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**Geographic information — Conformance  
and testing**

*Information géographique — Conformité et essais*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 19105 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

Annex A forms a normative part of this International Standard. Annex B is for information only.

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## Introduction

The scope of ISO/TC 211 is standardization in the field of digital geographic information. This work aims at establishing a structured set of International Standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth. These International Standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analysing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations. The work will be linked to appropriate International Standards for information technology and data, where possible, and provide a framework for the development of sector-specific applications using geographic data.

This International Standard provides the framework, concepts, and methodology for testing and the criteria to be achieved to claim conformance to this family of International Standards. This International Standard is based in part on ISO 9646-1 which describes conformance and testing in Open Systems Interconnection (OSI), ISO 10303-31 which describes conformance and testing in industrial automation systems and integration, and ISO 10641 which describes conformance and testing for computer graphics and image processing. While the framework of conformance testing described in these three International Standards is used in this International Standard, some concepts have been modified for use in this particular domain.

The objective of standardization in the field of digital geographic information cannot be completely achieved unless data and systems can be tested to determine whether they conform to the relevant geographic information standards. Conformance testing is the testing of a candidate product for the existence of specific characteristics required by an International Standard in order to determine the extent to which that product is a conforming implementation. It involves testing the capabilities of an implementation against both the conformance requirements in the relevant International Standard(s) and the statement of the implementation's capabilities.

A framework of an abstract test suite (ATS) is standardized for relevant standards in ISO/TC 211. The standardization of ATS requires international definition and acceptance of a common test methodology, together with appropriate test methods and procedures. The purpose of this International Standard is to define this methodology, to provide a framework for specifying ATS, and to define the procedures to be followed during conformance testing.

Test methods are also addressed in this International Standard; however, any organization contemplating the use of test methods defined in this International Standard should carefully consider the constraints on their applicability. Conformance testing does not include robustness testing, acceptance testing and performance testing, because the geographic information family of standards does not establish requirements for these areas.

The main body of this International Standard is structured as follows. The general framework of conformance including the definition of a conforming implementation appears in clause 5. Conformance testing methodology is described in clause 6. The possible test methods for testing conformance to the ISO geographic information standards are discussed in clause 7. The relationship between ATS and ETS is presented in clause 8. The bibliography on conformance testing is given at the end. Guidelines for writing conformance clauses and associated templates are provided in annex A.

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# Geographic information — Conformance and testing

## 1 Scope

This International Standard specifies the framework, concepts and methodology for testing and criteria to be achieved to claim conformance to the family of ISO geographic information standards. It provides a framework for specifying abstract test suites (ATS) and for defining the procedures to be followed during conformance testing. Conformance may be claimed for data or software products or services or by specifications including any profile or functional standard.

Standardization of test methods and criteria for conformance to geographic information standards will allow verification of conformance to those standards. Verifiable conformance is important to geographic information users, in order to achieve data transfer and sharing.

This International Standard is applicable to all the phases of conformance and testing. These phases are characterized by the following major activities:

- a) the definition of ATS for conformance to the ISO geographic information standards;
- b) the definition of test methods for conformance to the ISO geographic information standards;
- c) the conformance assessment process carried out by a testing laboratory for a client, culminating in the production of a conformance test report.

This International Standard specifies the requirements for, and gives guidance on, the procedures to be followed in conformance testing for the ISO geographic information standards. It includes only such information as is necessary to meet the following objectives:

- 1) to achieve confidence in the tests as a measure of conformance;
- 2) to achieve comparability between the results of corresponding tests applied in different places at different times;
- 3) to facilitate communication between the parties responsible for the activities described in 1) and 2).

This International Standard provides a framework for certification (an administrative procedure which may follow conformance testing) in informative annex B.

The following topics are outside the scope of this International Standard.

- a) The description of requirements for procurement and contracts.
- b) Testing by means of test methods which are specific to particular applications or systems.
- c) Acceptance testing, performance testing and robustness testing.

The framework established by this International Standard includes the concept of executable test suites (ETS). These, by their very nature, cannot be standardized; consequently, standardization of ETS is outside the scope of this International Standard.

## 2 Conformance

### 2.1 Conformance requirements

This International Standard defines two classes of conformance: class A and class B. Class A concerns conformance of specifications, including any profile or functional standard, with the series of ISO geographic information standards as a whole. Class B concerns conformance of conformance clauses as defined by this International Standard. Further requirements for conformance of profiles in addition to class A are given in ISO 19106.

NOTE Conformance is defined in annex A.

### 2.2 Abstract test suite

#### 2.2.1 Test case for conformance class A

- a) Test purpose: verify conformance with the ISO geographic information standards.
- b) Test method: manually check that all specifications, including profiles and functional standards, claiming conformance to the ISO geographic information standards have a conformance clause. This conformance clause shall not exclude conformance with any of the ISO geographic information standards. Conformance testing shall be performed in accordance with clause 6. The test method used shall be in accordance with clause 7.
- c) Reference: ISO 19105
- d) test type: capability test

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#### 2.2.2 Test case for conformance class B

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- a) Test purpose: verify that the conformance clause is written in a correct format.
- b) Test method: manually check if the conformance clause is written according to normative annex A.
- c) Reference: ISO 19105:2000, annex A.
- d) Test type: capability test.

## 3 Terms and definitions

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

### 3.1

#### **abstract test case**

generalized test for a particular requirement

NOTE An abstract test case is a formal basis for deriving executable test cases. One or more test purposes are encapsulated in the abstract test case. An abstract test case is independent of both the implementation and the values. It should be complete in the sense that it is sufficient to enable a test verdict to be assigned unambiguously to each potentially observable test outcome (i.e. sequence of test events).

### 3.2

#### **abstract test method**

method for testing implementation independent of any particular test procedure



**3.3****abstract test module**

set of related abstract test cases

NOTE Abstract test modules may be nested in a hierarchical way.

**3.4****ATS****abstract test suite**

abstract test module specifying all the requirements to be satisfied for conformance

NOTE Abstract test suites are described in a conformance clause.

**3.5****acceptance testing**

(user) process of determining whether an implementation satisfies acceptance criteria and enables the user to determine whether to accept the implementation

NOTE 1 This includes the planning and execution of several kinds of tests (e.g. functional, volume, performance tests) that demonstrate that the implementation satisfies the user requirements.

NOTE 2 This is not a part of conformance testing.

**3.6****basic test**

initial capability test intended to identify clear cases of non-conformance

**3.7****capability test**

test designed to determine whether an IUT conforms to a particular characteristic of an International Standard as described in the test purpose

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**3.8****conformance**

fulfilment of specified requirements

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**3.9****conformance assessment process**

process for assessing the conformance of an implementation to an International Standard

**3.10****conformance clause**

clause defining what is necessary in order to meet the requirements of the International Standard

**3.11****conformance testing**

testing of a product to determine the extent to which the product is a conforming implementation

**3.12****conformance test report**

summary of the conformance to the International Standard as well as all the details of the testing that supports the given overall summary

**3.13****conforming implementation**

implementation which satisfies the requirements

**3.14****executable test case**

specific test of an implementation to meet particular requirements

NOTE Instantiation of an abstract test case with values.

**3.15**

**ETS**

**executable test suite**

set of executable test cases

**3.16**

**fail verdict**

test verdict of non-conformance

NOTE Non-conformance may be with respect to either the test purpose or at least one of the conformance requirements of the relevant standard(s).

**3.17**

**falsification test**

test to find errors in the implementation

NOTE If errors are found, one can correctly deduce that the implementation does not conform to the International Standard; however, the absence of errors does not necessarily imply the converse. The falsification test can only demonstrate non-conformance. Compare with the verification test. Due to technical and economic problems, in most cases, the falsification test is adopted as a test method for conformance testing.

**3.18**

**implementation**

realization of a specification

NOTE In the context of the ISO geographic information standards, this includes specifications of geographic information services and datasets.

**3.19**

**ICS**

**Implementation Conformance Statement**

statement of specification options that have been implemented

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**3.20**

**IXIT**

**Implementation eXtra Information for Testing**

statement containing all of the information related to the IUT and its corresponding SUT which will enable the testing laboratory to run an appropriate test suite against that IUT

NOTE IXIT typically provides the details on the organization and storage of concepts in the SUT as well as on the means of access to and modification of the SUT.

**3.21**

**inconclusive verdict**

test verdict when neither a pass verdict nor a fail verdict apply

**3.22**

**non-conformance**

failure to fulfil one or more specified requirements

**3.23**

**pass verdict**

test verdict of conformance

**3.24**

**performance testing**

measurement of the performance characteristics of an Implementation Under Test (IUT), such as its throughput, responsiveness, etc., under various conditions

NOTE This is not a part of conformance testing.

**3.25****robustness testing**

process of determining how well an IUT processes data which contains errors

NOTE This is not a part of conformance testing.

**3.26****SUT****System Under Test**

computer hardware, software and communication network required to support IUT

**3.27****testing laboratory**

organization that carries out the conformance assessment process

**3.28****verification test**

test developed to prove rigorously whether an IUT is correct

**4 Abbreviated terms**

For the purposes of this International Standard, the following abbreviations apply.

ATS: Abstract Test Suite

ETS: Executable Test Suite

ICS: Implementation Conformance Statement

IUT: Implementation Under Test

IXIT: Implementation eXtra Information for Testing

SUT: System Under Test

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**5 General framework of conformance****5.1 Introduction**

In the context of the ISO geographic information standards, an implementation exhibits conformance if it complies with the conformance requirements of the applicable ISO geographic information standards. The conformance requirements are stated in the conformance clause of each International Standard.

**5.2 Conformance clause**

All testable ISO geographic information standards contain a conformance clause. This clause specifies all the requirements that shall be satisfied to claim conformance to that International Standard. The conformance clause serves as an entry point for conformance testing.

The requirements for conformance clauses are given in annex A.

**5.3 Conformance requirements**

Conformance requirements may be classified as

a) **mandatory requirements:** these shall be observed in all cases;