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

**Part 3:
Standard extensions and requirements**

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

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Partie 3: Exigences et spécifications des extensions du standard

ISO 13209-3:2012

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Published in Switzerland

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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 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 13209-3 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 13209 consists of the following parts, under the general title *Road vehicles — Open Test sequence eXchange format (OTX)*:

— *Part 1: General information and use cases*

[ISO 13209-3:2012](#)

— *Part 2: Core data model specification and requirements*

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— *Part 3: Standard extensions and requirements*

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Introduction

Diagnostic test sequences are utilized whenever automotive components or functions with diagnostic abilities are being diagnosed, tested, reprogrammed or initialised 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 environments 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.

ISO 13209 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.

ISO 13209-2 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.

This part of ISO 13209 extends the Core by a set of additional features, using the extension mechanism rules described in ISO 13209-2. The extensions defined herein comprise features which allow diagnostic communication to a vehicle's diagnostic interface, flashing, executing diagnostic jobs, controlling measurement equipment, internationalisation, working with physical units, accessing the environment, communication via a human machine interface (HMI) and other utility extensions.

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

Part 3: Standard extensions and requirements

1 Scope

This part of ISO 13209 defines the Open Test sequence eXchange (OTX) extension requirements and data model specifications.

The requirements are derived from the use cases described in ISO 13209-1. They are listed in Clause 4.

The data model specification aims at an exhaustive definition of all features of the OTX extensions which have been implemented to satisfy the requirements. This part of ISO 13209 establishes rules for the syntactical entities of each extension. Each of these syntactical entities is accompanied by semantic rules which determine how OTX documents containing extension features are to be 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.

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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.

ISO/IEC 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*

ISO 8601:2004, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO/IEC 8859-1:1998, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*

ISO/IEC 10646, *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*

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

ISO/IEC 13209-2, *Road vehicles — Open Test sequence eXchange format (OTX) — Part 2: Core data model specification and requirements*

ISO/IEC 19501:2005, *Information technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

ISO 14229 (all parts), *Road vehicles — Unified diagnostic services (UDS)*

ISO 22900 (all parts), *Road vehicles — Modular vehicle communication interface (MVC/I)*

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

RFC 1866, *Hypertext Markup Language - 2.0*

SAE J1979, *E/E Diagnostic Test Modes*

W3C XPtr:2003, *W3C Recommendation: XPointer Framework (all parts)*

W3C XLink:2001, *W3C Recommendation: XML Linking Language (XLink) Version 1.0*

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

W3C XMLNS:2009, *W3C Recommendation: Namespaces in XML 1.0 (Third Edition)*

W3C XSD:2004, *W3C Recommendation: XML Schema (all parts)*

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, ISO 13209-2 and the following apply.

3.1.1 custom screen

screen with attributes and fields defined by a test sequence author

3.1.2 dialog

screen with predefined attributes and fields which can be set or read from an ODX sequence

3.1.3 ECOS measurement device

widely-used embedded system for testing electrical consumer's current and voltage curves

3.1.4 modal dialog

dialog which is blocking the flow execution until the user dismisses it

3.1.5 non-modal screen

asynchronous, non-blocking screen which is still displayed while the test sequence execution continues

3.1.6 tester

computer system attached to a vehicle via a Vehicle Communication Interface, running a diagnostic application

3.1.7 text ID

string reference to a thesaurus data base entry containing localized string translations

3.2 Abbreviated terms

API Application Programming Interface

DTC Diagnostic Trouble Code

ECOS	Electric Check-Out System
ECU	Electronic Control Unit
GUI	Graphical User Interface
HMI	Human Machine Interface
IFD	Interface Definition (OTX extension)
NOP	No Operation Performed
OEM	Original Equipment Manufacturer
OTX	Open Test sequence eXchange
PDU	Protocol Data Unit
UI	User Interface
UML	Unified Modeling Language
VCI	Vehicle Communication Interface
XML	Extensible Markup Language
XSD	XML Schema Definition

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4 Requirements

4.1 Basic principles for requirements definition

Basic principles have been established as a guideline to define the OTX requirements:

- a) OTX requirements specify the conditions that the OTX data model and format shall satisfy.
- b) All stakeholders (System Suppliers, OEMs, Tool Suppliers), which offer diagnostic test procedures are expected to implement and follow the requirements of this standard.

The content of OTX documents and the quality of the information is the responsibility of the originator.

4.2 Requirement priorities

Each of the following requirements carries a priority-attribute which can be set to SHALL or SHOULD.

— SHALL:

The requirement represents stakeholder-defined characteristics the absence of which will result in a deficiency that cannot be compensated by other means.

— SHOULD:

If the requirement defined characteristic is not or not fully implemented in the data model, it does not result in a deficiency, because other features in the data model can be used to circumvent this.

4.3 Requirement listing

Extensions_R01 – Read current date and time

Priority: SHALL

Rationale: It shall be possible to retrieve the current date and time.

Description: The current date and time shall be accessible in a way appropriate for calculating durations between two dates but also for generating a human readable form of a date.

Extensions_R02 – Support but not require ODX

Priority: SHALL

Rationale: For communication with vehicle ECUs, the usage of ODX shall be supported but not forced.

Description: Any vehicle communication related extension data model shall match to a useful subset of the functionality of ODX.

Extensions_R03 – Handle flash sessions

Priority: SHALL

Rationale: Functionality shall be provided to browse and select flash sessions.

Description: A extension for flashing shall provide the possibility to select by direction and name.

Extensions_R04 – Low level flash data access [ISO 13209-3:2012](https://standards.iteh.ai/catalog/standards/sist/a303059e-292c-450c-808c-bd0a73348de3/iso-13209-3-2012)

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Priority: SHALL

Rationale: Functionality shall be provided for browsing and selecting data from the flash environment (download container).

Description: The data shall be clustered in blocks and segments. Security functions, used by modern data formats like ODX Flash shall be supported.

Extensions _R05 – Flash data storage

Priority: SHALL

Rationale: Uploaded flash data shall be stored in local storage.

Description: For flash data upload, an OTX extension for flashing shall provide functionality to store in a selected format.

Extensions _R06 – Enable developer to use OTX in place of ODX Java Jobs

Priority: SHALL

Rationale: Functionality shall be provided to emulate ODX Java Jobs by OTX sequences.

Description: A job extension shall enable developers to run OTX sequences as ODX Java Jobs. SingleEcuJob, SecurityAccessJob and FlashJob shall be supported.

Extensions _R07 – Provide means for diagnostic communication with vehicle ECUs**Priority:** SHALL**Rationale:** Functionality shall be provided for diagnostic communication with a vehicle's ECU systems.**Description:** There shall be an OTX extension which allows configuring and executing diagnostic services of vehicle ECUs. It shall be possible establish a communication channel to a particular ECU, to configure request parameters of a diagnostic service which is sent to the ECU and to analyze the response parameters of the ECU. The description of communication channels, diagnostic services and parameters shall happen in a human-readable and symbolic way; any existing diagnostic symbolic-to-binary mapping (e.g. ODX) shall be supported. The actual functionality for sending a diagnostic service and receiving shall be provided through an interface between test sequence and vehicle (e.g. MCD 3D API and MVCI).**Extensions _R08 – Provide means to browse diagnostic data****Priority:** SHALL**Rationale:** Functionality shall be provided to read information from the static diagnostic data base of a diagnostic application.**Description:** An OTX extension shall be provided which allows reading static information from a diagnostic data base, like e.g. available communication channels, diagnostic services for a communication channel or parameters for a diagnostic service.

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Extensions _R09 – Enable developer to handle events**Priority:** SHALL**Rationale:** Functionality shall be provided which allows for an OTX test sequence to react on a well-defined set of events.**Description:** An OTX extension shall enable developers to configure a test sequence so that it can wait for certain events to happen (e.g. when a timer expires, a variable value changes or user input is received from the UI, etc.). There shall be a way to get further information about an event, e.g. what kind of event it is, and additional information about a particular event.**Extensions _R10 – Provide means for human machine interface functionality****Priority:** SHALL**Rationale:** Functionality shall be provided which allows OTX test sequences to communicate with a user in a bidirectional way.**Description:** An OTX extension is required which allows sending and receiving information to and from a user interface (e.g. a GUI window with input controls). The extension shall not provide means for explicitly configuring the graphical layout of the information; instead it shall only provide a bidirectional interface for the communicated data itself.**Extensions _R11 – Enable developer to configure localized test sequences****Priority:** SHALL**Rationale:** A test sequence developer shall be supported in configuring OTX test sequences which are prepared for translation to different languages.**Description:** An OTX extension is required which allows the developer to access a thesaurus data base via a text ID concept. The developer shall be supported by functionality which translates text IDs into the language

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configured for the runtime system or to other languages (as far as known by the runtime system). The thesaurus data base itself shall not be part of the standard. A generic approach shall support different kinds of thesaurus data bases.

Extensions _R12 – Provide means for logging

Priority: SHALL

Rationale: It shall be possible to write log messages to a logging resource.

Description: An OTX extension is required which allows writing log messages to a logging resource; messages shall be filterable according to severity.

Extensions _R13 – Support measurement equipment

Priority: SHALL

Rationale: Measurement equipment in manufacturing and after sales workshops shall be accessible via appropriate functionality.

Description: An OTX extension is required which allows receiving measurement values from measurement equipment. There shall be an abstraction layer which allows using any kind of measurement equipment.

Extensions _R14 – Support physical units

Priority: SHALL

Rationale: Functionality is required which allows the handling of physical values with units

Description: An OTX extension is required which allows describing physical quantities. The extension shall facilitate common calculations done on such physical quantities, like e.g. the transformation of a physical value from one unit-system to another (e.g. representing a distance by kilometres or miles, etc.). It shall also allow basic mathematical operations on quantities without requiring the developer to explicitly care for the unit (e.g. it shall be possible to calculate 10 m + 2 km directly).

Extensions _R15 – Support for enhanced string operations

Priority: SHALL

Rationale: The OTX Core string operations shall be extended by additional commonly used string operations.

Description: An OTX extension is required which describes additional string operations which shall facilitate calculations on string values.

Extensions _R16 – Support of basic mathematical functions

Priority: SHALL

Rationale: The arithmetic operations of the OTX Core shall be extended by additional mathematical functions.

Description: An OTX extension is required which describes a set of additional mathematical functions which are needed in some diagnostic applications (like e.g. trigonometric and logarithmic functions, etc.).

5 Extension overview

5.1 General

This document represents the specification of the OTX standard extensions for data model version "1.0.0".

5.2 Dependencies

Figure 1 shows a UML package diagram [ISO/IEC 19501] describing the full set of OTX extensions (together with the OTX Core) and the import dependencies in between them. OTX extensions use or extend types defined in the OTX Core. Therefore, all of the extensions are (directly or indirectly) based on the OTX Core data model, as specified by Part 2 of ISO 13209. Aside of the OTX Core, the OTX EventHandling, OTX DiagCom and OTX Quantities extensions also play a central role; types defined there are used or extended by other OTX extensions.

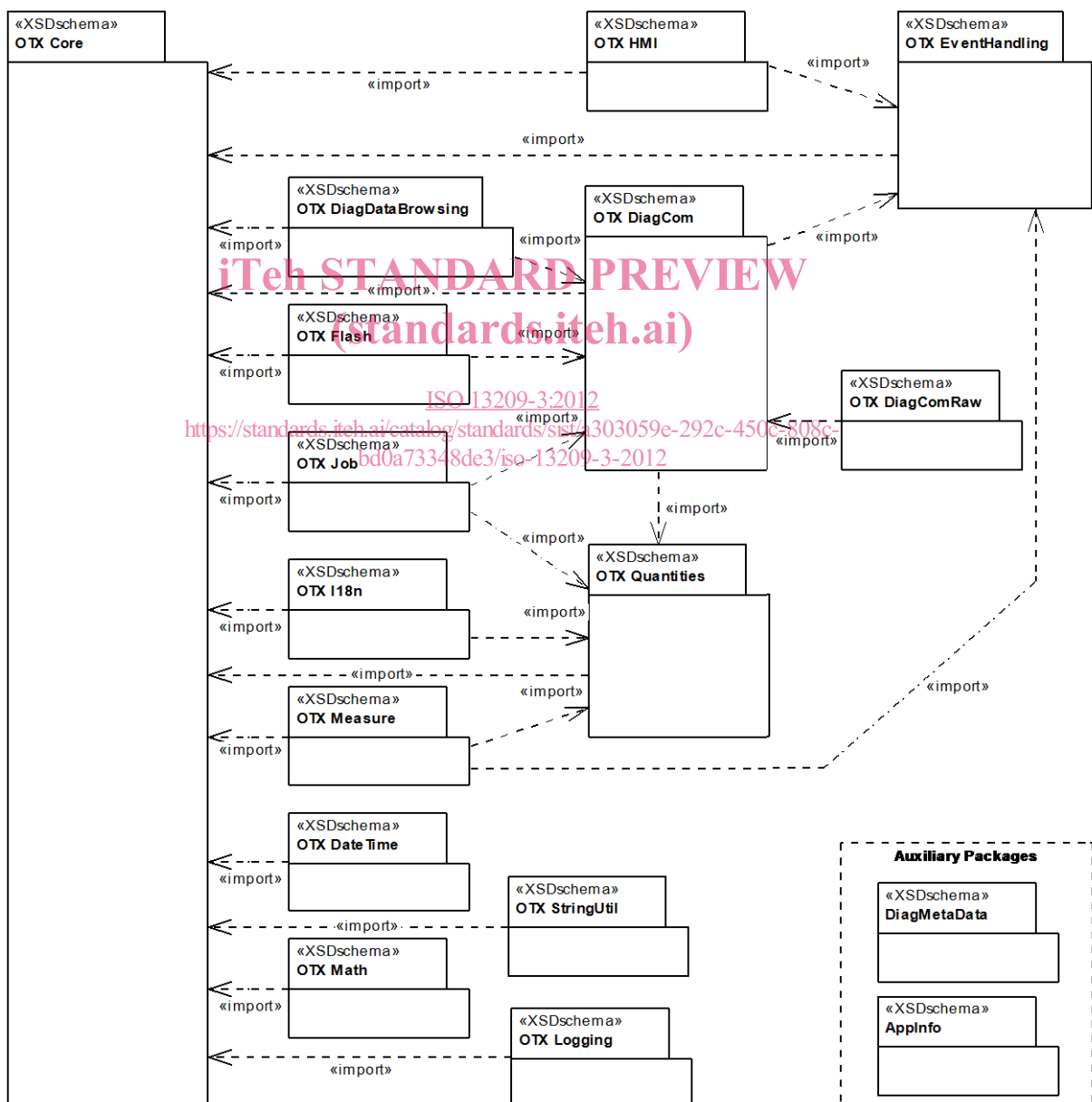


Figure 1 — Overview: OTX schema dependencies