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

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

Elektronische Gebührenerhebung - Konformitätsprüfung von Fahrzeuggeräten und straßenseitigen Einrichtungen nach EN 15509 - Teil 1: Struktur und Zweck des Prüfprogramms

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

**Ta slovenski standard je istoveten z: prEN 15876-1**

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**ICS:**

03.220.20	Cestni transport	Road transport
35.240.60	Uporabniške rešitve IT v prometu	IT applications in transport
43.040.15	Avtomobilska informatika. Vgrajeni računalniški sistemi	Car informatics. On board computer systems

**oSIST prEN 15876-1:2022**

**en,fr,de**



EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 15876-1**

June 2022

ICS 35.240.60

Will supersede EN 15876-1:2016

English Version

## Electronic fee collection - Conformity evaluation of on-board and roadside equipment to EN 15509 - Part 1: Test suite structure and test purposes

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

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

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 278.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (prEN 15876-1:2022) has been prepared by Technical Committee CEN/TC 278, *Intelligent transport systems*, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document will supersede EN 15876-1:2016.

This edition of EN 15876-1 incorporates the following main modifications compared with the previous version:

- amendments to reflect changes to the underlying requirements standards, in particular the updated data definitions in EN 15509;
- amendments to reflect changes in EN ISO 14907-2, specifically updated references following its amended structure,
- updated terms to reflect the harmonized terms between electronic fee collection standards in ISO/TS 17573-2.

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**prEN 15876-1:2022 (E)****Introduction**

CEN/TC 278 has produced a set of standards that support interoperable DSRC-EFC-systems e.g. prEN ISO/DIS 14906:2022 (a “toolbox” for defining EFC-application transaction) and EN ISO 14907-2 (EFC application interface conformance tests for on-board units). However, these standards are only of an enabling nature and do not ensure technical interoperability. Therefore EN 15509, *Electronic fee collection – Interoperability application profile for DSRC* was developed to support technical interoperability between EFC-systems.

This document defines the test suite structure and the test purposes for conformity evaluation of on-board and roadside equipment designed for compliance with the requirements of 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 – Evaluation of on-board and roadside equipment for conformity to EN 15509 – Part 2: Abstract test suites*

Together, the two parts of EN 15876 provide the necessary foundation for verification of the 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.

## 1 Scope

This document specifies the test suite structure (TSS) and test purposes (TPs) for evaluation of on-board equipment (OBE) and roadside equipment (RSE) to EN 15509.

Normative Annex A presents the test purposes for the OBE.

Normative Annex B presents the test purposes for the RSE.

Normative Annex C provides the protocol conformance test report (PCTR) proforma for OBE.

Normative Annex D provides the PCTR proforma for RSE.

## 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.

FprEN 15509:2022, *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 code (ISO 3166-1)*

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

prEN ISO/DIS 14906:2022, *Electronic fee collection — Application interface definition for dedicated short-range communication*

EN ISO 14907-2:2021, *Electronic fee collection - Test procedures for user and fixed equipment - Part 2: Conformance test for the on-board unit application interface (ISO 14907-2:2021)*

## 3 Terms and definitions

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

### 3.1

#### **attribute**

addressable package of data consisting of a single data element or structured sequences of data elements

[SOURCE: ISO/TS 17573-2:2020, 3.13]

### 3.2

#### **authenticator**

data, possibly encrypted, that is used for authentication

[SOURCE: ISO/TS 17573-2:2020, 3.16]

### 3.3

#### **data group**

class of closely related attributes

[SOURCE: ISO/TS 17573-2:2020, 3.55]

**prEN 15876-1:2022 (E)****3.4****Element****EFC Element**

coherent set of data and functionality

Note 1 to entry: The functionality includes, where applicable, the security-related functions and the associated security keys.

Note 2 to entry: EFC Elements are created by the applications and addressed using Element identifiers.

Note 3 to entry: In a given *on-board equipment* (OBE) (3.9), the EID is used to address a toll context, identified by the EFC-ContextMark, in which *attributes* (3.1) can be addressed unambiguously by AttributeIDs inside an EFC Element of the OBE

[SOURCE: ISO/TS 17573-2:2020, 3.71]

**3.5****implementation conformance statement****ICS**

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

[SOURCE: ISO/TS 17573-2:2020, 3.90]

**3.6****implementation conformance statement proforma**

document, in the form of a questionnaire, which when completed for an implementation or system becomes an *implementation conformance statement* (3.5)

[SOURCE: ISO/TS 17573-2:2020, 3.91]

**3.7****implementation extra information for testing****IXIT**

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/TS 17573-2:2020, 3.92]

**3.8****implementation extra information for testing proforma**

document, in the form of a questionnaire, which when completed for an IUT becomes an implementation extra information for testing (3.7)

[SOURCE: ISO/TS 17573-2:2020, 3.93]

**3.9****on-board equipment****OBE**

all required equipment on-board a vehicle for performing required electronic fee collection functions and communication services

[SOURCE: ISO/TS 17573-2:2020, 3.126]



**3.10****on-board unit****OBU**

electronic unit on-board a vehicle for performing specific electronic fee collection functions and for communication with external systems

Note 1 to entry: OBE and OBU have been used as terms with the same or similar meaning in the standardization of DSRC and DSRC-based EFC within CEN and ETSI. Previously developed relevant standards used the term OBU with the meaning OBE as defined in this document. When referring to relevant tests in other documents, this document uses the terms of the referenced source, which explains why the term OBU is often used in the Annexes.

[SOURCE: ISO/TS 17573-2:2020, 3.127]

**3.11****roadside equipment****RSE**

fixed or movable electronic fee collection equipment located along the road

Note 1 to entry: RSE and RSU have been used as terms with the same or similar meaning in the standardization of DSRC and DSRC-based EFC within CEN and ETSI. Previously developed relevant standards used the term RSU with the meaning RSE as defined in this document. When referring to relevant tests in other documents, this document uses the terms of the referenced source, which explains why the term RSU is often used in the Annexes

[SOURCE: ISO/TS 17573-2:2020, 3.161]

**3.12****tester**

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

[SOURCE: ISO/TS 17573-2:2020, 3.188]

**3.13****transaction**

whole of the exchange of information between two physically separated communication facilities

[SOURCE: ISO/TS 17573-2:2020, 3.211]

**4 Abbreviations**

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

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)
BST	beacon service table
BV	behaviour valid (i.e. Valid Behaviour tests)
DSRC	dedicated short-range communication
EFC	electronic fee collection

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ICS	implementation conformance statement
IUT	implementation under test
LLC	logical link control
LPDU	LLC protocol data unit
MAC	medium access control
OBE	on-board equipment
OBU	on-board unit
PCTR	protocol conformance test report
PDU	protocol data unit
PICS	protocol implementation conformance statement
PIXIT	protocol implementation extra information for testing
SCTR	system conformance test report
TP	test purposes
TSS	test suite structure
VST	vehicle service table

**5 Conformance**

The supplier of the OBE and RSE, respectively, is responsible for providing a conformance test report.

The supplier of the OBE shall complete the protocol conformance test report (PCTR) for the OBE as defined in Annex C.

The supplier of the RSE shall complete the PCTR for the RSE as defined in Annex D.

**6 Test Suite Structure****6.1 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 IUT	Behaviour
Physical layer	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour
DLC MAC sublayer	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour

Group	Type of IUT	Behaviour
DLC LLC sublayer	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour
Application layer – Functions	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour
Application Layer – Data	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour
Application Layer – Security Level 0	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour
Application Layer – Security Level 1	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour
Application Layer – Transactions	OBE	Valid behaviour
		Invalid behaviour
	RSE	Valid behaviour
		Invalid behaviour

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

## 6.2 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

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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.

### 6.3 Test Purposes

#### 6.3.1 TP Definition Conventions

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

**Table 2 — TP Definition Rules**

<b>TP ID according to the TP naming conventions</b>	Title
	Reference
	TP origin
	Initial condition
	Stimulus and expected behaviour

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

### 6.3.2 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>/<iut>/<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;
- <iut> : type of IUT (i.e. OBE 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.

**Table 3 — TP Naming Conventions**

Identifier	TP/<group>/<iut>/<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

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Identifier TP/<group>/<iut>/<x>-<nn>	
	<p>AP-0REL Application layer - EVENT-REPORT-rq PDU test purposes, security level 0</p> <p>AP-1BAS Application layer - initialization phase test purposes, security level 1</p> <p>AP-1GET Application layer - GET-rq PDU test purposes, security level 1</p> <p>AP-1SET Application layer - SET-rq PDU test purposes, security level 1</p> <p>AP-1STA Application layer - GET-STAMPED-rq PDU test purposes, security level 1</p> <p>AP-1MMI Application layer - SET-MMI-rq PDU test purposes security level 1</p> <p>AP-1ECH Application layer - ECHO-rq PDU test purposes, security level 1</p>
<iut> = type of IUT	<p>OBE On-board equipment</p> <p>RSE Roadside equipment</p>
x = Type of testing	<p>BV Valid Behaviour Tests</p> <p>BI Invalid Behaviour Tests</p>
<nn> = sequential number	(01-99) Test Purpose Number

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## Annex A (normative)

### Test purposes for on-board equipment

#### A.1 Introduction

This annex contains the test purposes (TP) for the conformity evaluation of on-board equipment (OBE) to FprEN 15509:2022.

OBE and OBU have been used as terms with the same or similar meaning in the standardization of DSRC and DSRC-based EFC within CEN and ETSI. Previously developed relevant standards used the term OBU with the meaning OBE as defined in this document. When referring to relevant tests in other documents, this document uses the terms of the referenced source, which explains why the term OBU is often used in this Annex

#### A.2 Physical Layer

##### A.2.1 BV Test Purposes

Test subgroup objective:

- to test the behaviour of the IUT in relation to syntactically and contextual correct behaviour of the test system.

<b>TP/PHY/OBU/BV/01</b>	<b>Dynamic range – sensitivity</b>
<b>TP Origin</b>	Identical to ETSI EN 300 674–1, 10.1.1
<b>Reference</b>	FprEN 15509:2022, 6.1.2
<b>Initial condition</b>	See ETSI EN 300 674–1, Clause 8.
<b>Stimulus and Expected Behaviour</b>	
See ETSI EN 300 674–1, 10.1.1	

<b>TP/PHY/OBU/BV/02</b>	<b>Dynamic range – upper power limit for communication</b>
<b>TP Origin</b>	Identical to ETSI EN 300 674–1, 10.1.2
<b>Reference</b>	FprEN 15509:2022, 6.1.2
<b>Initial condition</b>	See ETSI EN 300 674–1, Clause 8.
<b>Stimulus and Expected Behaviour</b>	
See ETSI EN 300 674–1, 10.1.2	