

This is a preview of "ISO 19111:2007". [Click here to purchase the full version from the ANSI store.](#)

Second edition
2007-07-01

Geographic information — Spatial referencing by coordinates

*Information géographique — Système de références spatiales par
coordonnées*



Reference number
ISO 19111:2007(E)

© ISO 2007

This is a preview of "ISO 19111:2007". [Click here to purchase the full version from the ANSI store.](#)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.



COPYRIGHT PROTECTED DOCUMENT

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

This is a preview of "ISO 19111:2007". [Click here to purchase the full version from the ANSI store.](#)

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Conformance requirements	1
3 Normative references	1
4 Terms and definitions.....	2
5 Conventions	7
5.1 Symbols	7
5.2 Abbreviated terms	7
5.3 UML notation	8
5.4 Attribute status	9
6 Spatial referencing by coordinates — Overview	9
6.1 Relationship between coordinates and coordinate reference system.....	9
6.2 UML model for spatial referencing by coordinates — Overview	11
7 Identified Object package	12
7.1 General.....	12
7.2 UML schema for the Identified Object package.....	12
8 Coordinate Reference System package	15
8.1 Reference system	15
8.2 Coordinate reference system	15
8.3 UML schema for the Coordinate Reference System package	17
9 Coordinate System package.....	23
9.1 Introduction	23
9.2 Coordinate system.....	23
9.3 Coordinate system axis	24
9.4 UML schema for the Coordinate System package	25
10 Datum package	34
10.1 Types of datums	34
10.2 Geodetic datum.....	34
10.3 UML schema for the Datum package.....	34
11 Coordinate Operation package	41
11.1 General characteristics of coordinate operations.....	41
11.2 UML schema for the Coordinate Operation package.....	41
Annex A (normative) Abstract test suite.....	51
Annex B (informative) Context for modelling of spatial referencing by coordinates	53
Annex C (informative) Spatial referencing by coordinates – Geodetic concepts.....	62
Annex D (informative) Examples	65
Annex E (informative) Recommended best practice for interfacing to ISO 19111	77
Bibliography	78

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

This second edition cancels and replaces the first edition (ISO 19111:2003), which has been technically revised.

This is a preview of "ISO 19111:2007". [Click here to purchase the full version from the ANSI store.](#)

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.

Spatial referencing by geographic identifiers is defined in ISO 19112 [4]. This International Standard describes the data elements, relationships and associated metadata required for spatial referencing by coordinates. It describes the elements that are necessary to fully define 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.

The traditional separation of horizontal and vertical position has resulted in coordinate reference systems that are horizontal (2D) and vertical (1D) in nature, as opposed to truly three-dimensional. It is established practice to define a three-dimensional position by combining the horizontal coordinates of a point with a height or depth from a different coordinate reference system. In this International Standard, this concept is defined as a compound coordinate reference system.

The concept of coordinates can be expanded from a strictly spatial context to include time. ISO 19108 describes temporal schema. Time can be added as a temporal coordinate reference system within a compound coordinate reference system. It is even possible to add two time-coordinates, provided the two coordinates describe different independent quantities.

EXAMPLE An example is the time/space position of a subsurface point of which the vertical coordinate is expressed as the two-way travel time of a sound signal in milliseconds, as is common in seismic imaging. A second time-coordinate indicates the time of observation, usually expressed in whole years.

Certain scientific communities use three-dimensional systems where horizontal position is combined with a non-spatial parameter. In these communities, the parameter is considered to be a third, vertical axis. The parameter, although varying monotonically with elevation or depth, does not necessarily vary in a simple manner; thus, conversion from the parameter to height or depth is non-trivial. The parameters concerned are normally absolute measurements and the datum is taken with reference to a direct physical measurement of the parameter. These non-spatial parameters are beyond the scope of this International Standard. However, the modelling constructs described within this International Standard can be applied through a profile specific to a community.

In addition to describing a coordinate reference system, this International Standard provides for the description of a coordinate transformation or a coordinate conversion between two different coordinate reference systems. With such information, spatial data referred to different coordinate reference systems can be related to one specified coordinate reference system. This facilitates spatial data integration. Alternatively, an audit trail of coordinate reference system manipulations can be maintained.