INTERNATIONAL STANDARD

ISO 13140-1

First edition
2016-11-15

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

Part 1: Test suite structure and test purposes

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

Partie 1: Structure de suite d'essai et buts des essais

Reference number
ISO 13140-1:2016(E)

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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 13140-1 cancels and replaces ISO/TS 13140-1:2011, 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 the underlying base standards, in particular, ISO 13141 and ISO 14906;

— 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 localization augmentation process. The application interface is defined in ISO 13141.

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.

This document is intended to

— assess OBU and RSE capabilities,

— assess OBU and RSE behaviour,

— serve as a guide for OBU 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 communications between parties.

This document is based on

— ISO/TS 13141,

— 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 1:
Test suite structure and test purposes

1 Scope

This document specifies the test suite structure (TSS) and test purposes (TP) to evaluate the conformity of on-board units (OBU) and roadside equipment (RSE) to ISO 13141.

It provides a basis for conformance tests for dedicated short-range communication (DSRC) equipment (on-board units and roadside units) to enable interoperability between different equipment supplied by different manufacturers.

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 13141:2015, *Electronic fee collection — Localisation augmentation communication for autonomous systems*

ISO 14906:2011/Amd 1:2015, *Electronic fee collection — Application interface definition for dedicated short-range communication/Amendment 1*

ISO/TS 14907-2:2016, *Electronic fee collection — Test procedures for user and fixed equipment — Part 2: Conformance test for the on-board unit application interface*

EN 15509:2014, *Electronic fee collection — Interoperability application profile for DSRC*

EN 15876-1:2016, *Electronic fee collection — Evaluation of on-board and roadside equipment for conformity to EN 15509 — Part 1: Test suite structure and test purposes*

ETSI/TS 102 486-2-2-V1.2.1 (2008-10), *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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp/

3.1
access credentials
trusted attestation or secure module that establishes the claimed identity of an object or application property that ensures that the actions of an entity may be traced uniquely to that entity

Note 1 to entry: Access credentials carry information needed to fulfil access conditions in order to perform the operation on the addressed *element* (3.7) in the *OBE* (3.10). Access credentials can carry passwords, as well as cryptography-based information such as *authenticators* (3.4).

[SOURCE: EN 15509:2014, 3.1]

3.2
attribute
addressable package of data consisting of a single data element or structured sequences of data elements

[SOURCE: ISO 17575-1:2016, 3.2]

3.3
authentication
security mechanism allowing verification of the provided identity

[SOURCE: EN 301 175]

3.4
authenticator
data, possibly encrypted, that is used for *authentication* (3.3)

[SOURCE: EN 15509:2014, 3.3]

3.5
cryptography
principles, means and methods for the transformation of data in order to hide its information content, prevent its undetected modification or prevent its unauthorized use

[SOURCE: EN 15509:2014, 3.6]

3.6
data group
class of closely related *attributes* (3.2)

[SOURCE: ISO 17575-1:2016, 3.10]

3.7
element
<DSRC> directory containing application information in the form of *attributes* (3.2)

[SOURCE: ISO 14906:2011, 3.11, modified]

3.8
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, modified]

3.9
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/TS 14907-2:2016, 3.8]

3.10
on-board equipment
OBE
all required equipment on-board a vehicle for performing required EFC functions and communication services

3.11
on-board unit
OBU
single electronic unit on-board a vehicle for performing specific EFC functions and for communication with external systems

3.12
roadside equipment
RSE
equipment located along the road either fixed or mobile

[SOURCE: ISO/TS 19299:2015, 3.34]

3.13
tester
combination of equipment, humans and processes able to perform specified conformance tests

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

3.14
transaction
whole of the exchange of information between two physically separated communication facilities

[SOURCE: ISO 17575-1:2016, 3.21]

4 Abbreviated terms

AC_CR	Access Credentials
ADU	Application Data Unit
APDU	Application Protocol Data Unit (ISO 14906)
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 (ISO 14906)
BV	Behaviour Valid (i.e. valid behaviour Tests)
cf	Confirm
DLC	Data Link Control
DSRC	Dedicated Short-Range Communication (ISO 14906)
DUT	Device Under Test (ISO/TS 14907-2)

EID	Element Identifier
EFC	Electronic Fee Collection (ISO 17573)
ICS	Implementation Conformance Statement
LLC	Logical Link Control (EN 12795)
MAC	Medium Access Control (EN 12795)
PCTR	Protocol Conformance Test Report
PDU	Protocol Data Unit
PIXIT	Protocol Implementation eXtra Information For Testing
TSS	Test Suite Structure
VST	Vehicle Service Table (ISO 14906)

5 Test Suite Structure (TSS)

5.1 Structure

The Test Suite Structure (TSS) including its subgroups that are inherited from other specifications is given in Table 1.

Table 1 — Test Suite Structure

Group	Type of DUT	Behaviour
Physical layer	On-board unit	Valid Behaviour
		Invalid Behaviour
	Roadside equipment	Valid Behaviour
		Invalid Behaviour
DLC MAC sublayer	On-board unit	Valid Behaviour
		Invalid Behaviour
	Roadside equipment	Valid Behaviour
		Invalid Behaviour
DLC LLC sublayer	On-board unit	Valid Behaviour
		Invalid Behaviour
	Roadside equipment	Valid Behaviour
		Invalid Behaviour
Application layer	On-board unit	Valid Behaviour
		Invalid Behaviour
	Roadside 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 test specifications

Conformance to a profile standard implies conformance to the related base standards; hence, a number of test cases for the LAC application 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 LAC application are identified for statements contained in the LAC application, which have no equivalence in the base standards. These latter cases cover, for example, the application layer data test purposes. 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 102 486-2-2 or EN 15876-1), a direct reference is reported. For readers' 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 (TP)

5.3.1 TP Definition conventions

The TPs are defined following the rules shown in Table 2. All Test Purposes are defined in Annexes A and B.

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 subclause 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 among those defined in Table 1 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.

Table 3 — TP naming convention

Identifier: TP/<group>/<dut>/<x>–<nn>		
<group>		
applicable for OBU/RSE	PHY	Physical layer
applicable for OBU/RSE	MAC/LLC	MAC/LLC sublayer
applicable for OBU/RSE	AP-BAS	Application layer — I Kernel support
applicable for OBU	AP-FUN	Application layer — T Kernel support
applicable for OBU	AP-DAT	Application layer — Data attributes support
applicable for OBU	AP-SEC	Application layer — Security Level 1 support
applicable for RSE	AP-SET	Application layer — SET-rq PDU test purposes,
applicable for RSE	AP-REL	Application layer — EVENT-REPORT-rq PDU test purposes
<dut> = type of DUT	OBU	On-Board Unit
	RSE	Roadside Equipment
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 manufacturer of the OBU and RSE, respectively, is responsible for providing a conformance test report.

The manufacturer of the OBU shall complete the protocol conformance test report (PCTR) for on-board units as defined in Annex C.

The manufacturer of the RSE shall complete the PCTR for roadside equipment as defined in Annex D.

Annex A
(normative)

Test purposes for on-board units

A.1 General

This annex contains the Test Purposes (TP) for the conformity evaluation of OBUs to ISO 13141.

A.1.1 Symbols in TP Descriptions

For the application layer test purposes, a special notation and symbol convention is used, as defined in what follows.

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

Table A.1 — Description of TP symbols

Symbol	Description
XXX.rq ⇒	The Tester sends the XXX.rq PDU to the DUT.
⇐ YYY.rs	The DUT sends the YYY.rs PDU to the Tester.
A ≡ B	Test Purpose A "is congruent to" Test Purpose B. The notation Test Purpose A ≡ Test Purpose B means that the Test Purpose A is the same as Test Purpose B. If differences in parameters or parameter values have to be applied, these differences are indicated in the text immediately below.
A → B	Object A "is transformed" into Object B. So a notation like "Table X → Table Y" means that for the scope of the Test Purpose, any reference of Table X should be changed into references to Table Y.
=	Means "assignment". That is, a notation like "accessCredentials = a value" means that the field accessCredentials is given a value.
Ø	Means "empty" or "not set". So, a notation like "accessCredentials = Ø → accessCredentials = calculated value", for a given Test Purpose, means "change all occurrences in which the field accessCredentials has not been assigned to calculation of the value accessCredentials to a given value.

A.2 Physical layer

Per ISO 13141:2015, 5.5.2, all test purposes TP/PHY/OBU/Bx/yy defined in EN 15876-1 are applicable for the conformity evaluation of OBUs to CEN–DSRC based LAC as claimed in ISO 13141:2015, Table B.8, Item 1.

A.3 MAC and LLC

Per ISO 13141:2015, 5.5.2, all test purposes TP/MAC/OBU/Bx/yy and TP/LLC/OBU/Bx/yy defined in EN 15876-1 are applicable for the conformity evaluation of OBUs to CEN–DSRC based LAC as claimed in ISO 13141:2015, Table B.8, Item 1.

A.4 Application Layer

A.4.1 Structure of BST and VST

A.4.1.1 BST

The BST general structure, as is transmitted to the OBU, is described in Table A.2.

Table A.2 — BST general structure

			Length	Allowed values
T-APDUs			4 bit	"1 000" indicating initialization-request (BST)
Option Indicator			1 bit (nonmandApplications opt.)	0/1
rsu	manufacturerid		16 bits	See ISO 14816
	individualid		27 bits	as specified by manufacturer
Time			32 bits	UNIX real time
profile			1 bit (Profile ext.)	0 (= no extension)
			7 bits	See profile in EN 12834:2003, Annex A and EN 13372:2004, 6.3.2.
Mand Applications			1 bit (mandApplications ext.)	0 (= no extension)
			7 bits (number of applications)	M
	LAC Application		1 bit (eid opt.)	0 (= eid not present)
			1 bit (parameter opt.)	0 (= parameter not present)
		aid	1 bit (aid ext.)	0 (= no extension)
			5 bits	21 (= LAC application)
	Application 2 (not LAC)		1 bit (eid opt.)	0/1
			1 bit (parameter opt.)	0/1
		aid	1 bit (aid ext.)	0 (= no extension)
			5 bits	any (≠ LAC application)
		eid	1 bit (eid ext.)	0 (= no extension)
			7 bits	any
		parameter		See ApplicationContextMark in EN 12834:2003, Annex A
	…		…	…
			1 bit (eid opt.)	0/1
			1 bit (parameter opt.)	0/1
		aid	1 bit (aid ext.)	0 (= no extension)
			5 bits	any (≠ LAC application)
		eid	1 bit (eid ext.)	0 (= no extension)
			7 bits	any
		parameter		See ApplicationContextMark in EN 12834:2003, Annex A

Table A.2 *(continued)*

		Length	Allowed values
nonmand Applications		1 bit (mandApplications ext.)	0 (= no extension)
		7 bits (number of applications)	N
	Application 1 (not EFC)	See "Application 2 (not EFC)" of mandApplications	
	...	...	
	Application N (not EFC)	See "Application 2 (not EFC)" of mandApplications	
		1 bit (profileList ext.)	0 (= no extension)
		7 bits (number of profiles)	K
	Profile 1	1 bit (Profile ext.)	0 (= no extension)
		7 bits	See profile in EN 12834:2003, Annex A and EN 13372:2004, 6.3.2.
	...	...	...
	Profile K	1 bit (Profile ext.)	0 (= no extension)
		7 bits	See profile in EN 12834:2003, Annex A and EN 13372:2004, 6.3.2.

A.4.1.2 VST

The VST general structure, as is transmitted by the OBU, is described in Table A.3.

Table A.3 — VST general structure (security level 1)

				Length	Allowed value
fill				4 bits	any
profile				1 bit (Profile ext.)	0 (= no extension)
				7 bits	See Profile in EN 12834:2003, Annex A
				1 bit (applications ext.)	0 (= no extension)
				7 bits (number of applic.)	M
				1 bit (eid opt.)	1 (= eid present)
				1 bit (parameter opt.)	1 (= parameter present)
		aid		1 bit (aid ext.)	0 (= no extension)
				5 bits	21 (= LAC application)
		eid		1 bit (eid ext.)	0 (= no extension)
				7 bits	any (≠ other eid used in this VST)
				1 bit (Container ext.)	0 (= no extension)
				7 bits (Container CHOICE)	2 (= OCTET STRING)
				1 bit (octet string ext.)	0 (= no extension)
				7 bits (octet string length)	16

Table A.3 *(continued)*

					Length	Allowed value
applications	LAC Application	para meter	LAC-ContextMark	contract Provider	10 bits (CountryCode)	See ISO 3166-1
					14 bits (IssuerIdentifier)	See ISO 14816
				typeOf Contract	16 bits	any
				context Version	1 bit (contextVersion ext.)	0 (= no extension)
					7 bits	any
					1 bit (Container ext.)	0 (= no extension)
					7 bits (Container CHOICE)	2 (= OCTET STRING)
					1 bit (octet string ext.)	0 (= no extension)
					7 bits (octet string length)	2
			AC_CR-Reference	AC_Master KeyRef	8 bits	any
				AC_CR-Diversifier	8 bits	any
					1 bit (Container ext.)	0 (= no extension)
					7 bits (Container CHOICE)	2 (= OCTET STRING)
					1 bit (octet string ext.)	0 (= no extension)
					7 bits (octet string length)	4
			RndOBE		32 bits	any
	Application 2				1 bit (eid opt.)	0/1
					1 bit (parameter opt.)	0/1
			aid		1 bit (aid ext.)	0 (= no extension)
					5 bits	See DSRCApplicationEntityID, EN 12834:2003, Annex A
			eid		1 bit (eid ext.)	0 (= no extension)
					7 bits	any (≠ other eid used in this VST)
			parameter			See ApplicationContextMark, EN 12834:2003, Annex A
	...				1 bit (eid opt.)	0/1
	Application M				1 bit (parameter opt.)	0/1
			aid		1 bit (aid ext.)	0 (= no extension)
					5 bits	See DSRCApplicationEntityID, EN 12834:2003, Annex A
			eid		1 bit (eid ext.)	0 (= no extension)
					7 bits	any (≠ other eid used in this VST)
			parameter			See ApplicationContextMark, EN 12834:2003, Annex A
obe Configuration					1 bit (obeStatus opt.)	0/1
	equipmentClass				15 bits	any
	manufacturerId				16 bits	any
	obeStatus				16 bits	any

A.4.2 PDUs parameters

A.4.2.1 Parameters of request PDUs

Tables A.4 and A.5 describe the valid format of the request APDUs. No other request commands are used by LAC application.

Fill bits shall always be set to zero.

Table A.4 — SET-Rq parameters (security level 1)

	EN 12834:2003, Annex A		ISO 14906:2011/ Amd 1:2015, Annex A	EN 15509:2014, C.4.5.5, Table C.16 and ISO/TS 13141:
SET-Rq	fill		=	=
	mode			=
	eid			=
	accessCredentials	OPTIONAL		mandatory
	attrList			=
	iid	OPTIONAL		prohibited

Table A.5 — EVENT-REPORT-Rq parameters

	EN 12834:2003, Annex A		ISO 14906:2011/ Amd 1:2015, Annex A	EN 15509:2014, C.4.5.5, Table C.16 and ISO/TS 13141
EVENT-REPORT-Rq	mode		=	false
	eid			0
	eventType			0 (release)
	accessCredentials	OPTIONAL		prohibited
	eventParameters	OPTIONAL		prohibited
	iid	OPTIONAL		prohibited

A.4.2.2 Parameters of response PDUs

Table A.6 describes the valid format of the response APDUs. No other response APDUs are used by LAC application.

Fill bits shall always be set to zero.

Table A.6 — SET-Rs parameters (security level 1)

	EN 12834:2003, Annex A		ISO 14906:2011/ Amd 1:2015, Annex A	EN 15509:2014, C.4.5.5, Table C.16
SET-Rs	fill		=	=
	eid			=
	iid	OPTIONAL		prohibited
	ret	OPTIONAL		mandatory

A.4.3 Application I-kernel test purposes for On-Board Unit, security level 1

These Test Purposes apply to the security level 1 as claimed in ISO 13141:2015, Table B.6, Item 1 and to initialization and termination as claimed in ISO 13141:2015, Table B.6, Items 1 and 5.

A.4.3.1 Data Structures

For the purpose of this conformance test, the following BSTs described in Tables A.7 and A.8 are transmitted to the DUT. Invalid values are indicated in **boldface**.

Table A.7 — BST1 (actual BST used, BV) valid BST

			Length	Value
Option Indicator			1 bit (nonmandApplications opt.)	0 (= nonmandApplications not present)
RSU	manufacturerid		16 bits	registered value
	individualid		27 bits	any
Time			32 bits	any
profile			1 bit (Profile ext.)	0 (= no extension)
			7 bits	0
Mand Applications			1 bit (mandApplications ext.)	0 (= no extension)
			7 bits (number of applications)	1
	LAC Application		1 bit (eid opt.)	0 (= eid not present)
			1 bit (parameter opt.)	0 (= parameter not present)
		aid	1 bit (aid ext.)	0 (= no extension)
			5 bits	21 (= LAC application)
profileList			1 bit (profileList ext.)	0 (= no extension)
			7 bits (number of profiles)	0 (= list empty)

Table A.8 — BST2 (actual BST used, BI) invalid BST: extraneous parameter (LAC application inserted as non mandatory application)

			Length	Value
Option Indicator			1 bit (nonmandApplications opt.)	1 (= nonmandApplications present)
RSU	manufacturerid		16 bits	registered value
	individualid		27 bits	any
Time			32 bits	any
profile			1 bit (Profile ext.)	0 (= no extension)
			7 bits	0
Mand Applications			1 bit (mandApplications ext.)	0 (= no extension)
			7 bits (number of applications)	1
	Application #1 (not LAC)		1 bit (eid opt.)	1 (= eid present)
			1 bit (parameter opt.)	0 (= parameter not present)
		aid	1 bit (aid ext.)	0 (= no extension)
			5 bits	≠ 21 (AID that is not supported by the OBU)
		eid	1 bit (eid ext.)	0 (= no extension)
			7 bits	any
nonmand Applications			**1 bit (nonmandApplications ext.)**	**0 (= no extension)**
			7 bits (number of applications)	**1**
	LAC Application		**1 bit (eid opt.)**	**0 (= eid not present)**
			1 bit (parameter opt.)	**0 (= parameter not present)**
		aid	**1 bit (aid ext.)**	**0 (= no extension)**
			5 bits	**21 (= LAC application)**
profileList			1 bit (profileList ext.)	0 (= no extension)
			7 bits (number of profiles)	0 (= list empty)

A.4.3.2 BV test purposes

Test subgroup objective:

— to test the behaviour of the DUT in relation to:

  — valid BST;

  — valid EVENT-REPORT-Rq (Release);

— to test the DUT support of:

  — BeaconId;

  — Time;

  — Profile;

  — Applications;

  — LID.

TP/AP-BAS/OBU/BV/01	**Receive and manage INITIALIZATION.request (BST)**
TP origin	Identical to TP/AL-I/OBU/BV/01 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Reference	ISO 13141:2015, 6.2.2
Initial condition	See TP/AL-I/OBU/BV/01 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Stimulus and expected behaviour	
See TP/AL-I/OBU/BV/01 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1.	

TP/AP-BAS/OBU/BV/02	**Receive and manage EVENTREPORT request (RELEASE) with mode = 0**
TP origin	Identical to TP/AL-I/OBU/BV/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Reference	ISO 13141:2015, 6.2.4
Initial condition	See TP/AL-I/OBU/BV/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Stimulus and expected behaviour	
See TP/AL-I/OBU/BV/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1.	

TP/AP-BAS/OBU/BV/03	**Read and manage the BeaconID in the BST**
TP origin	Identical to TP/AL-I/OBU/BV/03 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Reference	ISO 13141:2015, 6.2.2
Initial condition	Identical to TP/AL-I/OBU/BV/03 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Stimulus and expected behaviour	
See TP/AL-I/OBU/BV/03 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1.	

TP/AP-BAS/OBU/BV/04	Read and manage time of reception of BST in parameter time in BST
TP origin	Identical to TP/AL-I/OBU/BV/04 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Reference	ISO 13141:2015, 6.2.2
Initial condition	Identical to TP/AL-I/OBU/BV/04 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Stimulus and expected behaviour	
See TP/AL-I/OBU/BV/04 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1.	

NOTE Test purposes with ID TP/AP-BAS/OBU/BV/04 to TP/AP-BAS/OBU/BV/08 have not been used in order to be in line with the numbering in ETSI/TS 102 486-2-2-V1.2.1.

TP/AP-BAS/OBU/BV/09	Manage profile selection
TP origin	Identical to TP/AL-I/OBU/BV/09 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Reference	ISO 13141:2015, 6.2.2
Initial condition	See TP/AL-I/OBU/BV/09 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1
Stimulus and expected behaviour	
See TP/AL-I/OBU/BV/09 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.1.	

TP/AP-BAS/OBU/BV/10	Verify that the DUT replies to a BST with a VST		
TP origin	Specific		
Reference	ISO 13141:2015, 6.2.2		
Initial condition	DUT not in sleep mode and not yet initialized		
Stimulus and expected behaviour			
	Tester		DUT
1	BST1	⇒	
2		⇐	VST
3	Verify length and allowed values of VST (see Table A.3)		
4	IF verification performed in step 3 was not successful, THEN TP failed		

A.4.3.3 BI test purposes

Test subgroup objective:

— to check the behaviour of the DUT in response to invalid messages.

TP/AP-BAS/OBU/BI/01	Manage profile selection
TP origin	Identical to TP/AL-I/OBU/BI/01 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.2
Reference	ISO 13141:2015, 6.2.2

Initial condition	See TP/AL-I/OBU/BI/01 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.2
Stimulus and expected behaviour	
See TP/AL-I/OBU/BI/01 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.2.	

TP/AP-BAS/OBU/BI/02	**Manage applications**
TP origin	Identical to TP/AL-I/OBU/BI/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.2
Reference	ISO 13141:2015, 6.2.2
Initial condition	See TP/AL-I/OBU/BI/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.2
Stimulus and expected behaviour	
See TP/AL-I/OBU/BI/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.4.2.	

TP/AP-BAS/OBU/BI/03	**Verify that the DUT handles BST with LAC application marked as non-mandatory application**		
TP origin	Specific		
Reference	ISO 13141:2015, 6.2.2		
Initial condition	DUT not in sleep mode and not yet initialized		
Stimulus and expected behaviour			
	Tester		**DUT**
1	BST2	⇒	
3	Verify that DUT does not initialize with INITIALIZATION-response (VST).		
4	IF verification performed in step 3 was not successful, THEN TP failed		

A.4.4 Application T-kernel test purposes for On-Board Unit

These Test Purposes apply to the layer 7 functions related to T-kernel as claimed in ISO 13141:2015, Table B.7, Items 1, 2 and 5.

A.4.4.1 BV test purposes

Test subgroup objective:

— to test the behaviour of the DUT in relation to syntactically and contextual correct behaviour of the test system.

TP/AP-FUN/OBU/BV/02	**Receive SET.request and manage SET.response with LID = private**
TP origin	Identical to TP/AL-T/OBU/BV/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Reference	ISO 13141:2015, 6.2.3
Initial condition	See TP/AL-T/OBU/BV/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Stimulus and expected behaviour	
See TP/AL-T/OBU/BV/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1. NOTE: Request with accessCredentials.	

TP/AP-FUN/OBU/BV/13	Receive and manage non-fragmented APDUs with random PDU number
TP origin	Identical to TP/AL-T/OBU/BV/13 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Reference	ISO 13141:2015, 6.2.3
Initial condition	See TP/AL-T/OBU/BV/13 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Stimulus and expected behaviour	
See TP/AL-T/OBU/BV/13 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1. NOTE: Request with accessCredentials for SET. Test case applicable only for SET.	

TP/AP-FUN/OBU/BV/14	Receive and manage multiplexed APDUs from two different applications
TP origin	Identical to TP/AL-T/OBU/BV/14 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Reference	ISO 13141:2015, 6.2.3
Initial condition	See TP/AL-T/OBU/BV/14 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Stimulus and expected behaviour	
See TP/AL-T/OBU/BV/14 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1. NOTE: Request with accessCredentials for SET. Test case applicable only for SET.	

TP/AP-FUN/OBU/BV/16	Receive and manage concatenated and chained APDUs from a single application
TP origin	Identical to TP/AL-T/OBU/BV/16 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Reference	ISO 13141:2015, 6.2.3
Initial condition	See TP/AL-T/OBU/BV/16 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1
Stimulus and expected behaviour	
See TP/AL-T/OBU/BV/16 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.1. NOTE: Request with accessCredentials for SET. Test case applicable only for SET.	

TP/AP-FUN/OBU/BV/18	Support of DSRC L7 SET
TP origin	Identical to TC04-A in ISO/TS 14907-2:2016, C.2.4
Reference	ISO 13141:2015, 6.2.3
Initial condition	See TC04-A in ISO/TS 14907-2:2016, C.2.4
Stimulus and expected behaviour	
See TC04-A in ISO/TS 14907-2:2016, C.2.4. NOTE: Request with accessCredentials.	

A.4.4.2 BI test purposes

Test subgroup objective:

— to check the behaviour of the of the DUT in response to invalid stimuli and behaviour from the test tool.

TP/AP-FUN/OBU/BI/02	Receive and manage PDUs to broadcast kernel with awake but not yet initialized OBU
TP origin	Identical to TP/AL-T/OBU/BI/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Reference	ISO 13141:2015, 6.2.2
Initial condition	See TP/AL-T/OBU/BI/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Stimulus and expected behaviour See TP/AL-T/OBU/BI/02 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2.	

TP/AP-FUN/OBU/BI/03	Receive and manage non-fragmented PDUs with wrong fragment counter value with initialized OBU
TP origin	Identical to TP/AL-T/OBU/BI/03 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Reference	ISO 13141:2015, 6.2.3
Initial condition	See TP/AL-T/OBU/BI/03 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Stimulus and expected behaviour See TP/AL-T/OBU/BI/03 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2. NOTE: Request with accessCredentials for SET. Test case applicable only for SET.	

TP/AP-FUN/OBU/BI/04	Receive and manage non-fragmented PDUs with wrong fragment counter value with awake but not yet initialized OBU
TP origin	Identical to TP/AL-T/OBU/BI/04 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Reference	ISO 13141:2015, 6.2.2
Initial condition	See TP/AL-T/OBU/BI/04 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Stimulus and expected behaviour See TP/AL-T/OBU/BI/04 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2.	

NOTE Test purposes with ID TP/AP-BAS/OBU/BI/05 have not been used in order to be in line with the numbering in ETSI/TS 102 486-2-2-V1.2.1.

TP/AP-FUN/OBU/BI/06	Receive and manage concatenated and chained APDUs from a single application with chaining error
TP Origin	Identical to TP/AL-T/OBU/BI/06 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Reference	ISO 13141:2015, 6.2.3
Initial Condition	See TP/AL-T/OBU/BI/06 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2
Stimulus and Expected Behaviour See TP/AL-T/OBU/BI/06 in ETSI/TS 102 486-2-2-V1.2.1 (2008-10), 5.2.2. NOTE: Request with accessCredentials for SET. Test case applicable only for SET.	

A.4.5 Application data attributes test purposes, security level 1

These Test Purposes apply to security level 1 as claimed in ISO 13141:2015, Table B.6, Item 1, SET operation as claimed in ISO 13141:2015, Table B.7, Item 2 and attributes as claimed in ISO 13141:2015, Table B.9, Item 1 and ISO 13141:2015, Table B.10, Items 1 to 11.

A.4.5.1 Data attributes definition

Table A.9 contains the references to the standard definition of attributes length and allowed values.

Table A.9 — Table 12: Data group definition

Attribute	AttrId	Data element	Defined in...
LACData	54	lACOperator	[ISO 14906:2011/Amd 1:2015]
		rSEId	[ISO 13141:2015]
		latitude	[ISO 12813:2015]
		longitude	[ISO 12813:2015]
		altitude	[ISO 13141:2015]
		tollCharger	[ISO/TS 17575-1]
		chargeObject	[ISO/TS 17575-1]
		distanceToObject	[ISO 13141:2015]
		lACTime	[ISO 14906:2011/Amd 1:2015]
		mAC-TC	[ISO 13141:2015]
		mAC2	[ISO 13141:2015]

A.4.5.2 BV test purposes

Test subgroup objective:

— to test the behaviour of the DUT in relation to the support of mandatory attributes (in allowed length and allowed values):

  — LACData;

— by means of the syntactically and contextual correct PDUs:

  — SET using both confirmed and non-confirmed mode;

— to test the behaviour of the DUT receiving LACData from different toll contexts.

TP/AP-DAT/OBU/BV/01	**Verify that OBU accepts SET.rq on LACData attribute (confirmed mode)**		
TP origin	Specific		
Reference	ISO/TS 13141:2015, 6.2.3 and 7.1		
Initial condition	OBU initialized and can accept a SET-request		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**SET.rq** = { fill = 0, mode = T, eid = VST. DSRC- eid, accessCredentials = ac_1, attrList = {('54'D, v_1)}, iid = Ø }	⇒	
2		⇐	**SET.rs** = { fill, eid, iid = Ø, returnStatus }
3	IF (returnStatus NOT OK) OR (response not received), THEN TP failed		

TP/AP-DAT/OBU/BV/02	**Verify that OBU accepts SET.rq on LACData attribute for multiple toll contexts in separate messages (confirmed mode)**
TP origin	Specific
Reference	ISO 13141:2015, 8.3

Initial condition	OBU initialized and can accept a SET-request		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**SET.rq** = { fill = 0, mode = T, eid = VST. DSRC- eid, accessCredentials = ac_1, attrList = {('54'D, v_1)}, iid = Ø }	⇒	
2		⇐	**SET.rs** = { fill, eid, iid = Ø, returnStatus }
3	IF (returnStatus NOT OK) OR (response not received) THEN TP failed		
4	**SET.rq** = { fill = 0, mode = T, eid = VST. DSRC- eid, accessCredentials = ac_1, attrList = {('54'D, v_2)}, iid = Ø }	⇒	
5		⇐	**SET.rs** = { fill, eid, iid = Ø, returnStatus }
6	IF (returnStatus NOT OK) OR (response not received), THEN TP failed		

TP/AP-DAT/OBU/BV/03	**Verify that OBU accepts SET.rq on LACData attribute (non-confirmed mode)**		
TP origin	Specific		
Reference	ISO/TS 13141:2015, 6.2.3 and 7.1		
Initial condition	OBU initialised and can accept a SET-request		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**SET.rq** = { fill = 0, mode = F, eid = VST. DSRC- eid, accessCredentials = ac_1, attrList = {('54'D, v_1)}, iid = Ø }	⇒	
2	IF (any message from DUT received) OR (LACData not stored correctly in DUT), THEN TP failed NOTE: Condition "LACData not stored correctly in DUT" cannot be tested in black-box configuration, as DUT does not support GET message. This condition shall be tested using other means.		

TP/AP-DAT/OBU/BV/04	**Verify that OBU accepts SET.rq on LACData attribute for multiple toll contexts in separate messages (non-confirmed mode)**		
TP origin	Specific		
Reference	ISO 13141:2015, 8.3		
Initial condition	OBU initialized and can accept a SET-request		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**SET.rq** = { fill = 0, mode = F, eid = VST. DSRC- eid, accessCredentials = ac_1, attrList = {('54'D, v_1)}, iid = Ø }	⇒	

2	IF (any message from DUT received) OR (LACData not stored correctly in DUT) THEN TP failed NOTE: Condition “LACData not stored correctly in DUT” cannot be tested in black-box configuration, as DUT does not support GET message. This condition shall be tested using other means.	⇐	
3	**SET.rq** = { fill = 0, mode = F, eid = VST. DSRC- eid, accessCredentials = ac_1, attrList = {(‘54’D, v_2)}, iid = Ø }		
4	IF (any message from DUT received) OR (LACData not stored correctly in DUT), THEN TP failed NOTE: Condition “LACData not stored correctly in DUT” cannot be tested in black-box configuration, as DUT does not support GET message. This condition shall be tested using other means.		

A.4.5.3 BI test purposes

Test subgroup objective:

— to check the behaviour of the DUT in response to request with invalid accessCredentials;

— to check behaviour of the DUT once Tester tries to read LACData attribute.

NOTE The correct behaviour from the DUT in response to request with LACData attribute with wrong length is not defined by ISO 13141.

TP/AP-DAT/OBU/BI/01	**Verify that OBU prevents the update of LACData attribute with invalid access credentials**		
TP origin	Specific		
Reference	ISO 13141:2015, 6.2.3 and 6.3.2		
Initial condition	OBU initialized and can accept a SET-request		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**SET.rq** = { fill = 0, mode = T, eid = VST. DSRC-eid, accessCredentials = invalid_ac, attrList = {(‘54’D, v_1)}, iid = Ø }	⇒	
2		⇐	**SET.rs** = { fill, eid, iid = Ø, returnStatus }
3	IF (response received) AND (returnStatus ! = OK), THEN TP passed		

TP/AP-DAT/OBU/BI/02	**Verify that OBU prevents getting of LACData attribute by RSE**		
TP origin	Specific		
Reference	ISO/TS 13141:2015, 6.2.3		
Initial condition	OBU initialized and can receive SET message		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**GET.rq** = { fill = 0, eid = VST. DSRC-eid, accessCredentials = ac_1, iid = Ø, attrIdList = { '54'D - - LACData } }	⇒	
2	IF (GET.rs with returnStatus OK received) OR (GET.rs with any values received), THEN TP failed		

Annex B
(normative)

Test purposes for roadside equipment

B.1 General

This annex contains the Test Purposes (TP) for the conformity evaluation of RSE to ISO 13141.

B.1.1 TP symbols conventions

For the application layer test purposes, a special notation and symbol convention is used, as defined in what follows.

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

Table B.1 — Description of TP symbols

Symbol	Description
XXX.rq ⇒	The DUT sends the XXX.rq PDU to the tester.
⇐ YYY.rs	The tester sends the YYY.rs PDU to the DUT.
A ≡ B	Test Purpose A “is congruent to” Test Purpose B. The notation Test Purpose A ≡ Test Purpose B means that the Test Purpose A is the same as Test Purpose B. If differences in parameters or parameter values have to be applied, these differences are indicated in the text immediately below.
A → B	Object A “is transformed” into Object B. So a notation like “Table X → Table Y” means that for the scope of the Test Purpose, any reference of Table X should be changed into references to Table Y.
=	Means “assignment”. That is, a notation like “accessCredentials = a value” means that the field accessCredentials is given a value.
Ø	Means “empty” or “not set”. So, a notation like “accessCredentials = Ø → accessCredentials = calculated value”, for a given Test Purpose, means “change all occurrences in which the field accessCredentials has not been assigned to calculation of the value accessCredentials to a given value.

In addition, it has to be noted that the sequence of PDUs issued by an RSE is not constrained by ISO 13141. This means that PDUs cannot in general be forced to be generated by the DUT. In order for the test purposes to adequately cover all possibilities, and at the same time avoid the combinatorial explosion, an abbreviated notation has been used. According to the notation, if in a test purpose, a step is indicated as:

n	See Table B.2 — PDU Selector

This means that according to the received PDU, a corresponding test purpose is to be executed, as indicated in Table B.2.

Table B.2 — PDU Selector

n	On arriving	SET.rq	Execute	TP/AP-SET/RSE/...	... BI/x
		EVENT-REPORT.rq		TP/AP-REL/RSE/...	or ...BV/y
		Any other PDU	TP failed		

In order for the Test Purposes to clearly identify and specify the subject of the test, and because of the fact that most Application Protocol Data Unit exchanges can only be tested after other exchanges had been previously successfully performed, the Tester has been modelled as controlling a variable, named **Error**, which indicates if a previously executed Test Purpose had failed. This allows to properly control the sequence of events in a Test Purpose. The variable Error is set by the Tester to either T (True) or F (False), to indicate whether an error occurred or not.

Additionally, as most Application Protocol Data Unit carry the **mode** parameter, which indicates whether a response is expected or not, this mode parameter can be used in some Test Purpose by the Tester in order to decide whether to issue a response or not in the case the Test Purpose passes, so to enable the DUT to continue issuing requests in subsequent Test Purposes.

B.2 Physical Layer

Per ISO 13141:2015, 5.5.2, all test purposes TP/PHY/RSE/Bx/yy defined in EN 15876-1 are applicable for the conformity evaluation of RSE to CEN–DSRC based LAC as claimed in ISO 13141:2015, Table B.18, Item 1.

B.3 MAC and LLC

Per ISO 13141:2015, 5.5.2, all test purposes TP/MAC/RSE/Bx/yy and TP/LLC/RSE/Bx/yy defined in EN 15876-1, are applicable for the conformity evaluation of RSE to CEN–DSRC based LAC as claimed in ISO 13141:2015, Table B.18, Item 1.

B.4 Application Layer Test Purposes

B.4.1 Application initialization phase test purposes

These Test Purposes apply to the INITIALIZATION as claimed in ISO 13141:2015, Table B.17, Item 1.

To the purpose of this conformance test, the following VST described in Table B.3 is transmitted to the DUT.

Table B.3 — VST1 (security level 1); valid VST

						Length	Allowed value
fill						4 bits	any
profile						1 bit (Profile ext.)	0 (= no extension)
						7 bits	See Profile in EN 12834:2003, Annex A
applications						1 bit (applications ext.)	0 (= no extension)
						7 bits (number of applic.)	2
	LAC Application					1 bit (eid opt.)	1 (= eid present)
						1 bit (parameter opt.)	1 (= parameter present)
		aid				1 bit (aid ext.)	0 (= no extension)
						5 bits	21 (= LAC application)
		eid				1 bit (eid ext.)	0 (= no extension)
						7 bits	any
		para meter				1 bit (Container ext.)	0 (= no extension)
						7 bits (Container CHOICE)	2 (= OCTET STRING)
						1 bit (octet string ext.)	0 (= no extension)
						7 bits (octet string length)	16
			LAC-ContextMark	Contract Provider		10 bits (CountryCode)	See ISO 3166-1
						14 bits (IssuerIdentifier)	See ISO 14816
				TypeOf Contract		16 bits	any
				Context Version		1 bit (contextVersion ext.)	0 (= no extension)
						7 bits	any
						1 bit (Container ext.)	0 (= no extension)
						7 bits (Container CHOICE)	2 (= OCTET STRING)
						1 bit (octet string ext.)	0 (= no extension)
						7 bits (octet string length)	2
			AC_CR-Reference	AC_Master KeyRef		8 bits	any
				AC_CR-Diversifier		8 bits	any
						1 bit (Container ext.)	0 (= no extension)
						7 bits (Container CHOICE)	2 (= OCTET STRING)
						1 bit (octet string ext.)	0 (= no extension)
						7 bits (octet string length)	4
			RndOBE			32 bits	any
	Application 2					1 bit (eid opt.)	1 (= eid present)
						1 bit (parameter opt.)	0 (= parameter not present)
			aid			1 bit (aid ext.)	0 (= no extension)
						5 bits	≠ 21
			eid			1 bit (eid ext.)	0 (= no extension)
						7 bits	any (≠ other eid used in this VST)
obe Configuration						1 bit (obeStatus opt.)	1 (= obeStatus present)
	equipmentClass					15 bits	any
	manufacturerId					16 bits	any
	obeStatus					16 bits	any

B.4.1.1 BV test purposes

Test subgroup objective:

— to test the behaviour of the DUT in relation to valid VST.

TP/AP-BAS/RSE/BV/01	**Verify that DUT supports the BST**		
TP origin	Specific		
Reference	ISO 13141:2015, 6.2.2 and 8.2		
Initial condition	DUT and Tester are not in initialization or transaction phase		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**BST**	⇒	
2			Verify length and allowed values of BST (see Table A.2)
3			IF verification performed in step 2 was not successful, THEN TP failed
4		⇐	**VST1**
5	See Table B.2.		

B.4.1.2 BI test purposes

Not applicable.

B.4.2 Application SET-rq PDU test purposes

These Test Purposes apply to SET as claimed in ISO 13141:2015, Table B.17, Item 2 and to the data requirements as claimed in ISO 13141:2015, Table B.19, Item 1 and ISO 13141:2015, Table B.20, Items 1 to 11.

B.4.2.1 BV test purposes

Test subgroup objective:

— to test the DUT support of SET-rq;

— to test the behaviour of DUT in relation to valid SET-rs.

TP/AP-SET/RSE/BV/01	**Verify that DUT supports the writing of LACData attribute**		
TP origin	Specific		
Reference	ISO 13141:2015, 6.2.3, 5.3 and 7.1		
Initial condition	DUT and Tester initialized		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**SET.rq** = { fill, mode, eid = VST. DSRC-eid, accessCredentials = ac_1, attrList = {('54'D, v_1)}, iid = Ø }	⇒	

2			1. Verify length and allowed values of request parameters (see Table A.4). 2. Verify that attrList contains data attributes of Table A.9. Note that all data elements from above mentioned, table must be present in the request. LACData attribute shall be present in attrList at least once. 3. Verify that LACData consists of valid geographical coordinates (longitude, latitude, altitude) or valid charging object reference (ChargeObject) or both.
3			IF verification performed in step 2 was not successful, THEN TP failed

4		⇐	IF mode = T in **SET.rq** (step 1) THEN
			SET.rs = { fill = 0, eid = VST.DSRC-eid, iid = Ø,returnStatus = 0}
			ENDIF

5	See Table B.2.		

B.4.2.2 BI test purposes

Not applicable.

B.4.3 Application EVENT-REPORT-rq PDU test purposes

These Test Purposes apply to the EVENT-REPORT as claimed in ISO 13141:2015, Table B.17, Item 5.

B.4.3.1 BV test purposes

Test subgroup objective:

— to test the DUT support of EVENT-REPORT-rq.

TP/AP-REL/RSE/BV/01	**Verify that DUT supports the EVENT-REPORT-rq**		
TP origin	Specific		
Reference	ISO 13141:2015, 6.2.4 and 8.3		
Initial condition	DUT and Tester initialized		
Stimulus and expected behaviour			
	Tester		**DUT**
1	**EVENT-REPORT.rq** = { mode, eid, eventType, accessCredentials, eventParameter, iid}	⇒	
2			Verify length and allowed values of request parameters (see Table A.5).
3			IF verification performed in step 2 was not successful, THEN TP failed

B.4.3.2 BI test purposes

Not applicable.

Annex C
(normative)

PCTR proforma for on-board units

C.1 General

The protocol conformance test report (PCTR) proforma is based on ISO/IEC 9646-6, which can be consulted for any necessary additional information.

C.2 Identification summary

C.2.1 Protocol conformance test report

Table C.1 — Protocol conformance test report

PCTR Number:	
PCTR Date:	
Corresponding SCTR Number:	
Corresponding SCTR Date:	
Test Laboratory Identification:	
Test Laboratory Manager:	
Signature	

C.2.2 DUT identification

Table C.2 — DUT identification

Name:	
Version:	
Protocol specification:	
PICS:	
Previous PCTR if any:	

C.2.3 Testing environment

Table C.3 — Testing environment

PIXIT Number:	
ATS Specification:	
Abstract Test Method:	
Means of Testing identification:	
Date of testing:	
Conformance Log reference(s):	
Retention Date for Log reference(s):	

C.2.4 Limits and reservation

Additional information relevant to the technical contents or further use of the test report, or the rights and obligations of the test laboratory and the client, may be given here. Such information may include restriction on the publication of the report.

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C.2.5 Comments

Additional comments may be given by either the client or the test laboratory on any of the contents of the PCTR, for example, to note disagreement between the two parties.

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C.3 DUT Conformance status

This DUT has or has not been shown by conformance assessment to be non-conforming to the specified protocol specification.

Strike the appropriate words in this sentence. If the PICS for this DUT is consistent with the static conformance requirements (as specified in C.3) and there are no "FAIL" verdicts to be recorded (in C.6), strike the words "has or", otherwise strike the words "or has not".

C.4 Static conformance summary

The PICS for this DUT is or is not consistent with the static conformance requirements in the specified protocol.

Strike the appropriate words in this sentence.

C.5 Dynamic conformance summary

The test campaign did or did not reveal errors in the DUT.

Strike the appropriate words in this sentence. If there are no "FAIL" verdicts to be recorded (in C.6), strike the words "did or" otherwise strike the words "or did not".

Summary of the results of groups of test:

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C.6 Static conformance review report

If C.3 indicates non-conformance, this subclause itemises the mismatches between the PICS and the static conformance requirements of the specified protocol specification.

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C.7 Test campaign report

Table C.4 — Test campaign report

ATS reference	Selected?	Run?	Verdict	Observations (reference to any observations made in C.7)
TP/PHY/OBU/BV/01	Yes/No	Yes/No		
TP/PHY/OBU/BV/02	Yes/No	Yes/No		
TP/PHY/OBU/BV/03	Yes/No	Yes/No		
TP/PHY/OBU/BV/04	Yes/No	Yes/No		
TP/PHY/OBU/BV/05	Yes/No	Yes/No		
TP/PHY/OBU/BV/06	Yes/No	Yes/No		
TP/PHY/OBU/BV/07	Yes/No	Yes/No		
TP/PHY/OBU/BV/08	Yes/No	Yes/No		
TP/PHY/OBU/BV/09	Yes/No	Yes/No		
TP/MAC/OBU/BV/01	Yes/No	Yes/No		
TP/MAC/OBU/BV/02	Yes/No	Yes/No		
TP/MAC/OBU/BV/03	Yes/No	Yes/No		
TP/MAC/OBU/BV/04	Yes/No	Yes/No		
TP/MAC/OBU/BV/05	Yes/No	Yes/No		

Table C.4 *(continued)*

ATS reference	Selected?	Run?	Verdict	Observations (reference to any observations made in C.7)
TP/MAC/OBU/BV/06	Yes/No	Yes/No		
TP/MAC/OBU/BV/07	Yes/No	Yes/No		
TP/MAC/OBU/BV/08	Yes/No	Yes/No		
TP/MAC/OBU/BV/09	Yes/No	Yes/No		
TP/MAC/OBU/BI/01	Yes/No	Yes/No		
TP/MAC/OBU/BI/02	Yes/No	Yes/No		
TP/MAC/OBU/BI/03	Yes/No	Yes/No		
TP/MAC/OBU/BI/04	Yes/No	Yes/No		
TP/MAC/OBU/BI/05	Yes/No	Yes/No		
TP/MAC/OBU/BI/06	Yes/No	Yes/No		
TP/MAC/OBU/BI/07	Yes/No	Yes/No		
TP/MAC/OBU/BI/08	Yes/No	Yes/No		
TP/MAC/OBU/BI/09	Yes/No	Yes/No		
TP/MAC/OBU/BI/10	Yes/No	Yes/No		
TP/MAC/OBU/BI/11	Yes/No	Yes/No		
TP/MAC/OBU/BI/12	Yes/No	Yes/No		
TP/MAC/OBU/BI/13	Yes/No	Yes/No		
TP/MAC/OBU/BI/14	Yes/No	Yes/No		
TP/MAC/OBU/BI/15	Yes/No	Yes/No		
TP/MAC/OBU/BI/16	Yes/No	Yes/No		
TP/MAC/OBU/BI/17	Yes/No	Yes/No		
TP/MAC/OBU/BI/18	Yes/No	Yes/No		
TP/MAC/OBU/BI/19	Yes/No	Yes/No		
TP/MAC/OBU/BI/20	Yes/No	Yes/No		
TP/MAC/OBU/BI/21	Yes/No	Yes/No		
TP/MAC/OBU/BI/22	Yes/No	Yes/No		
TP/MAC/OBU/BI/23	Yes/No	Yes/No		
TP/MAC/OBU/BI/24	Yes/No	Yes/No		
TP/LLC/OBU/BV/01	Yes/No	Yes/No		
TP/LLC/OBU/BV/02	Yes/No	Yes/No		
TP/LLC/OBU/BV/03	Yes/No	Yes/No		
TP/LLC/OBU/BV/04	No	No	n.a.	Empty Test Purpose
TP/LLC/OBU/BV/05	Yes/No	Yes/No		
TP/LLC/OBU/BI/01	Yes/No	Yes/No		
TP/LLC/OBU/BI/02	Yes/No	Yes/No		
TP/LLC/OBU/BI/03	Yes/No	Yes/No		
TP/LLC/OBU/BI/04	Yes/No	Yes/No		
TP/LLC/OBU/BI/05	Yes/No	Yes/No		

Table C.4 *(continued)*

ATS reference	Selected?	Run?	Verdict	Observations (Reference to any observations made in C.7)
TP/LLC/OBU/BI/06	Yes/No	Yes/No		
TP/LLC/OBU/BI/07	Yes/No	Yes/No		
TP/AP-BAS/OBU/BV/01	Yes/No	Yes/No		
TP/AP-BAS/OBU/BV/02	Yes/No	Yes/No		
TP/AP-BAS/OBU/BV/03	Yes/No	Yes/No		
TP/AP-BAS/OBU/BV/04	Yes/No	Yes/No		
TP/AP-BAS/OBU/BV/05	No	No	n.a.	Empty Test Purpose
TP/AP-BAS/OBU/BV/06	No	No	n.a.	Empty Test Purpose
TP/AP-BAS/OBU/BV/07	No	No	n.a.	Empty Test Purpose
TP/AP-BAS/OBU/BV/08	No	No	n.a.	Empty Test Purpose
TP/AP-BAS/OBU/BV/09	Yes/No	Yes/No		
TP/AP-BAS/OBU/BV/10	Yes/No	Yes/No		
TP/AP-BAS/OBU/BI/01	Yes/No	Yes/No		
TP/AP-BAS/OBU/BI/02	Yes/No	Yes/No		
TP/AP-BAS/OBU/BI/03	Yes/No	Yes/No		
TP/AP-FUN/OBU/BV/02	Yes/No	Yes/No		
TP/AP-FUN/OBU/BV/13	Yes/No	Yes/No		
TP/AP-FUN/OBU/BV/14	Yes/No	Yes/No		
TP/AP-FUN/OBU/BV/16	Yes/No	Yes/No		
TP/AP-FUN/OBU/BV/18	Yes/No	Yes/No		
TP/AP-FUN/OBU/BI/02	Yes/No	Yes/No		
TP/AP-FUN/OBU/BI/03	Yes/No	Yes/No		
TP/AP-FUN/OBU/BI/04	Yes/No	Yes/No		
TP/AP-FUN/OBU/BI/05	No	No	n.a.	Empty Test Purpose
TP/AP-FUN/OBU/BI/06	Yes/No	Yes/No		
TP/AP-DAT/OBU/BV/01	Yes/No	Yes/No		
TP/AP-DAT/OBU/BV/02	Yes/No	Yes/No		
TP/AP-DAT/OBU/BV/03	Yes/No	Yes/No		
TP/AP-DAT/OBU/BV/04	Yes/No	Yes/No		
TP/AP-DAT/OBU/BI/01	Yes/No	Yes/No		
TP/AP-DAT/OBU/BI/02	Yes/No	Yes/No		

C.8 Observations

Additional information relevant to the technical content of the PCTR is given here.

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Annex D
(normative)

PCTR proforma for roadside equipment

The protocol conformance test report (PCTR) proforma is based on ISO/IEC 9646-6, which can be consulted for any necessary additional information.

D.1 Identification summary

D.1.1 Protocol conformance test report

Table D.1 — Protocol conformance test report

PCTR Number:	
PCTR Date:	
Corresponding SCTR Number:	
Corresponding SCTR Date:	
Test Laboratory Identification:	
Test Laboratory Manager:	
Signature	

D.1.2 DUT identification

Table D.2 — DUT identification

Name:	
Version:	
Protocol specification:	
PICS:	
Previous PCTR if any:	

D.1.3 Testing environment

Table D.3 — Testing environment

PIXIT Number:	
ATS Specification:	
Abstract Test Method:	
Means of Testing identification:	
Date of testing:	
Conformance Log reference(s):	
Retention Date for Log reference(s):	

D.1.4 Limits and reservation

Additional information relevant to the technical contents or further use of the test report, or the rights and obligations of the test laboratory and the client, may be given here. Such information may include restriction on the publication of the report.

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D.1.5 Comments

Additional comments may be given by either the client or the test laboratory on any of the contents of the PCTR, for example, to note disagreement between the two parties.

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D.2 DUT Conformance status

This DUT has or has not been shown by conformance assessment to be non-conforming to the specified protocol specification.

Strike the appropriate words in this sentence. If the PICS for this DUT is consistent with the static conformance requirements (as specified in D.3) and there are no "FAIL" verdicts to be recorded (in D.6), strike the words "has or", otherwise strike the words "or has not".

D.3 Static conformance summary

The PICS for this DUT is or is not consistent with the static conformance requirements in the specified protocol.

Strike the appropriate words in this sentence.

D.4 Dynamic conformance summary

The test campaign did or did not reveal errors in the DUT.

Strike the appropriate words in this sentence. If there are no "FAIL" verdicts to be recorded (in D.6), strike the words "did or" otherwise strike the words "or did not".

Summary of the results of groups of test:

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D.5 Static conformance review report

If D.3 indicates non-conformance, this subclause itemises the mismatches between the PICS and the static conformance requirements of the specified protocol specification.

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D.6 Test campaign report

Table D.4 — Test campaign report

ATS reference	Selected?	Run?	Verdict	Observations (Reference to any observations made in D.7)
TP/PHY/RSE/BV/01	Yes/No	Yes/No		
TP/PHY/RSE/BV/02	Yes/No	Yes/No		
TP/PHY/RSE/BV/03	Yes/No	Yes/No		
TP/PHY/RSE/BV/04	Yes/No	Yes/No		
TP/PHY/RSE/BV/05	Yes/No	Yes/No		
TP/PHY/RSE/BV/06	Yes/No	Yes/No		
TP/PHY/RSE/BV/07	Yes/No	Yes/No		
TP/PHY/RSE/BV/08	Yes/No	Yes/No		
TP/PHY/RSE/BV/09	Yes/No	Yes/No		
TP/PHY/RSE/BV/10	Yes/No	Yes/No		
TP/PHY/RSE/BV/11	Yes/No	Yes/No		
TP/PHY/RSE/BV/12	Yes/No	Yes/No		
TP/MAC/RSE/BV/01	Yes/No	Yes/No		
TP/MAC/RSE/BV/02	Yes/No	Yes/No		
TP/MAC/RSE/BV/03	Yes/No	Yes/No		
TP/MAC/RSE/BV/04	Yes/No	Yes/No		
TP/MAC/RSE/BV/05	Yes/No	Yes/No		
TP/MAC/RSE/BV/06	Yes/No	Yes/No		

Table D.4 *(continued)*

ATS reference	Selected?	Run?	Verdict	Observations (Reference to any observations made in D.7)
TP/MAC/RSE/BV/07	Yes/No	Yes/No		
TP/MAC/RSE/BV/08	Yes/No	Yes/No		
TP/MAC/RSE/BI/01	Yes/No	Yes/No		
TP/MAC/RSE/BI/02	Yes/No	Yes/No		
TP/MAC/RSE/BI/03	Yes/No	Yes/No		
TP/MAC/RSE/BI/04	Yes/No	Yes/No		
TP/MAC/RSE/BI/05	Yes/No	Yes/No		
TP/MAC/RSE/BI/06	Yes/No	Yes/No		
TP/MAC/RSE/BI/07	Yes/No	Yes/No		
TP/MAC/RSE/BI/08	Yes/No	Yes/No		
TP/MAC/RSE/BI/09	Yes/No	Yes/No		
TP/MAC/RSE/BI/10	Yes/No	Yes/No		
TP/MAC/RSE/BI/11	Yes/No	Yes/No		
TP/MAC/RSE/BI/12	Yes/No	Yes/No		
TP/MAC/RSE/BI/13	Yes/No	Yes/No		
TP/MAC/RSE/BI/14	Yes/No	Yes/No		
TP/MAC/RSE/BI/15	Yes/No	Yes/No		
TP/MAC/RSE/BI/16	Yes/No	Yes/No		
TP/MAC/RSE/BI/17	Yes/No	Yes/No		
TP/MAC/RSE/BI/18	Yes/No	Yes/No		
TP/MAC/RSE/BI/19	Yes/No	Yes/No		
TP/MAC/RSE/BI/20	Yes/No	Yes/No		
TP/MAC/RSE/BI/21	Yes/No	Yes/No		
TP/LLC/RSE/BV/01	Yes/No	Yes/No		
TP/LLC/RSE/BV/02	Yes/No	Yes/No		
TP/LLC/RSE/BV/03	Yes/No	Yes/No		
TP/LLC/RSE/BV/04	Yes/No	Yes/No		
TP/LLC/RSE/BV/05	Yes/No	Yes/No		
TP/LLC/RSE/BI/01	Yes/No	Yes/No		
TP/LLC/RSE/BI/02	Yes/No	Yes/No		
TP/LLC/RSE/BI/03	Yes/No	Yes/No		
TP/LLC/RSE/BI/04	Yes/No	Yes/No		
TP/LLC/RSE/BI/05	Yes/No	Yes/No		
TP/AP-BAS/RSE/BV/01	Yes/No	Yes/No		
TP/AP-SET/RSE/BV/01	Yes/No	Yes/No		
TP/AP-REL/RSE/BV/01	Yes/No	Yes/No		

D.7 Observations

Additional information relevant to the technical content of the PCTR is given here.

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ICS 03.220.20; 35.240.60

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