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Electronic fee collection — Evaluation of on-board and roadside equipment for conformity to ISO 13141 —

Part 2: Abstract test suite

Perception du télépéage — Évaluation des équipements embarqués et en bord de route quant à la conformité avec l'ISO 13141 —

Partie 2: Suite d'essais abstraite

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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 on 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.

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems.*

This first edition of ISO 13140-2 cancels and replaces ISO/TS 13140-2:2012, which has been technically revised. This first edition incorporates the following main modifications compared to the Technical Specification:

— conversion from a Technical Specification to an International Standard;

— amendment of terms, in order to reflect harmonization of terms across electronic fee collection (EFC) standards;

— amendments to reflect changes in ISO 13140-1 due to changes to the underlying base standards, in particular ISO 13141;

— editorial and formal corrections.

A list of all parts in the ISO 13140 series can be found on the ISO website.

Introduction

ISO 17575 is part of a set of standards that supports interoperability of autonomous EFC-systems. It defines the EFC context data, their charge reports and their use of communication infrastructure.

The set of standards also supports short-range communication links in the context of autonomous electronic fee collection (EFC) on-board equipment (OBE) to enable spot checks for the enforcement process. The application interface is defined in ISO 13141:2015.

Within the set of EFC standards, this document defines the process and tests for conformity evaluation of OBE and roadside equipment (RSE) that comply with the requirements in ISO 13141:2015.

This document is intended to

— assess OBE and RSE capabilities,

— assess OBE and RSE behaviour,

— serve as a guide for OBE and RSE conformance evaluation and type approval,

— achieve comparability between the results of the corresponding tests applied in different places at different times, and

— facilitate communication between parties (for example, between equipment manufacturers and test houses).

This document is based on

— ISO 13141:2015,

— the set of dedicated short-range communication (DSRC) standards defining the communication stack, and

— ISO 9646.

This document is based on using the tree and tabular combined notation (TTCN) that is a standardized language suitable for specification of test cases and steps for assessment of protocol and application behaviour. The TTCN language is also supported by modern automated tools that accelerate software design, implementation and testing.

Electronic fee collection — Evaluation of on-board and roadside equipment for conformity to ISO 13141 —

Part 2:
Abstract test suite

1 Scope

This document specifies the abstract test suite (ATS) to evaluate the conformity of on-board equipment (OBE) and roadside equipment (RSE) to ISO 13141:2015 in accordance with the test suite structure and test purposes defined in ISO 13140-1:2016.

It provides a basis for conformance tests for dedicated short-range communication (DSRC) equipment (OBE and RSE) to support interoperability between different equipment supplied by different manufacturers.

NOTE The OBE and RSE are subject to additional testing in order to ascertain that they fulfil the essential radio requirements as set out in European Directives, a pre-requisite for CE marking and placing on the European market. They are also likely to be subject to additional testing of physical, environmental endurance, quality assurance and control at manufacturing, charge point integration, as part of factory, site and system acceptance testing. The definition of these tests is outside the scope of 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/IEC 9646-3:1998, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 3: The Tree and Tabular Combined Notation (TTCN)*

ETSI/TS 102 486-2-3 V1.2.1 (2008-10), Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma

3 Terms and definitions

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

3.1
base standard
approved international standard, technical specification or ITU-T Recommendation

Note 1 to entry: This includes but is not limited to approved standard deliverables from ISO, ITU, CEN, CENELEC, ETSI and IEEE.

[SOURCE: ISO/IEC/TR 10000-1:1998, 3.1.1, modified]

3.2
implementation conformance statement
statement of capabilities and options that have been implemented defining to what extent the implementation is compliant with a given specification

[SOURCE: ISO/TS 14907-2:2016, 3.6]

3.3
implementation conformance statement proforma
document, in the form of a questionnaire, which when completed for an implementation or a system becomes an implementation conformance statement (ICS)

[SOURCE: ISO/IEC 9646-1:1994, 3.3.40]

3.4
implementation extra information for testing
statement containing all of the information related to the implementation under test (IUT) and its corresponding system under test (SUT) which will enable the testing laboratory to run an appropriate test suite against that IUT

[SOURCE: ISO/IEC 19015:2000, 3.20]

3.5
implementation extra information for testing proforma
document, in the form of a questionnaire, which when completed for an implementation under test (IUT) becomes an implementation extra information for testing (IXIT)

[SOURCE: ISO/IEC 9646-1:1994, 3.3.42, modified]

3.6
on-board equipment
all required equipment on-board a vehicle for performing required EFC functions and communication services

3.7
on-board unit
single electronic unit on-board a vehicle for performing specific EFC functions and for communication with external systems

3.8
roadside equipment
equipment located along the road, either fixed or mobile

3.9
tester
combination of equipment, humans and processes able to perform specified conformance tests

[SOURCE: EN 15876-1:2016, 3.12]

4 Abbreviated terms

AP	Application Process (ISO 14906)
ASN.1	Abstract Syntax Notation One (ISO/IEC 8824-1)
ATS	Abstract Test Suite
BI	Behaviour Invalid (i.e. Invalid Behaviour tests)
BV	Behaviour Valid (i.e. Valid Behaviour tests)

Cf	Confirm (ISO 14906)
CM	Co-ordination message
DSRC	Dedicated Short-Range communication (ISO 14906)
DUT	Device Under Test (ISO/TS 14907-2)
EFC	Electronic Fee Collection (ISO 17573)
ICS	Implementation Conformance Statement (EN 15509)
IXIT	Implementation eXtra Information for Testing (ISO/TS 14907-2)
IUT	Implementation Under Test (ISO/TS 14907-2)
MAC	Medium Access Control (EN 12795)
OBE	On-board equipment
OBU	On-board unit
PIXIT	Protocol Implementation extra Information for Testing
RSE	Roadside equipment
SAP	Service Access Point
SCS	Semiconductor Characterization System
TC	Test Case
TSS	Test Suite Structure (EN 15876-1)

5 Abstract Test Method (ATM)

5.1 General

This clause describes the abstract test method (ATM) used to test the layers at the OBE side and at the RSE side.

5.2 Test architecture

Clause 4 in ETSI/TS 102 486-2-3 describes the test architecture for application layer testing. As test purposes (TPs) from ETSI/TS 102 486-2-3 are referenced to in ISO 13140-1, the test architectures presented there are also relevant for the corresponding test cases (TCs). For all specific TPs introduced in ISO 13140-1, the test architecture defined in ETSI/TS 102 486-2-3 is also relevant.

5.3 Protocol Implementation Extra Information for Testing (PIXIT)

The supplier of the OBE and RSE, respectively, is responsible for providing a Protocol Implementation Extra Information for Testing (PIXIT).

The supplier of the OBE and RSE shall complete a PIXIT; see Annex C and Annex D for examples of proformas.

6 Untestable Test Purposes (TP)

This clause gives a list of TPs which are not implemented in the abstract test suite (ATS) due to the chosen abstract test method (ATM) or other restrictions.

NOTE The abbreviation OBU, rather than OBE, is used in the naming of test purposes for historical reasons and for direct correspondence with ETSI/TS 102 486–1-3, ETSI/TS 102 486–2-3 and ISO 13140-1.

Table 1 — Untestable TPs

Test purpose	Reason
(empty)	(empty)

NOTE Currently no untestable TPs have been identified.

7 Abstract test suite (ATS) conventions

7.1 General

The ATS conventions are intended to give a better understanding of the ATS but they also describe the conventions made for the development of the ATS. These conventions shall be considered during any later maintenance or further development of the ATS.

The ATS conventions contain the naming conventions (see 7.2) and the implementation conventions (see 7.3). The naming conventions describe the structure of the naming of all ATS elements. The implementation conventions describe the functional structure of the ATS.

ATSs for OBE and RSE are specified in Annex A and Annex B respectively. The partial PIXIT proformas for OBE and RSE are specified in Annex C and Annex D respectively.

7.2 Naming conventions

7.2.1 Declarations part

This clause describes the naming conventions chosen for the elements of the ATS declarations part.

7.2.1.1 General

The following general rules apply for the names given in the declarations part.

Names of ASN.1 types imported from the base standard are preserved.

Predefined types (e.g. BITSTRING as defined in ISO/IEC 9646-5) are never used in structured type definitions, application service point ASP type definitions or protocol data unit (PDU) type definitions. Simple types are used instead.

All declarations in the test suite are listed in alphabetical order. A different order of listing should be used for maintenance reasons only.

7.2.1.2 Test suite operations

The test suite operation identifiers are prefixed with “TSO_”.

EXAMPLE TSO_substring

