
Geographic information — Spatial referencing by geographic identifiers

*Information géographique — Système de références spatiales par
identificateurs géographiques*

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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and notation	1
3.1 Terms and definitions	1
3.2 Conceptual schema notation	2
4 Conformance	2
4.1 General	2
4.2 Spatial reference system using geographic identifiers conformance class	2
4.3 Gazetteer conformance class	3
5 Conceptual schema overview	3
6 Requirements for spatial reference systems using geographic identifiers	4
6.1 Spatial reference system using geographic identifiers	4
6.2 Conceptual schema for spatial referencing using geographic identifiers	4
6.3 Object Type: SpatialReferenceSystemUsingGeographicIdentifiers	5
6.4 Object Type: LocationClass	6
7 Requirements for a gazetteer	7
7.1 Overview	7
7.2 Conceptual schema for gazetteers	7
7.3 Object Type: Gazetteer	9
7.4 Object Type: Location	10
7.5 Object Type: GeographicIdentifier	11
Annex A (normative) Abstract test suites	13
Annex B (informative) Example spatial reference systems using geographic identifiers	14
Annex C (informative) Examples of gazetteer data	16
Annex D (informative) Backward compatibility	17
Bibliography	20

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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 19112:2003), which has been technically revised.

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

- revision of the conceptual schema to meet current standards and harmonise with other ISO/TC 211 standards;
- introduction of the class `LocationClass` to replace the class `SI_LocationType`;
- introduction of the class `Location` to replace the class `SI_LocationInstance`;
- introduction of the class `SpatialReferenceSystemUsingGeographicIdentifiers` to replace the class `SI_SpatialReferenceSystemUsingGeographicIdentifiers`;
- introduction of the class `Gazetteer` to replace the class `SI_Gazetteer`;
- introduction of the class `GeographicIdentifier`;
- recognition that a gazetteer is a sub-type of `Register` as defined in ISO 19135-1, and that `LocationClass` is an `ItemClass` and `Location` a `RegisterItem` in that context;
- changes to package identifiers.

The changes are elaborated in [Annex D](#).

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

Geographic information contains spatial references that relate information represented in data or text to positions in geographic space.

Spatial references fall into two categories:

- a) those using coordinates;
- b) those using geographic identifiers.

This document deals only with spatial referencing by geographic identifiers. This type of spatial reference is sometimes called “indirect”. Spatial referencing by coordinates is the subject of ISO 19111.

Spatial reference systems using geographic identifiers are based not explicitly on coordinates but on a relationship with a location defined by a geographic feature or features. The relationship of the position to the feature may be as follows:

- containment, where the position is within the geographic feature, for example in a country;
- local measurements, where the position is defined relative to a fixed point or points in the geographic feature or features, for example at a given distance along a street from a junction with another street. This aspect, known as linear referencing, is the subject of ISO 19148;
- loosely related, where the position has a fuzzy relationship with the geographic feature or features, for example adjacent to a building or between two buildings.

The purpose of this document is to specify ways to define and describe systems of spatial references using geographic identifiers. It only covers the definition and recording of the referencing feature, and does not consider the forms of the relationship of the position relative to that feature.

A spatial reference system using geographic identifiers is a collection of Location classes of different sub-types, while a gazetteer is a collection of Location instances (of one or more Location sub-types).

A common form of spatial referencing system using geographic identifiers is addressing. This is the subject of ISO 19160-1.

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Geographic information — Spatial referencing by geographic identifiers

1 Scope

This document defines the conceptual schema for spatial references based on geographic identifiers. It establishes a general model for spatial referencing using geographic identifiers and defines the components of a spatial reference system. It also specifies a conceptual scheme for a gazetteer.

Spatial referencing by coordinates is addressed in ISO 19111. However, a mechanism for recording complementary coordinate references is included in this document.

This document enables producers of data to define spatial reference systems using geographic identifiers and assists users in understanding the spatial references used in datasets. It enables gazetteers to be constructed in a consistent manner and supports the development of other standards in the field of geographic information.

This document is applicable to digital geographic data, and its principles may be extended to other forms of geographic data such as maps, charts and textual documents.

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 19107:2003, *Geographic information — Spatial schema*

ISO 19111:2007, *Geographic information — Spatial referencing by coordinates*

ISO 19115-1:2014, *Geographic information — Metadata — Part 1: Fundamentals*

ISO 19135-1:2015, *Geographic information — Procedures for item registration — Part 1: Fundamentals*

3 Terms, definitions and notation

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:

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

3.1.1

gazetteer

register of location instances of one or more location sub-types, containing some information regarding position

Note 1 to entry: The positional information need not be coordinates, but could be descriptive.

3.1.2

geographic identifier

spatial reference in the form of a label or code that identifies a location

EXAMPLE “Spain” is an example of a label (country name); “SW1P 3AD” is an example of a code (postcode).

3.1.3

location

particular place or position

Note 1 to entry: A location identifies a geographic place.

EXAMPLE “Madrid”, “California”.

3.1.4

spatial reference

description of position in the real world

Note 1 to entry: This may take the form of a label, code or coordinate tuple.

[SOURCE: ISO 19111:2007, 4.43]

3.2 Conceptual schema notation

Several model elements used in this document are defined in packages specified in other International Standards; these are listed in [Table 1](#).

Table 1 — Packages defined in other International Standards

Prefix	Package	International standard
EX	Extent	ISO 19115-1
CI	Citation	ISO 19115-1
CRS	Coordinate Reference System	ISO 19111
GM	Geometry	ISO 19107
MD	Metadata	ISO 19115-1
RE	Register	ISO 19135-1

4 Conformance

4.1 General

Two classes of conformance are defined for this document:

- Spatial reference system using geographic identifiers — the minimum requirements for establishing a spatial reference system using geographic identifiers;
- Gazetteer — the minimum requirements for establishing a gazetteer.

4.2 Spatial reference system using geographic identifiers conformance class

[Table 2](#) defines the characteristics of the spatial reference system using geographic identifiers conformance class.

Table 2 — Spatial reference system using geographic identifiers conformance class

Conformance class identifier	<http://standards.iso211.org/19112/-1/2/conf/srs>
Standardization target	Spatial reference system using geographic identifiers
Dependency	None
Requirements	All requirements in Clause 6
Requirements class identifier	<http://standards.iso211.org/19112/-1/2/req/srs>
Tests	All tests in A.1

4.3 Gazetteer conformance class

[Table 3](#) defines the characteristics of the gazetteer conformance class.

Table 3 — Gazetteer conformance class

Conformance class identifier	<http://standards.iso211.org/19112/-1/2/conf/gaz>
Standardization target	Gazetteer
Dependency	None
Requirements	All requirements in Clause 7
Requirements class identifier	<http://standards.iso211.org/19112/-1/2/req/gaz>
Tests	All tests in A.2

5 Conceptual schema overview

[Clauses 6](#) and [7](#) specify a conceptual schema (expressed in UML) for

- a spatial referencing system using geographic identifiers, and
- a gazetteer.

An overview of the schema is provided in [Figure 1](#). The classes originating in this document (depicted by unshaded boxes in [Figures 1, 2](#) and [3](#)) are elaborated in [Figures 2](#) and [3](#) and are fully specified in [6.3](#), [6.4](#), [7.3](#), [7.4](#) and [7.5](#).



A spatial reference system using geographic identifiers comprises a related set of one or more location classes, together with their corresponding geographic identifiers. These location classes may be related to each other through aggregation or disaggregation, possibly forming a hierarchy.

Examples of spatial reference systems using geographic identifiers are shown in [Table 4](#).

Table 4 — Examples of spatial reference systems

6.2 Conceptual schema for spatial referencing using geographic identifiers

The conceptual schema presented in this document includes two classes for describing a spatial referencing system that uses geographic identifiers, these being

- `SpatialReferenceSystemUsingGeographicIdentifiers`, and

— LocationClass.

The classes are illustrated in [Figure 2](#) and are fully specified in [6.3](#) and [6.4](#).

Requirement 1 A spatial referencing system using geographic identifiers shall conform to the schema (presented in UML) that is illustrated in [Figure 2](#) and specified in [6.3](#) and [6.4](#).

[Requirement identifier <<http://standards.iso211.org/19112/-1/2/req/srs/srs>>]

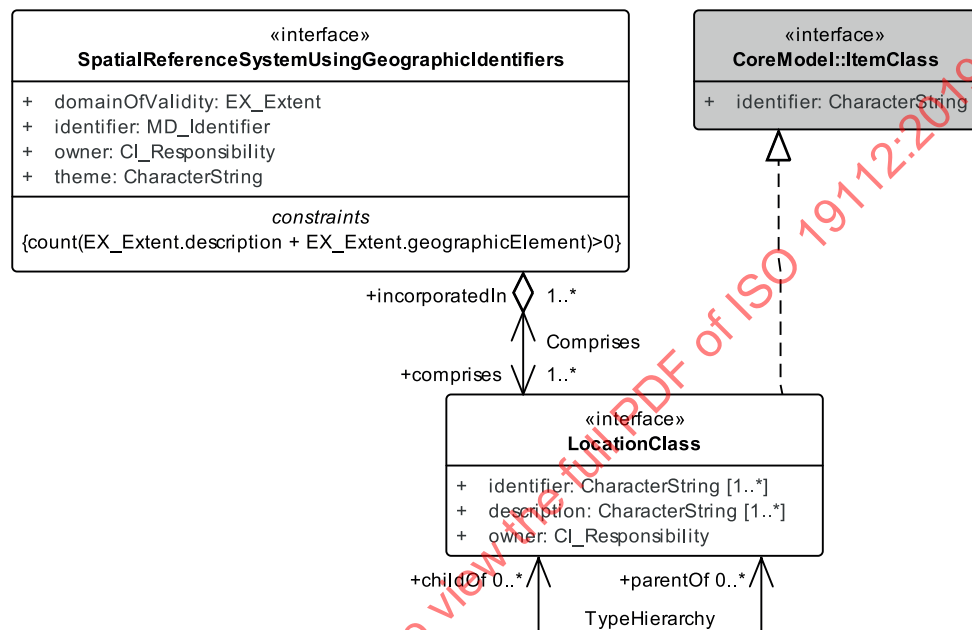


Figure 2 — Conceptual schema — Spatial referencing using geographic identifiers

6.3 Object Type: SpatialReferenceSystemUsingGeographicIdentifiers

The characteristics of object type SpatialReferenceSystemUsingGeographicIdentifiers are specified in [Table 5](#).

Table 5 — Object Type SpatialReferenceSystemUsingGeographicIdentifiers

SpatialReferenceSystemUsingGeographicIdentifiers	
Definition:	system for identifying position in the real world by reference to a location defined by a geographic feature or features
Type:	Object Type
Attribute:	
Name:	domainOfValidity
Definition:	geographic area in which the spatial reference system using geographic identifiers is applicable
Multiplicity:	1
Value type:	EX_Extent (ISO 19115-1:2014, 6.6.1)
Constraint:	domainOfValidity shall contain at least one of description and geographicElement

Table 5 (continued)

Attribute:	
Name:	identifier
Definition:	identifier of the spatial reference system using geographic identifiers
Multiplicity:	1
Value type:	MD_Identifier (ISO 19115-1:2014, B.17.2)
Attribute:	
Name:	owner
Definition:	authority with overall responsibility for the spatial reference system using geographic identifiers
Multiplicity:	1
Value type:	CI_Responsibility (ISO 19115-1:2014, B.16.1)
Attribute:	
Name:	theme
Definition:	basis for the spatial reference system using geographic identifiers Example “Addressing”
Multiplicity:	1
Value type:	CharacterString
Association role:	
Name:	comprises
Definition:	location classes making up the spatial reference system using geographic identifiers
Multiplicity:	1..*
Value type:	LocationClass (6.4)

6.4 Object Type: LocationClass

The characteristics of object type LocationClass are specified in [Table 6](#).

Table 6 — Object Type LocationClass

LocationClass
Definition:
categorisation of locations
Type:
Object Type
Realization of:
ItemClass (from ISO 19135-1:2015, 7.4.2)
Attribute:
Name:
Definition:
Example “town”
Multiplicity:
Value type:
CharacterString

Table 6 (continued)

Attribute:	
Name:	description
Definition:	description of the location class Example "centre of population containing a market"
Multiplicity:	1..*
Value type:	CharacterString
Attribute:	
Name:	owner
Definition:	name of the organization or class of organization able to create and destroy instances of locations of this location class
Multiplicity:	1
Value type:	CI_Responsibility (ISO 19115-1:2014, B.16.1)
Association role:	
Name:	incorporatedIn
Definition:	spatial reference system using geographic identifiers
Multiplicity:	1..*
Value type:	SpatialReferenceSystemUsingGeographicIdentifiers (6.3)
Association role:	
Name:	childOf
Definition:	Location class of which this Location class forms part
Multiplicity:	0..*
Value type:	LocationClass (6.4)
Association role:	
Name:	parentOf
Definition:	Location class that forms part of this Location class
Multiplicity:	0..*
Value type:	LocationClass (6.4)

7 Requirements for a gazetteer

7.1 Overview

A gazetteer contains information regarding the position of each location instance. This positional information may be a coordinate reference, or it may also be purely descriptive. A coordinate reference will enable transformation from the spatial reference system using geographic identifiers to the coordinate reference system. A descriptive reference will be a spatial reference using a different spatial reference system using geographic identifiers, e.g. the postcode of a property. For any location class, there may be more than one gazetteer.

7.2 Conceptual schema for gazetteers

The conceptual schema in this document establishes a single class to describe a gazetteer. The class, "Gazetteer", is illustrated in Figure 3 and is specified in 7.3. The class "Gazetteer" is also associated with classes "Location" (specified in 7.4) and "GeographicIdentifier" (specified in 7.5). Implementations may extend this model to include references from the gazetteer to other datasets.

A gazetteer is a register. Accordingly:

- the class "Gazetteer" is specified as being a subtype of the class "Register" [ISO 19135-1:2015, 7.2.2].

- the class "Location" is specified as being a subtype of the class "RegisterItem" [ISO 19135-1:2015, 7.5.2].

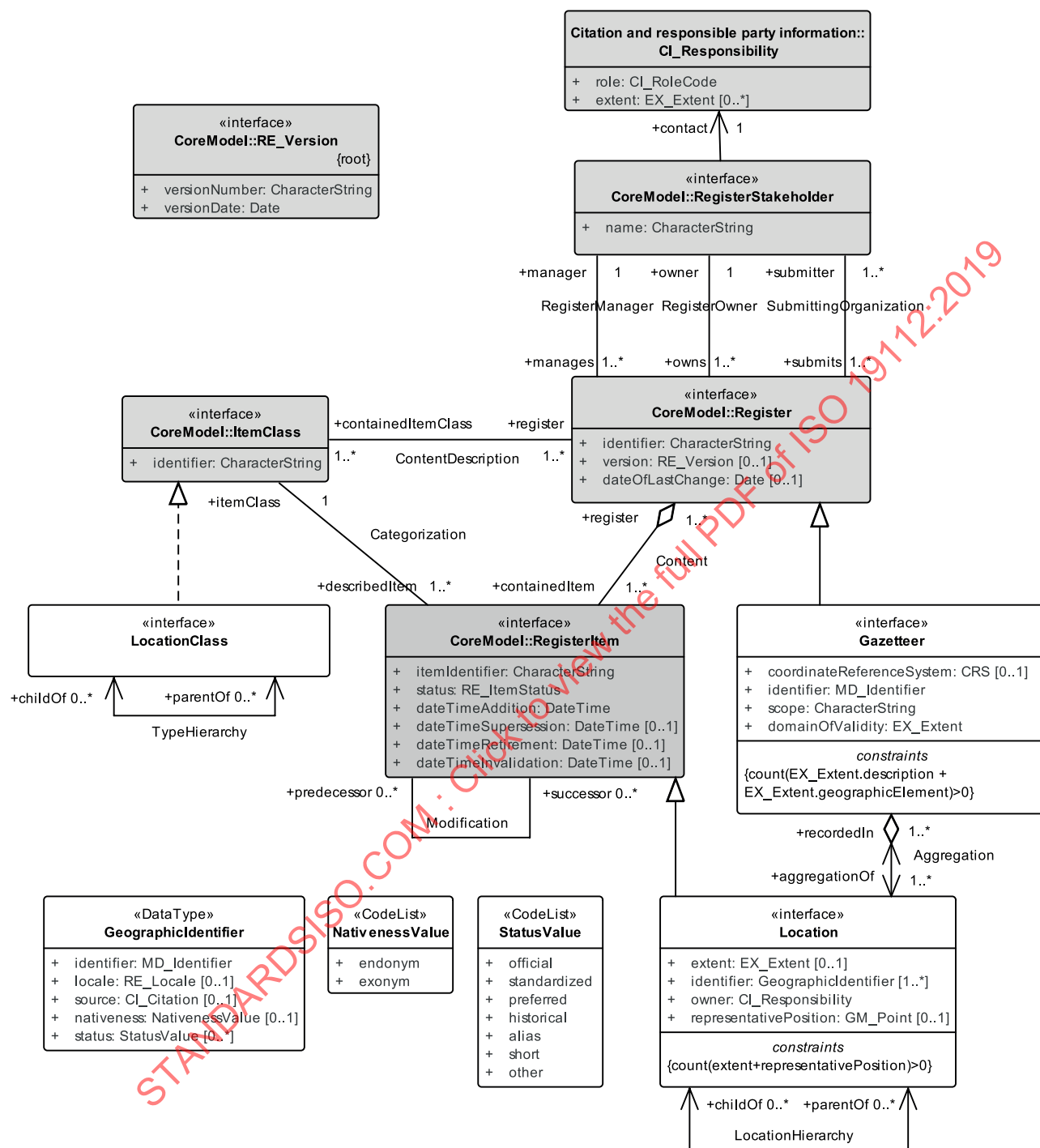


Figure 3 — Conceptual schema — Gazetteer

- Requirement 2 A gazetteer shall conform to the schema (presented in UML) that is illustrated in [Figure 3](#) and specified in [7.3](#), [7.4](#) and [7.5](#) of this document.
[Requirement identifier <<http://standards.iso211.org/19112/-1/2/req/gaz/sch>>]
- Requirement 3 A gazetteer shall be managed in accordance with Requirements 1 to 23 in ISO 19135-1:2015.
[Requirement identifier <<http://standards.iso211.org/19112/-1/2/req/gaz/mng>>]

7.3 Object Type: Gazetteer

The characteristics of object type Gazetteer are specified in [Table 7](#).

Table 7 — Object Type Gazetteer

Gazetteer	
Definition: register of instances of a class or classes of features containing some information regarding position Note 1 to entry: The positional information need not be coordinates, but could be descriptive.	
Subtype of: Register (from ISO 19135-1:2015, 7.2.2)	
Type: Object Type	
Attribute:	
Name:	coordinateReferenceSystem
Definition:	name of the coordinate reference system used for describing position
Multiplicity:	0..1
Value type:	CRS (ISO 19111:2007 8.3)
Attribute:	
Name:	identifier
Definition:	name of the gazetteer
Multiplicity:	1
Value type:	MD_Identifier (ISO 19115-1:2014, B.17.2)
Attribute:	
Name:	scope
Definition:	description of the Location classes contained in the gazetteer
Multiplicity:	1
Value type:	CharacterString
Attribute:	
Name:	domainOfValidity
Definition:	domain covered by the gazetteer
Multiplicity:	1
Value type:	EX_Extent (ISO 19115-1:2014, 6.6.1)
Constraint:	domainOfValidity shall contain at least one of description and geographicElement
Association role:	
Name:	aggregationOf
Definition:	instances of Location which form the gazetteer
Multiplicity:	1..*
Value type:	Location (7.4)

7.4 Object Type: Location

The characteristics of object type Location are specified in [Table 8](#).

Table 8 — Object Type Location

Location	
Definition: identifiable geographic place	
Type: Object Type	
Subtype of: RegisterItem (from ISO 19135-1:2015, 7.5.2)	
Attribute:	
Name:	extent
Definition:	spatial and temporal extent of the location
Multiplicity:	0..1
Constraint:	Either an extent or a representativePosition shall be present
Value type:	EX_Extent (ISO 19115-1:2014, 6.6.1)
Attribute:	
Name:	identifier
Definition:	identifier of the location
Multiplicity:	1..*
Value type:	GeographicIdentifier (7.5)
Attribute:	
Name:	owner
Definition:	name of the organization with responsibility for the existence of the location
Multiplicity:	1
Value type:	CI_Responsibility (ISO 19115-1:2014, B.16.1)
Attribute:	
Name:	representativePosition
Definition:	point within the extent of the Location
Multiplicity:	0..1
Constraint:	Either an extent or a representativePosition shall be present
Value type:	GM_Point (ISO 19107:2003, 6.3.11)
Association role:	
Name:	recordedIn
Definition:	gazetteer containing this location
Multiplicity:	1..*
Value type:	Gazetteer (7.3)
Association role:	
Name:	childOf
Definition:	Location of which this Location forms part
Multiplicity:	0..*
Value type:	Location (7.4)

Table 8 (continued)

Association role:	
Name:	parentOf
Definition:	Location which forms part of this Location
Multiplicity:	0..*
Value type:	Location (7.4)

7.5 Object Type: GeographicIdentifier

The characteristics of object type GeographicIdentifier are specified in [Table 9](#).

Table 9 — Object Type GeographicIdentifier

GeographicIdentifier		
Definition:		
Spatial reference in the form of a label or code that identifies a location		
Type:		
Object Type		
Attribute:		
Name:	identifier	
Definition:	name or label for the geographic identifier	
Multiplicity:	1	
Value type:	MD_Identifier (ISO 19115-1:2014, B.17.2)	
Attribute:		
Name:	locale	
Definition:	set of parameters that specify the cultural and linguistic environment	
	NOTE: The locale provides information about the language in which the identifier is recorded e.g. “Welsh”.	
Multiplicity:	0...1	
Value type:	RE_Locale (ISO 19135-1:2015, B.2.2.3)	
Attribute:		
Name:	source	
Definition:	origin of the identifier	
Multiplicity:	0...1	
Value type:	CI_Citation (ISO 19115-1:2014, B.16)	
Attribute:		
Name:	nativeness	
Definition:	relationship of identifier to the local language	
Multiplicity:	0...1	
Value type:	NativenessValue	
Values:	endonym	name is in an official or well-established language occurring in that area where the geographical feature is located
	exonym	name is in a specific language situated outside the area where that language is widely spoken, and differing in its form from the name used in an official or well-established language of that area where the geographical feature is located

Table 9 (continued)

Attribute:		
Name:	status	
Definition:	degree of credibility of identifier	
Multiplicity:	0...*	
Value type:	StatusValue	
Values:	official	identifier is in current use and officially approved or established by legislation
	standardized	identifier is in current use and accepted or recommended by a body assigned advisory function or power of decision in matters of toponymy
	preferred	identifier is the recommended one where there is no official one
	historical	identifier is not in current use
	alias	identifier is not the official one, but an equivalent
	short	identifier is an abbreviation of the official one
	other	identifier is current, but none of the other types

Annex A (normative)

Abstract test suites

A.1 Spatial reference system using geographic identifiers

Test identifier	< http://standards.iso.org/19112/-1/2/conf/srs/srs >
Test purpose	Verify that the spatial reference system using identifiers includes the minimum content specified by the schema in 6.2 to 6.4 of this document.
Test method	Inspect the spatial reference system using geographic identifiers to ensure it includes all mandatory elements of information required by this document.
Reference	Clause 6 , Requirement 1
Test type	Basic

A.2 Gazetteer

A.2.1 Gazetteer schema

Test identifier	< http://standards.iso.org/19112/-1/2/conf/gaz/sch >
Test purpose	Verify that the gazetteer includes the minimum content specified by the schema in 7.2 to 7.5 of this document.
Test method	Inspect each of a sample of entries in the gazetteer to ensure that they include all mandatory elements of information required by this document.
Reference	Clause 7 , Requirement 2
Test type	Basic

A.2.2 Gazetteer management

Test identifier	< http://standards.iso.org/19112/-1/2/conf/gaz/mng >
Test purpose	Verify that the gazetteer has a management system that conforms with Requirements 1 to 23 of ISO 19135-1:2015.
Test method	Request information about the gazetteer from the gazetteer manager.
Reference	Clause 7 , Requirement 3
Test type	Basic

Annex B (informative)

Example spatial reference systems using geographic identifiers

B.1 UK street addressing

The UK street addressing spatial reference system is described in [Table B.1](#).

Table B.1 — UK street addressing spatial reference system

Attribute	Value
domain of validity	UK
identifier	UK Street addressing
owner	National Address Gazetteer
theme	UK street addressing
location classes	Administrative area Town Locality Street Property

B.2 Denmark road network

The Denmark Road Network Referencing system is described in [Table B.2](#).

Table B.2 — Denmark Road Network Referencing System

Attribute	Value
domain of validity	DK
identifier	Road Network Referencing Model
owner	SDFE/VD/KL (SDFE: Agency for Data Supply and Efficiency, VD: Danish Road Directorate, KL: Local Government Denmark)
theme	DK road network referencing
location classes	Road Link Sequence Road Link Road Node Road Name Administrative Road Reference

The Denmark Road Network Referencing Model consists of two parts:

- a) The Reference Network: the basic network consisting of nodes and edges.
- b) Reference Lines: "strings" drawn across the reference network. The geometry of the reference lines is derived from the mapping, which is established from the reference net.

A reference line is an identifier of a road segment. When a road segment is assigned to a reference line, it will never change. The reference lines are persistent over time, and will be unaffected by changes to the geometry which will not affect the reference identifiers.

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Annex C (informative)

Examples of gazetteer data

This annex gives an example of a gazetteer, and an entry therein. [Table C.1](#) shows the properties of a gazetteer.

Table C.1 — Example gazetteer properties

Attribute	Value
coordinate reference system	National Grid of Great Britain
identifier	National Land and Property Gazetteer
scope	Land and Property Units
domain of validity	Great Britain
aggregationOf	Property

[Table C.2](#) gives an example of a property record in a gazetteer for a sub-type of Location, Property.

Table C.2 — Example property record

Attribute	Value
extent	54626 25973 54629 25970 54631 25974 54627 25976
identifier	1 Church Street, Cambridge
owner	Cambridge City Council
representative position	54628 25973
parent	Church House
child	Flat 1