
**Electronic fee collection — Evaluation
of equipment for conformity to
ISO/TS 17575-3 —**

**Part 1:
Test suite structure and test purposes**

iTeh STANDARD PREVIEW
*Perception du télépéage — Évaluation de la conformité de l'équipement
à l'ISO/TS 17575-3 —
(standards.iteh.ai)
Partie 1: Structure de la suite d'essais et objectifs des essais*

ISO/TS 16410-1:2011

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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 16410-1 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*, in collaboration with Technical Committee CEN/TC 278, *Road Transport and Traffic Telematics*.

ISO/TS 16410 consists of the following parts, under the general title *Electronic fee collection — Evaluation of equipment for conformity to ISO/TS 17575-3*:

- *Part 1: Test suite structure and test purposes*
- *Part 2: Abstract test suites*

Introduction

This part of ISO 16410 is part of a set of standards that supports interoperability of autonomous EFC-systems, which includes ISO/TS 17575 parts 1 to 4 that define the EFC context data, their charge reports and their use of communication infrastructure.

Within the suite of EFC standards this conformance evaluation procedure defines the process and tests for conformity evaluation of Front End and Back End that comply with the requirements in ISO/TS 17575-3.

This part of ISO 16410 is intended to

- assess Front End and Back End capabilities,
- assess Front End and Back End behaviour,
- serve as a guide for Front End and Back End conformance evaluation and type approval,
- achieve comparability between the results of the corresponding tests applied in different places at different times, and
- facilitate communications between parties.

This part of ISO 16410 is based on [\(standards.iteh.ai\)](https://standards.iteh.ai/)

- ISO/TS 17575-3, and [ISO/TS 16410-1:2011](https://standards.iteh.ai/catalog/standards/sist/bd841cd7-aeb2-4548-be95-4d23627571a3/iso-ts-16410-1-2011)
- the ISO 9646 family of standards on conformance test methodology.

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Electronic fee collection — Evaluation of equipment for conformity to ISO/TS 17575-3 —

Part 1: Test suite structure and test purposes

1 Scope

This part of ISO/TS 16410 specifies the test suite structure (TSS) and test purposes (TP) to evaluate the conformity of Front End and Back End to ISO/TS 17575-3.

The objective of this part of ISO/TS 16410 is to provide a basis for conformance tests for the Front End and the Back End in Electronic Fee Collection (EFC) based on autonomous on-board equipment (OBE) to enable interoperability between different equipment supplied by different manufacturers.

Autonomous OBE operates without relying on dedicated road-side infrastructure by employing wide-area technologies such as Global Navigation Satellite Systems (GNSS) and Cellular Communications Networks (CN). These EFC systems are referred to by a variety of names. Besides the terms autonomous systems and GNSS/CN systems, also the terms GPS/GSM systems and wide-area charging systems are in use.

Autonomous systems use satellite positioning, often combined with additional sensor technologies such as gyroscopes, odometers, and accelerometers, to localise the vehicle and to find its position on a map containing the charged geographic objects, such as charged roads or charged areas. From the charged objects, the vehicle characteristics, the time of day and other data that are relevant for describing road use, the tariff and ultimately the road usage fee is determined.

For more information regarding autonomous systems, please refer to ISO/TS 17575-3.

Testing of the following behaviours and functionalities is outside of the scope of this part of ISO/TS 16410:

- dynamic behaviour, i.e. sequence of messages and triggering events that must be exchanged/happen to fulfil certain charging scenarios;
- profiles and business logic built on top of particular pricing schemas;
- authentication, as its handling is not described in ISO/TS 17575-3;
- Front End behaviour with respect to optional data elements in ChargeReportConfiguration, as handling of configurations requesting presence/absence of parent data element, and absence/presence of child data element is not specified in ISO/TS 17575-3.

As ISO/TS 17575-3 does not specify any invalid behaviour of Front End and Back End, BI test purposes are not applicable for any test purpose group.

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 9646-6, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 6: Protocol profile test specification*

ISO/TS 17575-1, *Electronic fee collection — Application interface definition for autonomous systems — Part 1: Charging*

ISO/TS 17575-3, *Electronic fee collection — Application interface definition for autonomous systems — Part 3: Context data*

3 Terms and definitions

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

3.1 area pricing

charging process based on road usage occurring within a given area

[ISO/TS 17575-1:2010, definition 3.1]

3.2 attribute

application information formed by one or by a sequence of data elements, and that is managed by different actions used for implementation of a transaction

[ISO 14906:2011, definition 3.3] <http://standards.iteh.ai/catalog/standards/sist/bd841cd7-aeb2-4548-be95-ad2e5d957591/iso-ts-16410-1-2011>

3.3 authenticator

data appended to, or a cryptographic transformation of, a data unit that allows a recipient of the data unit to prove the source and/or the integrity of the data unit and protect against forgery

[ISO 14906:2011, definition 3.4]

3.4 Back End

generic name for the computing and communication facilities of the Service Provider and the Toll Charger exchanging data with the Front End

NOTE 1 Adapted from ISO/TS 17575-1.

NOTE 2 According to the architecture defined in ISO 17573, it is assumed in this part of ISO/TS 16410 that the Front End in general communicates with the Back End typically controlled and operated by the Service Provider.

3.5 charge object

any object that is part of the toll context description, including toll objects but also used for parking fees, etc.

NOTE Adapted from ISO/TS 17575-1.

3.6 charge report

data structure transmitted from the Front End to the Back End to report road usage data and supplementary related information

[ISO/TS 17575-1:2010, definition 3.5]

3.7**contract**

expression of an agreement between two or more parties concerning the use of the road infrastructure

[ISO 14906:2011, definition 3.7]

3.8**cordon**

border line of an area

[ISO/TS 17575-1:2010, definition 3.8]

3.9**cordon pricing**

charging process based on registering passages of a cordon

[ISO/TS 17575-1:2010, definition 3.9]

3.10**data element**

datum, which might itself consist of lower level data elements

[ISO/TS 17575-1:2010, definition 3.10]

3.11**Front End**

part(s) of the toll system where road usage data for an individual road user are collected, processed and delivered to the Back End

NOTE The Front End comprises the on-board equipment and an optional proxy.

[ISO/TS 17575-1:2010, definition 3.13]

[ISO/TS 16410-1:2011](https://standards.iteh.ai/catalog/standards/sist/bd841cd7-aeb2-4548-be95-ad2e5d957591/iso-ts-16410-1-2011)

3.12**service provider**

operator that accepts the user's payment means and in return provides a road-use service to the user

NOTE Taken from ISO 14906:2004.

3.13**tester**

combination of equipment and processes which is able to perform conformance tests according to this part of ISO/TS 16410

NOTE Adapted from ISO/TS 14907-2.

3.14**toll charger**

legal entity charging a toll for vehicles in a toll domain

[ISO/TS 17574:2009, definition 3.27]

3.15**toll context**

logical view of a toll scheme as defined by attributes and functions

[ISO/TS 17575-1:2010, definition 3.22]

3.16**toll regime**

set of rules, including enforcement rules, governing the collection of toll in a toll

[ISO/TS 17575-1:2010, definition 3.25]

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply, unless otherwise specified.

ADU	Application data unit (ISO/TS 17575-1)
ASN.1	Abstract Syntax Notation One (ISO/IEC 8824-1:2002)
ATS	Abstract Test Suite
BI	Invalid Behaviour
BV	Valid Behaviour
CCC	Compliance Check Communication (ISO/TS 12813)
CN	Cellular network (ISO/TS 17575-1)
DUT	Device Under Test
EFC	Electronic Fee Collection (ISO 17573)
GNSS	Global Navigation Satellite Systems (ISO/TS 17575-1)
HMI	Human Machine Interface (ISO/TS 17575-1)
ID	Identifier
OBE	On-board Equipment (ISO/TS 17575-1)
PCTR	Proforma Conformance Test Report ISO/TS 16410-1:2011
PICS	Protocol Implementation Conformance Statements https://standards.iteh.ai/catalog/standards/sist/bd841cd7-aeb2-4548-be95-ad2c3d975914/iso-16410-1-2011
TP	Test Purposes
TSS	Test Suite Structure
VAT	Value Added Tax (ISO/TS 17575-1)

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5 Test Suite Structure (TSS)

5.1 Structure

Table 1 — Test Suite Structures shows the Test Suite Structure (TSS).

Table 1 — Test Suite Structures

Group	Type of DUT	Behaviour
Procedural	Back End	Valid Behaviour
		Invalid Behaviour not applicable
ADU Header	Back End	Valid Behaviour
		Invalid Behaviour not applicable

ADU Body – Attribute general	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Toll Context Overview	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Tariff Table	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Tariff Class Definition	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Local Vehicle Class Definition	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Time Class Definition	Back End	Valid Behaviour
		Invalid Behaviour not applicable
User Class Definition	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Toll Context Layout	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Toll Context Layout for Section Pricing	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Toll Context Layout for Area Pricing	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Toll Context Layout for Cordon Pricing	Back End	Valid Behaviour
		Invalid Behaviour not applicable
Context Handling	Front End	Valid Behaviour
		Invalid Behaviour not applicable
Charge Report	Front End	Valid Behaviour
		Invalid Behaviour not applicable

Front End related Test Purposes uses Charge Report message for validation which is specified in ISO/TS 17575-1. As a precondition to run those test purposes the compliance to ISO/TS 17575-1 shall be validated.

5.2 Reference to conformance test specifications

This part of ISO/TS 16410 takes into account already defined test purposes for conformance to the base standards by referencing them, so that

- a) for test purposes that are **identical** to those defined in this specification or the base standards conformance test cases direct reference is reported; for reader's convenience, the title or a verbal description of the referenced test purpose is given, together with the reference,
- b) for test purposes that are **derived** from those defined in the base standards conformance test cases, a direct reference is reported, plus an indication on how the referred test purpose has to be modified for the profile conformance testing,
- c) for test purposes that are **specific** to ISO/TS 17575-3, a complete description is given, and
- d) an indication on whether a test purpose is **identical**, **derived**, or **specific** is given in each test purpose.

5.3 Test Purposes (TP)

5.3.1 TP definition conventions

The TPs are defined following the rules shown in Table 2 — TP Definition Rules below. All test purposes are defined in Annex A and Annex B, including the special notation and symbol conventions that shall be used. The data structures that shall be used are specified in Annex C and defined in ISO/TS 17575-1 and ISO/TS 17575-3.

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Table 2 — TP Definition Rules

TP ID according to the TP naming conventions	Title Reference TP origin Initial condition Stimulus and expected behaviour
TP ID	The TP ID is a unique identifier. It shall be specified according to the TP naming conventions defined in the sub-clause below.
Title	Short description of Test Purpose objective.
Reference	The reference should contain the references of the subject to be validated by the actual TP (specification reference, clause, paragraph), or the reference to the standard document defining the TP.
TP origin	Indicates if the TP is identical to a TP defined in another test standard, derived from a TP defined in another test standard, or specific for this standard profile.
Initial condition	The condition defines in which initial state the DUT has to be to apply the actual TP.
Stimulus and expected behaviour	Definition of the events the tester performs, and the events that are expected from the DUT to conform to the base specification.

5.3.2 TP naming conventions

Each TP is given a unique identification. This unique identification is built up to contain the following string of information:

TP/<group>/<dut>/<x>-<nn>

TP : to indicate that it is a Test Purpose;

<group> : which group TP belongs to;

<dut> : type of DUT (i.e. FE or BE);

X : type of testing (i.e. Valid Behaviour tests – BV, or Invalid Behaviour tests – BI)

<nn> : sequential TP number (01-99)

The naming conventions are as described in Table 3.

Table 3 — TP naming convention

Identifier:		
TP/<group>/<dut>/<x>-<nn>		
<group>		
<i>applicable for BE</i>	PRO	Procedural
<i>applicable for BE</i>	ADUH	ADU Header
<i>applicable for BE</i>	ADUB	ADU Body – Attribute general
<i>applicable for BE</i>	ATTR-11	Toll Context Overview
<i>applicable for BE</i>	ATTR-21	Tariff Table
<i>applicable for BE</i>	ATTR-22	Tariff Class Definition
<i>applicable for BE</i>	ATTR-23	Local Vehicle Class Definition
<i>applicable for BE</i>	ATTR-24	Time Class Definition
<i>applicable for BE</i>	ATTR-25	User Class Definition
<i>applicable for BE</i>	ATTR-31	Toll Context Layout
<i>applicable for BE</i>	ATTR-31S	Toll Context Layout for Section Pricing
<i>applicable for BE</i>	ATTR-31A	Toll Context Layout for Area Pricing
<i>applicable for BE</i>	ATTR-31C	Toll Context Layout for Cordon Pricing
<i>applicable for FE</i>	CH	Context Handling
<i>applicable for FE</i>	CR	Charge Report
<dut> = type of DUT	FE	Front End
	BE	Back End
x = Type of testing	BV	Valid Behaviour Tests
	BI	Invalid Behaviour Tests
<nn> = sequential number	(01-99)	Test Purpose Number

5.4 Conformance test report

The supplier of the Front End and Back End, respectively, is responsible for providing a conformance test report.

The supplier of the Front End shall complete the proforma conformance test report (PCTR) for Front End as defined in Annex D.

The supplier of the Back End shall complete the proforma conformance test report (PCTR) for Back End as defined in Annex E.

Annex A (normative)

Test Purposes (TP) for Front End

A.1 Introduction

This annex contains the test purposes (TP) for the conformity evaluation of Front End to ISO/TS 17575-3.

A.1.1 TP symbols conventions

A special notation and symbol convention shall be used, as defined in what follows.

Symbols are used in the description of the TPs, with meanings according to Table A.1 below.

Table A.1 — Description of TP Symbols

SYMBOL	DESCRIPTION
XXX.rq ⇒	The Tester sends the XXX.rq to the DUT
⇐ YYY.rs	The DUT sends the YYY.rs to the Tester
⇐ YYY.rs = {attribute1, attribute2, attribute3}	The DUT sends the YYY.rs to the Tester. YYY.rs shall not consist of any attributes different than attribute1, attribute2, attribute3. If any of attributes in the list is optional it may be missing in YYY.rs.
⇐ YYY.rs = {attribute1= value1}	The DUT sends the YYY.rs to the Tester with attribute1. Value of attribute1, i.e. value1 shall be stored by the tester and will be utilized in further TP steps.
A ≡ B	A "is equal to" B
A → B	A "is transformed" into B
∅	Means "empty" or "not set".

A.2 Context Handling

These test purposes apply to Iso17575-3Adu as claimed in ISO/TS 17575-3 Clause B.5.4.1/1, EFC Attributes as claimed in ISO/TS 17575-3 Clause B.5.4.3/1-9.

NOTE 1 No claims related to optional items of PICS proforma are covered, as there is no means to observe any behaviour of Front End proving support of these items.

NOTE 2 No test purposes for invalid behaviour are specified (BI), as ISO/TS 17575-3 does not specify any invalid behaviour of Front End.

NOTE 3 No dynamic behaviour is covered by this specification. Dynamic behaviour is e.g. selection of applicable Tariff Class by the Front End depending on vehicle, time, user, location criteria.

NOTE 4 A Charge Report sent by the DUT may or may not include all data elements listed in the structure as almost all of them are optional.

A.2.1 BV test purposes

Test subgroup objective:

- to test the behaviour of the DUT in relation to the context activation;
- to test the behaviour of the DUT in relation to handling of multiple contexts;
- to test usage of communication services by DUT,
by means of the syntactically and contextual correct ADUs:
 - single ADU consisting of all necessary attributes to activate the context, and/or
 - several consecutive ADUs consisting of all necessary attributes to activate the context.

TP/CH/FE/BV/01	Verify that DUT activates toll context – toll charger attribute check		
TP Origin	Specific		
Reference	ISO/TS 17575-3, Clause 8.1		
Initial Condition	<p>Front End is initialized and can accept Context Data.</p> <p>OBU belonging to the Front End is located within geographic borders defined in Context Data.</p> <p>Version of any data element of context data is known for the Front End.</p> <p>No authentication is required by the Front End.</p>		
Stimulus and Expected Behaviour			
	Tester		DUT
1	ContextData1	⇒	
2	Event defined in ContextData1 occurred		
3		⇐	ChargeReport = { obeld, vehicleLPNr, paymentMeans, serviceProviderContract, tollCharger, timeOfReport, reportPeriod, versionInfo, usageStatementList, vatForThisSession, accountStatus, transactionCounter, mileage, listOfCCCAttributes, authenticator}
4	<p>IF (ChargeReport not received) THEN TP failed ENDIF</p> <p>IF (tollCharger in ChargeReport equals to tollContextOverview.tollCharger in ContextData1) THEN TP passed ELSE TP failed ENDIF</p>		