SLOVENSKI STANDARD
SIST EN 15876-1:2010+A1:2012

01-junij-2012

Elektronsko pobiranje pristojbin - Ugotavljanje skladnosti opreme v vozilu in v obcestni napravi s standardom EN 15509 - 1. del: Zgradba preskuševalnega niza in namen preskušanja

Electronic fee collection - Evaluation of on-board and roadside equipment for conformity to EN 15509 - Part 1: Test suite structure and test purposes

Elektronische Gebührenerhebung - Konformitätsprüfung von Fahrzeuggeräten und straßenseitigen Einrichtungen mit der EN 15509 - Teil 1: Prüfreihenstruktur und Prüfzweck

Perception de télépéage - Évaluation de conformité de l'équipement embarqué et de l'équipement au sol à l'EN 15509 - Partie 1: Structure des suites de tests et intention des tests

Ta slovenski standard je istoveten z: **EN 15876-1:2010+A1:2012**

ICS:

03.220.20	Cestni transport	Road transport
35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade

SIST EN 15876-1:2010+A1:2012 **en,fr,de**

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15876-1:2010+A1

April 2012

ICS 35.240.60

Supersedes EN 15876-1:2010

English Version

Electronic fee collection - Evaluation of on-board and roadside equipment for conformity to EN 15509 - Part 1: Test suite structure and test purposes

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This European Standard was approved by CEN on 4 March 2010 and includes Amendment 1 approved by CEN on 4 March 2012.

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Ref. No. EN 15876-1:2010+A1:2012: E

EN 15876-1:2010+A1:2012 (E)

Contents

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EN 15876-1:2010+A1:2012 (E)

Foreword

This document (EN 15876-1:2010+A1:2012) has been prepared by Technical Committee CEN/TC 278 "Road transport and traffic telematics", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2012, and conflicting national standards shall be withdrawn at the latest by October 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

This document includes Amendment 1, approved by CEN on 2012-03-04.

This document supersedes EN 15876-1:2010.

The start and finish of text introduced or altered by amendment is indicated in the text by tags Ⓐ₁ Ⓐ₁.

CEN/TC 278 has produced a set of standards that support interoperable DSRC-EFC-systems e.g. EN ISO 14906 (a "toolbox" for defining EFC-application transaction) and CEN ISO/TS 14907-2 (EFC application interface conformance tests for On Board Units). However, these standards are only of an enabling nature and do not guarantee unambiguous technical interoperability. Therefore EN 15509, *Road transport and traffic telematics — Electronic fee collection — Interoperability application profile for DSRC* was developed to support technical interoperability between EFC-systems.

This standard defines the test suite structure and the test purposes for conformity evaluation of OBUs and RSE designed for compliance with the requirements set up in EN 15509. A test standard for evaluation of conformity of on-board and roadside equipment is a necessary element for coherent, practical and effective appraisal of products' compliance to EN 15509.

This document forms Part 1 of a two-part standard:

⎯ EN 15876-1, *Electronic fee collection — Evaluation of on-board and roadside equipment for conformity to EN 15509 — Part 1: Test suite structure and test purposes*

⎯ EN 15876-2, *Electronic fee collection — Conformity evaluation of on-board and roadside equipment to EN 15509 — Part 2: Abstract test suites*

Together, the two parts of EN 15876 provide the necessary foundation for implementation of the interoperability requirements as stated in EN 15509:

⎯ industry is provided with an easy-to-use toolbox for product assessment;

⎯ operators can easily assess conformity to EN 15509 and reference to the standard in tendering processes;

⎯ authorities and joint undertakings may reference to the test standard when stating interoperability requirements;

⎯ certification organisations are given an effective tool for certification of products.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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EN 15876-1:2010+A1:2012 (E)

1 Scope

This European Standard contains the Test Suite Structure (TSS) and Test Purposes (TP) to evaluate the conformity of On Board Units (OBU) and Roadside Equipment (RSE) to EN 15509.

The objective of this document is to provide a basis for conformance tests for DSRC equipment (on board units and roadside units) to enable interoperability between different equipment supplied by different manufacturers.

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.

EN 15509:2007, *Road transport and traffic telematics — Electronic fee collection — Interoperability application profile for DSRC*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:2006)*

EN ISO 14816, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure (ISO 14816:2005)*

EN ISO 14906:2004, *Road transport and traffic telematics — Electronic fee collection — Application interface definition for dedicated short-range communication (ISO 14906:2004)*

CEN ISO/TS 14907-2:2006, *Road transport and traffic telematics — Electronic fee collection — Test procedures for user and fixed equipment — Part 2: Conformance test for the onboard unit application interface (ISO/TS 14907-2:2006)*

ETSI EN 300 674-1:2004, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 1: General characteristics and test methods for Road Side Units (RSU) and On-Board Units (OBU)*

ETSI TS 102 486-1-2:2008, *Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)*

ETSI TS 102 486-2-2:2008, *Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)*

3 Terms and definitions

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

3.1
access credentials
data that is transferred to *on-board equipment (OBE),* in order to establish the claimed identity of a roadside equipment (RSE) application process entity

[EN ISO 14906:2004]

6

NOTE   The access credentials data carries information needed to fulfil access conditions in order to perform the operation on the addressed element in the OBE. The access credentials can carry passwords as well as cryptographic based information such as authenticators.

3.2
action
function that an application process resident at the *roadside equipment* can invoke in order to make the *on-board equipment* execute a specific operation during the *transaction*

[EN ISO 14906:2004]

3.3
attribute
application information formed by one or by a sequence of data elements, and is managed by different actions used for implementation of a *transaction*

[EN ISO 14906:2004]

3.4
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

[EN ISO 14906:2004]

3.5
channel
information transfer path

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[EN ISO 14906:2004]

3.6
component
logical and physical entity composing an *on-board equipment*, supporting a specific functionality

[EN ISO 14906:2004]

3.7
contract
expression of an agreement between two or more parties concerning the use of the road infrastructure

[EN ISO 14906:2004]

3.8
cryptography
discipline which embodies principles, means, and methods for the transformation of data in order to hide its information content, prevent its undetected modification or/and prevent its unauthorised use

[EN ISO 14906:2004]

3.9
data group
collection of closely related EFC data attributes which together describe a distinct part of an EFC transaction

[EN ISO 14906:2004]

3.10
data integrity
property that data has not been altered or destroyed in an unauthorised manner

EN 15876-1:2010+A1:2012 (E)

[EN ISO 14906:2004]

3.11
element
<DSRC> directory containing application information in form of *attributes*

[EN ISO 14906:2004]

3.12
implementation conformance statement
statement made by the supplier of an implementation or system claimed to conform to a given specification, stating which capabilities have been implemented

[EN ISO 14906:2004]

3.13
implementation conformance statement proforma
document, in the form of a questionnaire, which when completed for an implementation or system becomes an implementation conformance statement

[CEN ISO/TS 14907-2:2006]

3.14
implementation extra information for testing
statement made by the supplier or an implementor of a DUT which contains or references all of the information (in addition to that given in the implementation conformance statement) related to the DUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the DUT

[CEN ISO/TS 14907-2:2006]

3.15
implementation extra information for testing proforma
document, in the form of a questionnaire, which when completed for a DUT becomes an implementation extra information for testing

[CEN ISO/TS 14907-2:2006]

3.16
on-board equipment
equipment located within the vehicle and supporting the information exchange with the *roadside equipment*, and which is composed of the *on-board unit* and other sub-units whose presence have to be considered optional for the execution of a *transaction*

[EN ISO 14906:2004]

3.17
on-board unit
minimum component of an *on-board equipment*, whose functionality always includes at least the support of the DSRC interface

[EN ISO 14906:2004]

3.18
roadside equipment
equipment located at a fixed position along the road transport network, for the purpose of communication and data exchanges with the *on-board equipment* of passing vehicles

[EN ISO 14906:2004]

3.19
service (EFC)
road transport related facility provided by a *service provider*. Normally a type of infrastructure, the use of which is offered to the *user* for which the *User* may be requested to pay

[EN ISO 14906:2004]

3.20
service primitive (communication)
elementary communication service provided by the Application layer protocol to the application processes

[EN ISO 14906:2004]

NOTE   The invocation of a service primitive by an application process implicitly calls upon and uses services offered by the lower protocol layers.

3.21
service provider (EFC)
operator that accepts the user's payment means and in return provides a road-use service to the user

[EN ISO 14906:2004]

3.22
session
exchange of information and interaction occurring at a specific EFC station between the *roadside equipment* and the user/vehicle

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[EN ISO 14906:2004]

3.23
SIST EN 15876-1:2010+A1:2012
transaction
https://standards.iteh.ai/catalog/standards/sist/3c02a8f9-266a-453a-affb-
whole of the exchange of information between the *roadside equipment* and the *on-board equipment* necessary for the completion of an EFC operation over the DSRC 1-2010a1-2012

[EN ISO 14906:2004]

3.24
transaction model
functional model describing the general structure of Electronic Payment Fee Collection transactions

[EN ISO 14906:2004]

3.25
tester
combination of equipment and processes which is able to perform conformance tests according to this CEN standard

3.26
user
entity that uses transport services provided by the *Service Provider* according to the terms of a *contract*

4   Abbreviations

For the purposes of this document, the following abbreviations apply throughout the document unless otherwise specified.

ADU   Application Data Unit

APDU	Application Protocol Data Unit
AP	Application Process
ASN.1	Abstract Syntax Notation One (ISO/IEC 8824-1)
ATS	Abstract Test Suite
BI	Behaviour Invalid (i.e. Invalid Behaviour tests)
B-Kernel	Broadcast Kernel
BST	Beacon Service Table
BV	Behaviour Valid (i.e. Valid Behaviour tests)
cf	Confirm
DLC	Data Link Control
DSRC	Dedicated Short-Range communication
DUT	Device Under Test [CEN ISO/TS 14907-2]
EID	Element Identifier
EFC	Electronic Fee Collection
EVENT-RT	EVENT-REPORT
ICS	Implementation Conformance Statement
IXIT	Implementation eXtra Information for Testing
LLC	Logical Link Control
LPDU	LLC Protocol Data Unit
MAC	Medium Access Control
PCTR	Proforma Conformance Test Report
PICS	Proforma Implementation Conformance Statement
SCTR	System Conformance Test Report
TP	Test Purposes
TSS	Test Suite Structure
VST	Vehicle Service Table

5   Test Suite Structure

5.1   Structure

The table below shows the Test Suite Structure (TSS) including its subgroups defined for the conformance testing.

Table 1 — Test Suite Structure

Group	Type of DUT	Behaviour
Physical layer	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour
DLC MAC sublayer	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour
DLC LLC sublayer	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour
Application layer – Functions	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour
Application Layer – Data	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour
Application Layer – Security Level 0	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour
Application Layer – Security Level 1	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour
Application Layer – Transactions	On Board Unit	Valid behaviour
		Invalid behaviour
	Road Side Equipment	Valid behaviour
		Invalid behaviour

Physical layer tests are to be performed in a radio wave lab. They will not form part of the ATS.

5.2   Reference to Conformance Specifications

Conformance to a profile standard implies conformance to the related base standards; hence, a number of test cases for the profile standard are exactly the same as the conformance test cases for the related base standards. Other test cases are derived from the base standards conformance test cases, by applying some restrictions or choices in e.g. the parameters values, according to what is stated in the profile standard. Finally, specific conformance test cases for the profile standard are identified for statements contained in the profile standard, which have no equivalence in the base standards. These latter cases cover for example the security algorithms and functions that are described in the profile standard. This document 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 the base standards conformance test cases (see e.g ETSI TS 102 486-1-2 or ETSI TS 102 486-2-2) a 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 the standard profile**, a complete description is given.

An indication on whether a test purpose is **identical**, **derived**, or **specific** is given in each test purpose.

5.3 Test Purposes

5.3.1 TP Definition Conventions

The TPs are defined following the rules shown in Table 2 below.

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).
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.

Note that the reference field normally points to the clause of the base standard [EN 15509]. As the same standard contains the Protocol Implementation Conformance Statement proforma, where appropriate a reference to the relevant table of the PICS is given either in this field or in the text introducing the group of Test Purposes.

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 among those defined in Table 1 — Test Suite Structure does the TP apply to;

<dut> : type of DUT (i.e. OBU or RSE);

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 — TP Naming Conventions below.

<div align="center">Table 3 — TP Naming Conventions</div>

Identifier: TP/<group>/<dut>/<x>-<nn>			
<group>	PHY	Physical layer	
	MAC	MAC sublayer	
	LLC	LLC sublayer	
	AP-0BAS	Application layer – I Kernel support Security level 0	
	AP-0FUN	Application layer – T Kernel support Security level 0	
	AP-0DAT	Application layer – Data attributes support Security Level 0	
	AP-0SEC	Application layer – Security Level 0 support	
	AP-0TRA	Application layer – Transaction support Security level 0	
	AP-1BAS	Application layer – I Kernel support Security level 1	
	AP-1FUN	Application layer – T Kernel support Security level 1	
	AP-1DAT	Application layer – Data attributes support Security Level 1	
	AP-1SEC	Application layer – Security Level 1 support	
	AP-1TRA	Application layer – Transaction support Security level 1	
	AP-0BAS	Application layer – Initialisation phase support Security level 0	
	AP-0GET	Application layer - GET-rq PDU test purposes, security level 0	
	AP-0SET	Application layer - SET-rq PDU test purposes, security level 0	
	AP-0STA	Application layer - GET-STAMPED-rq PDU test purposes, security level 0	
	AP-0MMI	Application layer - SET-MMI-rq PDU test purposes security level 0	
	AP-0ECH	Application layer - ECHO-rq PDU test purposes, security level 0	
	AP-0REL	Application layer - EVENT-REPORT-rq PDU test purposes, security level 0	
	AP-1BAS	Application layer - initialization phase test purposes, security level 1	
	AP-1GET	Application layer - GET-rq PDU test purposes, security level 1	
	AP-1SET	Application layer - SET-rq PDU test purposes, security level 1	
	AP-1STA	Application layer - GET-STAMPED-rq PDU test purposes, security level 1	
	AP-1MMI	Application layer - SET-MMI-rq PDU test purposes security level 1	
	AP-1ECH	Application layer - ECHO-rq PDU test purposes, security level 1	
<dut> = type of DUT	OBU	On Board Unit	
	RSE	Road Side Equipment	
x = Type of testing	BV	Valid Behaviour Tests	
	BI	Invalid Behaviour Tests	
<nn> = sequential number	(01-99)	Test Purpose Number	