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Australian/New Zealand Standard™

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



AS/NZS ISO 19162:2020

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Australian/New Zealand Standard™

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

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## Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT-004, Geographical Information/Geomatics, to supersede AS/NZS ISO 19162:2018.

The objective of this document is to define the structure and content of a text string implementation of the abstract model for coordinate reference systems described in AS/NZS 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 AS/NZS 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 utilize 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.

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# Contents

Preface .....	ii
Foreword .....	vi
Introduction .....	vii
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms, definitions and abbreviated terms .....</b>	<b>1</b>
3.1 Terms and definitions .....	1
3.2 Abbreviated terms .....	10
<b>4 Conformance requirements .....</b>	<b>10</b>
<b>5 Backus-Naur Form notation and syntax .....</b>	<b>11</b>
<b>6 WKT string form .....</b>	<b>12</b>
6.1 Overview .....	12
6.2 Encoding .....	12
6.3 Characters used in WKT .....	12
6.3.1 Basic characters .....	12
6.3.2 Numbers .....	13
6.3.3 Date and time .....	14
6.3.4 CRS WKT characters .....	15
6.3.5 Double quote .....	15
6.4 Delimiter .....	16
6.5 Case sensitivity .....	16
6.6 Reserved keywords .....	16
6.7 Backward compatibility .....	18
<b>7 WKT representation of common attributes .....</b>	<b>18</b>
7.1 General .....	18
7.2 Name .....	19
7.3 Scope, extent, identifier and remark .....	19
7.3.1 General .....	19
7.3.2 Usage (scope and extent) .....	19
7.3.3 Identifier .....	23
7.3.4 Remark .....	24
7.4 Unit and unit conversion factor .....	25
7.4.1 Unit description .....	25
7.4.2 Conversion factor — Spatial and parametric units .....	26
7.4.3 Conversion factor — Temporal quantities .....	26
7.4.4 Default unit .....	27
7.5 Coordinate system .....	27
7.5.1 Syntax .....	27
7.5.2 Coordinate system type, dimension and coordinate data type .....	30
7.5.3 Axis name and abbreviation .....	31
7.5.4 Axis direction .....	32
7.5.5 Axis order .....	33
7.5.6 Axis unit and coordinate system unit .....	33
7.5.7 Examples of WKT describing coordinate systems .....	34
7.6 Datum ensemble .....	36
7.7 Dynamic coordinate reference systems .....	38
<b>8 WKT representation of geodetic and geographic coordinate reference systems .....</b>	<b>39</b>
8.1 Overview .....	39
8.2 Geodetic reference frame (geodetic datum) .....	40
8.2.1 Ellipsoid .....	40
8.2.2 Prime meridian .....	41

8.2.3	Geodetic reference frame (datum)	42
8.3	Coordinate systems for geodetic and geographic CRSs	44
8.4	Examples of WKT describing a geodetic or geographic CRS	44
<b>9</b>	<b>WKT representation of projected CRSs</b>	<b>45</b>
9.1	Overview	45
9.2	Base CRS	46
9.2.1	General	46
9.2.2	Ellipsoidal CS unit	47
9.3	Map projection	47
9.3.1	Introduction	47
9.3.2	Map projection name and identifier	48
9.3.3	Map projection method	48
9.3.4	Map projection parameter	49
9.4	Coordinate systems for projected CRSs	49
9.5	Examples of WKT describing a projected CRS	49
<b>10</b>	<b>WKT representation of vertical CRSs</b>	<b>51</b>
10.1	Overview	51
10.2	Vertical reference frame (vertical datum)	52
10.3	Vertical coordinate system	53
10.4	Example of WKT describing a vertical CRS	54
<b>11</b>	<b>WKT representation of engineering CRSs</b>	<b>54</b>
11.1	Overview	54
11.2	Engineering datum	55
11.3	Coordinate systems for engineering CRSs	55
11.4	Examples of WKT describing an engineering CRS	55
<b>12</b>	<b>WKT representation of parametric CRSs</b>	<b>56</b>
12.1	Overview	56
12.2	Parametric datum	56
12.3	Parametric coordinate system	57
12.4	Example of WKT describing a parametric CRS	57
<b>13</b>	<b>WKT representation of temporal CRSs</b>	<b>57</b>
13.1	Temporal CRS	57
13.2	Temporal datum	57
13.3	Temporal coordinate system	58
13.3.1	General	58
13.3.2	Axis unit for temporalDateTime coordinate systems	58
13.3.3	Axis unit for temporalCount and temporalMeasure coordinate systems	59
13.4	Examples of WKT describing a temporal CRS	59
<b>14</b>	<b>WKT representation of derived CRSs</b>	<b>60</b>
14.1	Overview	60
14.2	Deriving conversion	60
14.2.1	General	60
14.2.2	Derived CRS conversion method	61
14.2.3	Derived CRS conversion parameter	61
14.2.4	Derived CRS conversion parameter file	62
14.2.5	Derived CRS conversion example	62
14.3	Derived geodetic CRS and derived geographic CRS	63
14.3.1	Representation	63
14.3.2	Example of WKT describing a derived geographic CRS	64
14.4	Derived projected CRS	65
14.4.1	Representation	65
14.4.2	Example of WKT describing a derived projected CRS	65
14.5	Derived vertical CRS	66
14.6	Derived engineering CRS	67
14.7	Derived parametric CRS	67

14.8	Derived temporal CRS .....	68
<b>15</b>	<b>WKT representation of compound coordinate reference systems .....</b>	<b>68</b>
15.1	Overview .....	68
15.2	Examples of WKT describing a compound CRS .....	69
<b>16</b>	<b>WKT representation of coordinate epoch and coordinate metadata .....</b>	<b>70</b>
16.1	Coordinate epoch .....	70
16.2	Coordinate metadata .....	70
<b>17</b>	<b>WKT representation of coordinate transformations and coordinate conversions excluding map projections .....</b>	<b>71</b>
17.1	Coordinate operations .....	71
17.2	Transformation and conversion components .....	72
17.2.1	Operation name and version .....	72
17.2.2	Source and target CRS .....	72
17.2.3	Transformation and conversion name and identifier .....	72
17.2.4	Coordinate operation method .....	73
17.2.5	Coordinate operation parameter .....	73
17.2.6	Coordinate operation parameter file .....	74
17.2.7	Interpolation CRS .....	74
17.2.8	Coordinate operation accuracy .....	74
17.2.9	Other coordinate operation attributes .....	74
17.3	Examples of WKT describing a coordinate transformation .....	75
<b>18</b>	<b>WKT representation of point motion operations .....</b>	<b>76</b>
<b>19</b>	<b>WKT representation of concatenated coordinate operations .....</b>	<b>77</b>
19.1	General .....	77
19.2	Examples of WKT describing a concatenated coordinate operation .....	79
<b>20</b>	<b>WKT representation of CRS and coordinate operation couplets .....</b>	<b>80</b>
20.1	Bound CRS .....	80
20.2	Bound CRS components .....	81
20.2.1	Abridged coordinate transformation .....	81
20.2.2	Coordinate operation method in abridged coordinate transformations .....	81
20.2.3	Abridged coordinate transformation parameter .....	81
20.2.4	Coordinate operation parameter file .....	82
20.3	Examples of WKT describing a bound CRS .....	82
<b>Annex A</b>	(normative) <b>Abstract test suite .....</b>	<b>84</b>
<b>Annex B</b>	(informative) <b>Recommended practice for implementation .....</b>	<b>93</b>
<b>Annex C</b>	(informative) <b>Mapping of concepts from previous versions of CRS WKT .....</b>	<b>97</b>
<b>Annex D</b>	(informative) <b>Backward compatibility with ISO 19162:2015 .....</b>	<b>108</b>
<b>Annex E</b>	(normative) <b>Triaxial ellipsoid .....</b>	<b>112</b>
<b>Annex F</b>	(informative) <b>Identifiers for coordinate operation methods and parameters .....</b>	<b>113</b>
<b>Bibliography</b>	.....	<b>118</b>

## 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](http://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](http://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](http://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](http://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.

## NOTES

# Australian/New Zealand Standard

## 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]

##### 3.1.2

##### **bearing**

<geodesy> horizontal angle at a point relative to a specified direction

Note 1 to entry: The direction is usually specified to be north. In some communities the term bearing refers specifically to grid north and directions relative to true north are then termed 'azimuth'; in other communities a bearing refers specifically to true north. In this document bearing is used for any specified reference direction. The angle may be reckoned positive clockwise or positive counter-clockwise depending upon the application.