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

**Part 3:
Standard extensions and
requirements**

*Véhicules routiers — Format public d'échange de séquence-tests
(OTX) —
Partie 3: Exigences et spécifications des extensions du standard*

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Contents

	Page
Foreword.....	viii
Introduction.....	ix
1 Scope.....	1
2 Normative references.....	1
3 Terms, definitions and abbreviated terms.....	1
3.1 Terms and definitions.....	1
3.2 Abbreviated terms.....	2
4 Requirements and recommendations.....	3
4.1 Basic principles for requirements and recommendations definition.....	3
4.2 Entries priorities.....	3
4.3 Requirement listing.....	3
5 Extension overview.....	6
5.1 General.....	6
5.2 Dependencies.....	6
5.3 Basic characteristics of the OTX extensions.....	8
6 OTX DateTime extension.....	9
6.1 General.....	9
6.2 Terms.....	9
6.2.1 Overview.....	9
6.2.2 Syntax.....	9
6.2.3 Semantics.....	10
7 OTX DiagCom extension.....	12
7.1 General.....	12
7.2 General considerations.....	13
7.2.1 Communication channels.....	13
7.2.2 Diagnostic services.....	13
7.2.3 Diagnostic communication patterns.....	15
7.2.4 Special-purpose diagnostic data types.....	19
7.3 Data types.....	20
7.3.1 Overview.....	20
7.3.2 Syntax.....	20
7.3.3 Semantics.....	20
7.4 Exceptions.....	23
7.4.1 Overview.....	23
7.4.2 Syntax.....	23
7.4.3 Semantics.....	24
7.5 Variable access.....	25
7.5.1 Overview.....	25
7.5.2 Syntax.....	25
7.5.3 Semantics.....	26
7.6 Actions.....	26
7.6.1 Overview.....	26
7.6.2 ComChannel related actions.....	26
7.6.3 ComParameter related actions.....	28
7.6.4 DiagService related actions.....	29
7.7 Terms.....	40
7.7.1 Overview.....	40
7.7.2 ComChannel related terms.....	41
7.7.3 DiagService related terms.....	45
7.7.4 Request related terms.....	49
7.7.5 Result related terms.....	50
7.7.6 Response related terms.....	53

	7.7.7	Parameter related terms.....	55
	7.7.8	ComParam related terms.....	61
	7.7.9	Event related terms.....	64
8		OTX DiagDataBrowsing extension.....	65
	8.1	General.....	65
	8.2	Data types.....	66
	8.2.1	Overview.....	66
	8.2.2	Syntax.....	66
	8.2.3	Semantics.....	66
	8.3	Variable access.....	67
	8.3.1	Overview.....	67
	8.3.2	Syntax.....	67
	8.3.3	Semantics.....	67
	8.4	Terms.....	68
	8.4.1	Overview.....	68
	8.4.2	Syntax.....	68
	8.4.3	Semantics.....	68
9		OTX EventHandling extension.....	72
	9.1	General.....	72
	9.2	Data types.....	72
	9.2.1	Overview.....	72
	9.2.2	Syntax.....	73
	9.2.3	Semantics.....	73
	9.3	Variable access.....	74
	9.3.1	Overview.....	74
	9.3.2	Syntax.....	74
	9.3.3	Semantics.....	74
	9.4	Actions.....	74
	9.4.1	Overview.....	74
	9.4.2	Syntax.....	74
	9.4.3	Semantics.....	74
	9.4.4	Example.....	76
	9.5	Terms.....	76
	9.5.1	Overview.....	76
	9.5.2	Event terms.....	77
	9.5.3	Event source terms.....	78
	9.5.4	Event property terms.....	81
	9.5.5	Exception terms.....	83
10		OTX Flash extension.....	84
	10.1	General.....	84
	10.2	Data types.....	85
	10.2.1	Overview.....	85
	10.2.2	Syntax.....	85
	10.2.3	Semantics.....	86
	10.3	Exceptions.....	88
	10.3.1	Overview.....	88
	10.3.2	Syntax.....	88
	10.3.3	Semantics.....	88
	10.4	Variable access.....	88
	10.4.1	Overview.....	88
	10.4.2	Syntax.....	89
	10.4.3	Semantics.....	89
	10.5	Actions.....	89
	10.5.1	Overview.....	89
	10.5.2	Syntax.....	89
	10.5.3	Semantics.....	89
	10.5.4	Example.....	91

10.6	Terms.....	92
10.6.1	Overview.....	92
10.6.2	Flash job related terms.....	93
10.6.3	Flash session related terms.....	95
10.6.4	Flash block related terms.....	99
10.6.5	Flash block segment related terms.....	104
10.6.6	Security related terms.....	106
10.6.7	Own ident related terms.....	109
10.6.8	Enumeration related terms.....	110
11	OTX HMI extension.....	112
11.1	General.....	112
11.1.1	General considerations.....	112
11.1.2	Dialogs.....	113
11.1.3	Custom screens.....	113
11.1.4	Custom screen usage example.....	114
11.2	Data types.....	115
11.2.1	Overview.....	115
11.2.2	Syntax.....	115
11.2.3	Semantics.....	115
11.3	Exceptions.....	117
11.3.1	Overview.....	117
11.3.2	Syntax.....	117
11.3.3	Semantics.....	117
11.4	Variable access.....	118
11.4.1	Overview.....	118
11.4.2	Syntax.....	118
11.4.3	Semantics.....	118
11.5	Actions.....	118
11.5.1	Overview.....	118
11.5.2	Dialog related actions.....	119
11.5.3	Custom screen related actions.....	125
11.6	Terms.....	129
11.6.1	Overview.....	129
11.6.2	Syntax.....	130
11.6.3	Semantics.....	131
11.7	Signatures.....	134
11.7.1	Overview.....	134
11.7.2	Syntax.....	134
11.7.3	Semantics.....	134
12	OTX i18n extension.....	136
12.1	General.....	136
12.2	Data types.....	136
12.2.1	Overview.....	136
12.2.2	Syntax.....	136
12.2.3	Semantics.....	137
12.3	Exceptions.....	137
12.3.1	Overview.....	137
12.3.2	Syntax.....	137
12.3.3	Semantics.....	138
12.4	Variable access.....	138
12.4.1	Overview.....	138
12.4.2	Syntax.....	138
12.4.3	Semantics.....	139
12.5	Terms.....	139
12.5.1	Overview.....	139
12.5.2	Locale settings related terms.....	140
12.5.3	Translation related terms.....	141

	12.5.4	Quantity related terms	145
13		OTX Logging extension	147
	13.1	General	147
	13.2	Data types	148
	13.2.1	Overview	148
	13.2.2	Syntax	148
	13.2.3	Semantics	148
	13.3	Variable access	149
	13.3.1	Overview	149
	13.3.2	Syntax	149
	13.3.3	Semantics	149
	13.4	Actions	150
	13.4.1	Overview	150
	13.4.2	Syntax	150
	13.4.3	Semantics	150
	13.4.4	Example	151
	13.5	Terms	152
	13.5.1	Overview	152
	13.5.2	Syntax	152
	13.5.3	Semantics	152
14		OTX Math extension	153
	14.1	General	153
	14.2	Terms	154
	14.2.1	Overview	154
	14.2.2	Syntax	154
	14.2.3	Semantics	154
15		OTX Measure extension	156
	15.1	General	156
	15.2	Data types	157
	15.2.1	Overview	157
	15.2.2	Syntax	157
	15.2.3	Semantics	157
	15.3	Exceptions	157
	15.3.1	Overview	157
	15.3.2	Syntax	157
	15.3.3	Semantics	158
	15.4	Variable access	159
	15.4.1	Overview	159
	15.4.2	Syntax	159
	15.4.3	Semantics	159
	15.5	Signatures	159
	15.5.1	Overview	159
	15.5.2	Syntax	159
	15.5.3	Semantics	160
	15.6	Actions	161
	15.6.1	Overview	161
	15.6.2	Syntax	161
	15.6.3	Semantics	162
	15.7	Terms	164
	15.7.1	Overview	164
	15.7.2	Measurement related terms	165
	15.7.3	Event related terms	168
16		OTX quantities extension	169
	16.1	General	169
	16.2	Data types	172
	16.2.1	Overview	172

16.2.2	Syntax.....	172
16.2.3	Semantics.....	172
16.3	Exceptions.....	173
16.3.1	Overview.....	173
16.3.2	Syntax.....	173
16.3.3	Semantics.....	174
16.4	Variable access.....	174
16.4.1	Overview.....	174
16.4.2	Syntax.....	174
16.4.3	Semantics.....	175
16.5	Terms.....	175
16.5.1	Overview.....	175
16.5.2	Quantity and unit related terms.....	176
16.5.3	Overloading semantics.....	180
17	OTX StringUtil extension.....	182
17.1	General.....	182
17.2	Data types.....	182
17.2.1	Overview.....	182
17.2.2	Syntax.....	182
17.2.3	Semantics.....	182
17.3	Exceptions.....	183
17.3.1	Overview.....	183
17.3.2	Syntax.....	183
17.3.3	Semantics.....	184
17.4	Variable access.....	184
17.4.1	Overview.....	184
17.4.2	Syntax.....	184
17.4.3	Semantics.....	185
17.5	Terms.....	185
17.5.1	Overview.....	185
17.5.2	Syntax.....	185
17.5.3	Semantics.....	186
	Annex A (normative) Comprehensive checker rule listing.....	193
	Annex B (normative) OTX DiagCom extension data type mappings.....	197
	Annex C (normative) OTX DiagMetaData auxiliary for the OTX DiagCom extension.....	201
	Annex D (informative) OTX DiagComRaw extension for resource-restrained systems.....	206
	Annex E (informative) OTX job extension.....	217
	Bibliography.....	228

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 13209-3:2012), which has been technically revised.

The main changes are as follows:

- DiagMetaData: introduced `ComChannelGroup` and `EcuVariantGroup`;
- EventHandlering: introduced `CompositeEventSource`, `GetEventSourceFromEvent`, `IsEventHasException`;
- DiagCom: introduced `textIdTarget`, `GetParameterValueTextId`;
- added new checker rules.

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.

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 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.

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.

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 document 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.

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

Part 3: Standard extensions and requirements

1 Scope

This document 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 document 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.

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 639-1, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

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

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

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

W3C XLink, *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, ISO 13209-2 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

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 OTX 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 (3.1.2) 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

4 Requirements and recommendations

4.1 Basic principles for requirements and recommendations definition

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

- a) OTX requirements or recommendations 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 document.

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

4.2 Entries priorities

Each of the following requirements and recommendations 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 recommendations-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: A 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

Priority: SHALL

Rationale: A 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 a functionality to store in a selected format.

Extensions_R06 – Enable developer to use OTX in place of ODX Java jobs

Priority: SHALL

Rationale: A 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: A 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 to establish a communication channel to a particular ECU, to request parameters of a diagnostic service which is sent to the ECU and to analyse 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: A 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, e.g. available communication channels, diagnostic services for a communication channel or parameters for a diagnostic service.

Extensions_R09 – Enable developer to handle events

Priority: SHALL

Rationale: A 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). There shall be a way to get further information about an event, for example, 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: A 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 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: A 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, for example, the transformation of a physical value from one unit-system to another (e.g. representing a distance by kilometres or miles). 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 $10\text{ m} + 2\text{ km}$ directly).

Extensions _R15 – Support for enhanced string operations