
**Information technology — Database
languages — SQL multimedia and
application packages —**

**Part 3:
Spatial**

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*Technologies de l'information — Langages de bases de données —
Multimédia SQL et paquetages d'application —*

Partie 3: Spatial

ISO/IEC 13249-3:2003

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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 and IEC shall not be held responsible for identifying any or all such patent rights.

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ISO/IEC 13249-3 was prepared by Joint Technical Committee ISO/IEC/JTC 1, *Information technology*, Subcommittee SC 32, *Data management services*.

This second edition cancels and replaces the first edition (ISO/IEC 13249-3:1999), which has been technically revised.

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ISO/IEC 13249 consists of the following parts, under the general title *Information technology — Database languages — SQL multimedia and application packages*:

- *Part 1: Framework*
- *Part 2: Full-Text*
- *Part 3: Spatial*
- *Part 5: Still image*
- *Part 6: Data mining*

Introduction

The purpose of this International Standard is to define multimedia and application specific types and their associated routines using the user-defined features in ISO/IEC 9075.

This document is based on the content of ISO/IEC International Standard Database Language (SQL).

The organization of this part of ISO/IEC 13249 is as follows:

- 1) Clause 1, "Scope", specifies the scope of this part of ISO/IEC 13249.
- 2) Clause 2, "Normative references", identifies additional standards that, through reference in this part of ISO/IEC 13249, constitute provisions of this part of ISO/IEC 13249.
- 3) Clause 3, "Definitions, notations, and conventions", defines the notations and conventions used in this part of ISO/IEC 13249.
- 4) Clause 4, "Concepts", presents concepts used in the definition of this part of ISO/IEC 13249.
- 5) Clause 5, "Geometry Types", defines the geometry supertype.
- 6) Clause 6, "Point Types", defines primitive 0-dimensional geometry types.
- 7) Clause 7, "Curve Types", defines primitive 1-dimensional geometry types.
- 8) Clause 8, "Surface Types", defines primitive 2-dimensional geometry types.
- 9) Clause 9, "Geometry Collection Types", defines the geometry collection types.
- 10) Clause 10, "Spatial Reference System Types", defines the user defined type to manage spatial reference systems.
- 11) Clause 11, "Angle and Direction Types", defines the angles and direction types.
- 12) Clause 12, "Support Routines", defines supporting functions and procedures used by this part of ISO/IEC 13249.
- 13) Clause 13, "SQL/MM Spatial Information Schema" defines the SQL/MM Spatial Information Schema.
- 14) Clause 14, "SQL/MM Spatial Definition Schema" defines the SQL/MM Spatial Definition Schema.
- 15) Clause 15, "Status Codes", defines the SQLSTATE codes used in this part of ISO/IEC 13249.
- 16) Clause 16, "Conformance", defines the criteria for conformance to this part of ISO/IEC 13249.
- 17) Annex A, "Implementation-defined elements", is an informative Annex. It lists those features for which the body of this part of ISO/IEC 13249 states that the syntax or meaning or effect on the database is partly or wholly implementation-defined, and describes the defining information that an implementer shall provide in each case.
- 18) Annex B, "Implementation-dependent elements", is an informative Annex. It lists those features for which the body of this part of ISO/IEC 13249 states explicitly that the meaning or effect on the database is implementation-dependent.
- 19) Annex C, "Incompatibilities with ISO/IEC 13249-3:1999", is an informative Annex. It lists incompatibilities with the previous version of this part of ISO/IEC 13249-3.
- 20) Annex D, "Geometry Type Hierarchy", is an informative Annex. It visually describes the inheritance relationship between user-defined types in this part of ISO/IEC 13249.
- 21) Bibliography is the last informative Annex. It is a list of selective reading relating to this part of ISO/IEC 13249.

In the text of this part of ISO/IEC 13249, Clauses begin a new odd-numbered page, and in Clause 5, "Geometry Types", through Clause 11, "Angle and Direction Types", subclauses begin a new page. Any resulting blank space is not significant.

Information technology — Database languages — SQL multimedia and application packages — Part 3: Spatial

1 Scope

This part of ISO/IEC 13249:

- a) introduces the Spatial part of ISO/IEC 13249,
- b) gives the references necessary for this part of ISO/IEC 13249,
- c) defines notations and conventions specific to this part of ISO/IEC 13249,
- d) defines concepts specific to this part of ISO/IEC 13249,
- e) defines spatial user-defined types and their associated routines.

The spatial user-defined types defined in this part adhere to the following:

- A spatial user-defined type is generic to spatial data handling. It addresses the need to store, manage and retrieve information based on aspects of spatial data such as geometry, location, and topology.
- A spatial user-defined type does not redefine the database language SQL directly or in combination with another spatial data type.

Implementations of this part of ISO/IEC 13249 may exist in environments that also support geographic information, decision support, data mining, and data warehousing systems.

Application areas addressed by implementations of this part of ISO/IEC 13249 include, but are not restricted to, automated mapping, desktop mapping, facilities management, geoen지니어ing, graphics, multimedia, and resource management applications.

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2 Normative references

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.

2.1 ISO/IEC JTC 1 standards

ISO/IEC 13249-1:2002, *Information technology — Database languages — SQL multimedia and application packages — Part 1: Framework*

2.2 ISO standards

ISO/IEC 9075 (all parts), *Information technology — Database languages — SQL*

ISO 19107:2003, *Geographic information — Spatial schema*

ISO 19111:2003, *Geographic information — Spatial referencing by coordinates*

2.3 IEC standards

IEC 559:1989, *Binary floating-point arithmetic for microprocessor systems*

2.4 Other international standards

Open GIS Consortium, Inc., *OpenGIS® Geography Markup Language (GML), Revision 2.0*, 2001-02-20.
<http://www.opengis.net/gml/01-029/GML2.html>

The W3C Consortium, *Extensible Markup Language (XML) Version 1.0 (second edition)*, 2000-10-02.
<http://www.w3.org/TR/REC-xml>

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3 Terms and definitions, notations and conventions

3.1 Terms and definitions

3.1.1 Terms and definitions provided in ISO/IEC 13249-1:2002

This part of ISO/IEC 13249 makes use of all the terms and definitions given in ISO/IEC 13249-1.

3.1.2 Terms and definitions provided in this part of ISO/IEC 13249

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

3.1.2.1

0-dimensional geometry

a geometry with a geometric dimension of 0 (zero)

3.1.2.2

1-dimensional geometry

a geometry with a geometric dimension of 1 (one)

3.1.2.3

2-dimensional geometry

a geometry with a geometric dimension of 2

3.1.2.4

angle

the inclination to each other of two intersecting lines (which may be measured by the arc of a circle intercepted between the two lines forming the angle, the center of the circle being the point of intersection). The value of an angle can be expressed in degrees, in degrees, minutes, and seconds, in radians, or in gradians

3.1.2.5

azimuth

a representation of a geographic heading that is given by a rotation measured clockwise either from True North (North azimuth) or True South (South azimuth), having a value greater than or equal to 0 (zero) and less than 360 degrees (or 2pi radians, or 400 gradians).

3.1.2.6

bearing

a representation of a geographic heading that is given by a rotation measured from True North or True South towards East or West. A bearing is specified with three parts: the prefix is either 'N' or 'S' for North or South; an angle in the range of 0 (zero) to 90 degrees, 0 to pi/2 radians, or 0 to 100 gradians; and a suffix of 'E' or 'W' for East or West. For example, a direction of Northeast is defined as the bearing N 45 E, where 45 is in degrees. A bearing of S 30 E is 30 degrees measured counterclockwise from due South and is equivalent to a North azimuth of 150 degrees.

3.1.2.7

boundary of a curve

the empty set if the curve is closed, otherwise the set containing the start and end points of the curve

3.1.2.8

boundary of a point

the empty set

3.1.2.9

boundary of a surface

the set of curves that delineate the edge of the surface, including interior and exterior rings

3.1.2.10

clockwise

a sense of rotation followed by the hands of a conventional analog clock; or, equivalently, making a fist with the left hand, raising the thumb and pointing it toward your face, the remaining fingers on the left hand point in a clockwise direction around the thumb