:2019, *Geographic information — Referencing by coordinates*

3 Terms, definitions and abbreviated terms

3.1 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:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1.1

affine coordinate system

coordinate system in Euclidean space with straight axes that are not necessarily mutually perpendicular

[SOURCE: ISO 19111:2019, 3.1.1]