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Road vehicles — Open Test sequence eXchange format (OTX) —

Part 2: Core data model specification and requirements

Véhicules routiers — Format public d'échange de séquence-tests (OTX) —

Partie 2: Exigences et spécifications du modèle de données central

Reference number
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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.

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).

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.

This document was prepared by Technical Committee ISO/TC 22, Road vehicles, Subcommittee SC 31, Data communication.

This second edition cancels and replaces the first edition (ISO 13209-2:2012), which has been technically revised.

The main changes are as follows:

— introduction of new extension interfaces, e.g. for procedure realisations, compound nodes, and **`NamedAndSpecified;`**

— made **`ForEachLoop`** more convenient;

— new terms added (e.g. **`RoundToNearest`**);

— introduction of **`MutexLock;`**

— added new checker rules;

— deprecated **`TerminateLanes`** node.

A list of all parts in the ISO 13209 series can be found on the ISO website.

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.

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Introduction

Diagnostic test sequences are utilized whenever automotive components or functions with diagnostic abilities are being diagnosed, tested, reprogrammed or initialized by off-board test equipment. Test sequences define the succession of interactions between the user (i.e. workshop or assembly line staff), the diagnostic application (the test equipment) and the vehicle communication interface as well as any calculations and decisions that have to be carried out. Test sequences provide a means to define interactive, guided diagnostics or similar test logic.

Today, the automotive industry mainly relies on paper documentation and/or proprietary authoring environmments to document and to implement such test sequences for a specific test application. An author who is setting up engineering, assembly line or service diagnostic test applications needs to implement the required test sequences manually, supported by non-uniform test sequence documentation, most likely using different authoring applications and formats for each specific test application. This redundant effort can be greatly reduced if processes and tools support the OTX concept.

The ISO 13209 series proposes an open and standardized format for the human- and machine-readable description of diagnostic test sequences. The format supports the requirements of transferring diagnostic test sequence logic uniformly between electronic system suppliers, vehicle manufacturers and service dealerships/repair shops.

This document represents the requirements and technical specification for the fundament of the OTX format, namely the “OTX core”. The core describes the basic structure underlying every OTX document. This comprises detailed data model definitions of all required control structures by which test sequence logic is described, but also definitions of the outer, enveloping document structure in which test sequence logic is embedded. To achieve extensibility the core also contains well-defined extension points that allow a separate definition of additional OTX features—without the need to change the core data model.

ISO 13209-3[2] extends the core by a set of additional features, using of the core extension mechanism (which may also be applied for proprietary extensions).

This document is the most generic and stand-alone part of the ISO 13209 series. In principle, it is also applicable in other areas for any sequential logic description, even outside the automotive domain. Automotive-specific features are, therefore, contained solely in ISO 13209-3[2].

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Road vehicles — Open Test sequence eXchange format (OTX) —

Part 2: Core data model specification and requirements

1 Scope

This document defines the OTX core requirements and data model specifications.

The requirements are derived from the use cases described in ISO 13209-1. They are listed in the requirements section.

The data model specification aims at an exhaustive definition of all OTX core features implemented to satisfy the core requirements. Since OTX is designed for describing test sequences, which themselves represent a kind of program, the core data model follows the basic concepts common to most programming languages.

Thus, this document establishes rules for syntactical entities like parameterised procedures, constant and variable declarations, data types, basic arithmetic, logic and string operations, flow control statements like loop, branch or return, simple statements like assignment or procedure call as well as exception handling mechanisms. Each of these syntactical entities is accompanied by semantic rules which determine how OTX documents are interpreted. The syntax rules are provided by UML class diagrams and XML schemas, whereas the semantics are given by UML activity diagrams and prose definitions.

With respect to documentation use cases, special attention is paid to defining a specification/realisation concept (which allows for "hybrid" test sequences: human readable test sequences that are at the same time machine-readable) and so-called floating comments (which can refer to more than one node of the sequence).

The core data model does not define any statements, expressions or data types that are dependent on a specific area of application.

For the convenience of the user, the ISO 13209-2 OTX XML schema definition file (XSD) is published alongside this document.

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 13209-1, *Road vehicles — Open Test sequence eXchange format (OTX) — Part 1: General information and use cases*

ISO 22901 (all parts), *Road vehicles — Open diagnostic data exchange (ODX)*

IEEE 754:2019, *IEEE Standard for Floating-Point Arithmetic*

RFC 2045, *Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies*

RFC 2046, *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*

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W3C XSD (all parts):2012, *W3C Recommendation: W3C XML Schema Definition Language (XSD) 1.1*

W3C XML:2008, *W3C Recommendation: Extensible Markup Language (XML) 1.0*

W3C XLink:2010, *W3C Recommendation: XML Linking Language (XLink) Version 1.1*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13209-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
attribute
<UML> property of a UML class

3.1.2
attribute
<XSD/XML> named property of an XSD complex type or an XML element

3.1.3
constant
identifier of a non-writable memory location

3.1.4
context
environmental circumstances which influence *test sequence* (3.1.11) execution

Note 1 to entry: OTX test sequences can be configured to behave differently according to different context situations. Contextual information depends on factors such as the particular vehicle that is currently attached to the test application (e.g. the current vehicle's model type, the engine type), on the test application settings (e.g. a setting controlling whether the test sequence shall run in debug mode) or on other factors such as whether the test sequence is running in a manufacturing or a service workshop environment, etc.

3.1.5
expression
syntactical construct which describes a specific computation with a set of arguments and a single return value

3.1.6
identification routine
method or software by which a diagnostic application identifies contextual information

3.1.7
procedure signature
description of the interface of an OTX procedure

3.1.8
reference
value which refers to data in memory

3.1.9
session
instance of *test sequence* (3.1.11) execution

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3.1.10
term
value described by and computed from an *expression* (3.1.5)

3.1.11
test sequence
test procedure (3.1.12) defining a full test

Note 1 to entry: A test sequence is also a procedure, but not all procedures are test sequences. In an OTX document, the procedure representing a test sequence shall be named "main". By using procedures, a test sequence may be split into several procedure modules. An adequately assembled set of frequently needed procedures may serve as a library which provides procedures that can be called from any other (client) procedure or test sequence.

3.1.12
test procedure
procedure
stand-alone, parameterisable flow of OTX actions that can be called from other OTX procedures

3.1.13
validity
named Boolean *expression* (3.1.5) used for activating/deactivating parts of the OTX *test sequences* (3.1.11) according to the current *context* (3.1.4) situation

Note 1 to entry: Parts of OTX test sequences which are marked with a validity name shall be executed only if the associated Boolean expression is true according to the current context situation.

3.1.14
variable
identifier of a writable memory location

Note 1 to entry: The term "variable" is used as a collective term for document scope variables, local variables, non-constant parameters and also items in non-constant lists or maps or other compound data structures. In OTX, these can be addressed by giving the identifier of the variable or parameter, optionally accompanied by a path into compound data structures which allows the inner parts of variables or parameters to be addressed.

3.2 Abbreviated terms

API	Application Programming Interface
IFD	Interface Definition (OTX extension)
JRE	Java Runtime Environment
NOP	No Operation Performed
OEM	Original Equipment Manufacturer
OTX	Open Test sequence eXchange
UML	Unified Modelling Language
XML	Extensible Markup Language
XSD	XML Schema Definition

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