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Electronic fee collection - Compliance check communication for autonomous systems (ISO 12813:2019)

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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See Eesti standard EVS-EN ISO 12813:2019 sisaldab Euroopa standardi EN ISO 12813:2019 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 12813:2019 consists of the English text of the European standard EN ISO 12813:2019.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 04.12.2019.	Date of Availability of the European standard is 04.12.2019.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 03.220.20, 35.240.60

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 12813

December 2019

ICS 03.220.20; 35.240.60

Supersedes EN ISO 12813:2015

English Version

Electronic fee collection - Compliance check communication for autonomous systems (ISO 12813:2019)

Perception de télépéage - Communication de contrôle de conformité pour systèmes autonomes (ISO 12813:2019)

Elektronische Gebührenerhebung - Kommunikation zur Übereinstimmungsprüfung für autonome Systeme (ISO 12813:2019)

This European Standard was approved by CEN on 5 October 2019.

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Ref. No. EN ISO 12813:2019 E

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European foreword

This document (EN ISO 12813:2019) has been prepared by Technical Committee ISO/TC 204 "Intelligent transport systems" in collaboration with Technical Committee CEN/TC 278 “Intelligent transport systems” 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of an identical text or by endorsement, at the latest by June 2020, and conflicting national standards shall be withdrawn at the latest by June 2020.

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

This document supersedes EN ISO 12813:2015.

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

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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 12813:2019 has been approved by CEN as EN ISO 12813:2019 without any modification.

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Contents

Page

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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).

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For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

This second edition cancels and replaces the first edition (ISO 12813:2015), which has been technically revised. It also incorporates the Amendment ISO 12813:2015/Amd 1:2017.

The main changes compared to the previous edition are as follows:

— inclusion of the changes of ISO 12813:2015/Amd 1:2017(E), i.e. it defines the electronic fee collection compliance check communication using the WAVE communication stack as defined in IEEE;

— reverting the length of attribute GnssStatus back to 23 octets and removing the data element of type Altitude;

— allowing a maximum of two instances of AID = 20 in the ApplicationList in the VST;

— adding values goSuspicion (5) and noGoPaymentMeans (4) to the data element statusIndicator as well as updating and clarifying the semantic definitions of all statuses and when they change;

— updating the OBEStatusHistory – timeWhenChanged and ExtendedOBEStatusHistory -timeWhenChanged/timeWhenChangedToPrevious based on the updated sematic definition of statusIndicator;

— clarifing the relationship between the LLLL element in VehicleClass and the LocalVehicleClassId (imported from ISO 17575-3);

— clarifing that ExtendedOBEStatusHistory - timeWhenChangedToPrevious shall be set to zero in case no previous value is available;

— clarifing that VehicleWeightHistory – timeWhenChangedToCurrentValue changes not only due to changes in the attribute VehicleCurrentMaxTrainWeight but also changes in the assignment of the LocalVehicleClassId or the LLL element within VehicleClass;

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— adding the EFC attributes ExtendedOBUStatusHistoryPart1, ExtendedOBUStatusHistoryPart2 and UserConfirmation;

— updating Annex C by adding the attributes VehicleCurrentMaxTrainWeight and AttributeUpdateInterval to the information in virtual memory according to ETSI ES 200 674-1 communication stack usage for CCC applications.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

On-board equipment (OBE) that uses satellite-based positioning technology to collect data required for charging for the use of roads operates in an autonomous way (i.e. without relying on dedicated roadside infrastructure). The OBE will record the amount of road usage in all toll charging systems it passes through.

This document defines requirements for dedicated short-range communication (DSRC) between OBE and an interrogator for the purpose of checking compliance of road use with a local toll regime. It assumes an electronic fee collection (EFC) services architecture according to ISO 17573-1. See Figure 1.

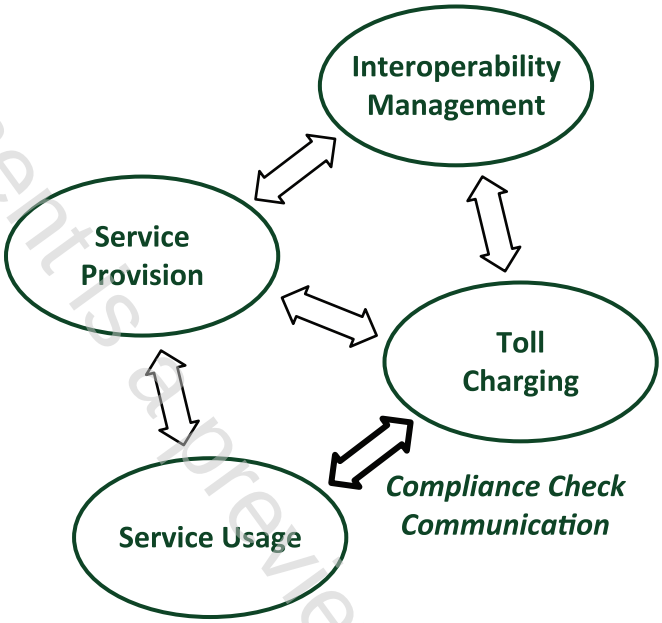

Figure 1 — Compliance check communication in EFC architecture according to ISO 17573-1

Toll chargers have the need to check whether the road is used in compliance with the rules in the local toll regime. One way of checking compliance is to observe a passing vehicle and to interrogate the OBE. This interrogation happens under control of an entity responsible for toll charging (see Figure 1), accomplished via short-range communication between an interrogator at roadside or in another vehicle (operated by a competent enforcement agency) and the OBE. In an interoperable environment, it is essential that this interrogation communication be standardized such that every operator of compliance checking equipment can check all passing OBE. For that purpose, this document defines attributes required on all OBE for reading by an interrogator.

This document has been prepared to fulfil the following statements:

a) Collected evidence can be used as court proof. Data is indisputable and secured such that the operator of the compliance checking interrogator can prove the integrity and authenticity of the data in case of dispute.

b) The data required for compliance checking is read only, since the operator of the interrogator does not interfere with the working of the OBE.

c) All attributes, standardised at the time of personalisation of the OBE, are present in the OBE such that an operator of an interrogator essentially can read the same data from all OBE independent of type and make. In case an attribute does not make sense in a certain OBE implementation, a value assignment for “not applicable” or “not defined” is provided in each case. An OBE compliant to the first edition will not answer with such a response for new attributes introduced in the current edition of this document.

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d) The attributes, derived from the individual toll regime, are of general importance for all toll system types (motorway tolling, area tolling, tolls for ferries, bridges, tunnels, cordon pricing, etc.).

e) The attributes apply to all OBE architectures, and especially to both thin (edge-light) and fat (edge heavy) client architectures. The interrogator is intended to receive essentially the same information irrespective of the type of OBE.

It is assumed that the prime objective of the operator of the compliance checking interrogator is to check whether the user has fulfilled his obligations, especially:

— whether the OBE is mounted in the correct vehicle;

— whether the classification data transmitted by the OBE are correct; and

— whether the OBE is in operational condition, both in a technical and a contractual sense.

Regarding the last point of the above list, on the operational status of OBE, the following model is assumed.

As long as the OBE signals to the user correct operational status ("green"), the service provider takes full responsibility for the correct operation of the OBE and for the payment by the user. Hence, as long as the OBE signals "green" and the user fulfils its other obligations (e.g. entering correct classification data and not tampering with the OBE), the user can expect the OBE to serve as a valid payment means. As soon as the OBE signals an invalid operational status ("red") — either set by the central system of the service provider (e.g. because the user account is negative), by internal mechanisms of the OBE itself (e.g. because of a detected defect or an outdated data set) or a user manipulation with such result — the user knows that the OBE is no longer a valid payment means. The user then has to use alternative means of toll declaration or payment until the problem is remedied and the OBE is "green" again[1)].

Ultimately, the policy of when to signal "green" or "red" is defined by the service provider in accordance with the requirements defined by the toll charger(s).

In the case where the OBE status turns "red", the user has to take action, declare road usage subject to fees or pay by some alternative means as soon as practicable. Until he does, the user is in a potentially non-compliant situation. In order to allow a judgment to be made as to whether or not a user has taken the appropriate action within an acceptable period of time, information is provided by this document not only on the "green/red" operational status but also on the length of time that the OBE has been in its current status.

Different toll contexts can overlap geographically. A user could be liable in several toll contexts at once, e.g. for a nationwide distance-dependent road tax and a local city access pricing scheme — a fact of which the user might not in all cases be aware. This document builds on the concept that regarding compliance, there is no notion of toll context as far as possible (see especially 5.4). It is within the responsibility of the service provider to resolve issues with overlapping toll contexts and to distil all information into a binary "red/green" message to the user.

A secondary objective of the operator of the compliance checking interrogator might be to collect data on the performance of the OBE, e.g. in order to check for the correct technical functioning. Since different OBE can work according to quite different principles, the possibilities for doing this in a standardised way are quite limited. This document contains some provisions for this task (e.g. the attributes CommunicationStatus, GnssStatus, DistanceRecordingStatus), but otherwise assumes that toll chargers monitor correct recording by comparing observed traffic (e.g. with cameras) with usage data received from service providers.

This document has been prepared with the intention to be "minimalist" in the sense that it covers what is required by operational systems and systems planned in the foreseeable future.

1) In this case, "red" and "green" are used in the abstract, symbolic sense, and do not imply any physical implementation. The design of the user interface of the OBE is implementation-dependent, and several methods for signalling "red" or "green" are conceivable.

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A test suite for checking an OBE or RSE implementation for compliance with this document is defined in the corresponding edition of ISO 13143-1 and ISO 13143-2.

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Electronic fee collection — Compliance check communication for autonomous systems

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1 Scope

This document defines requirements for short-range communication for the purposes of compliance checking in autonomous electronic fee collecting systems. Compliance checking communication (CCC) takes place between a road vehicle's on-board equipment (OBE) and an interrogator (roadside mounted equipment, mobile device or hand-held unit), and serves to establish whether the data that are delivered by the OBE correctly reflect the road usage of the corresponding vehicle according to the rules of the pertinent toll regime.

The operator of the compliance checking interrogator is assumed to be part of the toll charging role as defined in ISO 17573-1. The CCC permits identification of the OBE, vehicle and contract, and verification of whether the driver has fulfilled his obligations and the checking status and performance of the OBE. The CCC reads, but does not write, OBE data.

This document is applicable to OBE in an autonomous mode of operation; it is not applicable to compliance checking in dedicated short-range communication (DSRC)-based charging systems.

It defines data syntax and semantics, but not a communication sequence. All the attributes defined herein are required in any OBE claimed to be compliant with this document, even if some values are set to “not defined” in cases where certain functionality is not present in an OBE. The interrogator is free to choose which attributes are read in the data retrieval phase, as well as the sequence in which they are read. In order to achieve compatibility with existing systems, the communication makes use of the attributes defined in ISO 14906 wherever useful.

The CCC is suitable for a range of short-range communication media. Specific definitions are given for the CEN-DSRC as specified in EN 15509, as well as for the use of ISO CALM IR, the Italian DSRC as specified in ETSI ES 200 674-1, ARIB DSRC and WAVE DSRC as alternatives to the CEN-DSRC. The attributes and functions defined are for compliance checking by means of the DSRC communication services provided by DSRC application layer, with the CCC attributes and functions made available to the CCC applications at the roadside equipment (RSE) and OBE. The attributes and functions are defined on the level of application data units (ADU).

The definition of the CCC includes:

— the application interface between OBE and RSE (as depicted in Figure 2);

— use of the generic DSRC application layer as specified in ISO 15628 and EN 12834;

— CCC data type specifications given in Annex A;

— a protocol implementation conformance statement (PICS) proforma is given in Annex B;

— use of the CEN-DSRC stack as specified in EN 15509, or other equivalent DSRC stacks as described in Annex C, Annex D, Annex E and Annex F;

— security services for mutual authentication of the communication partners and for signing of data (see Annex H);

— an example CCC transaction is presented in Annex G;

— the informative Annex I highlights how to use this document for the European electronic toll service (as defined in Commission Decision 2009/750/EC).

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Test specifications are not within the scope of this document.

NOTE A test suite for checking an OBE or RSE implementation for compliance with this document is defined in the corresponding edition of ISO 13143-1 and ISO 13143-2.

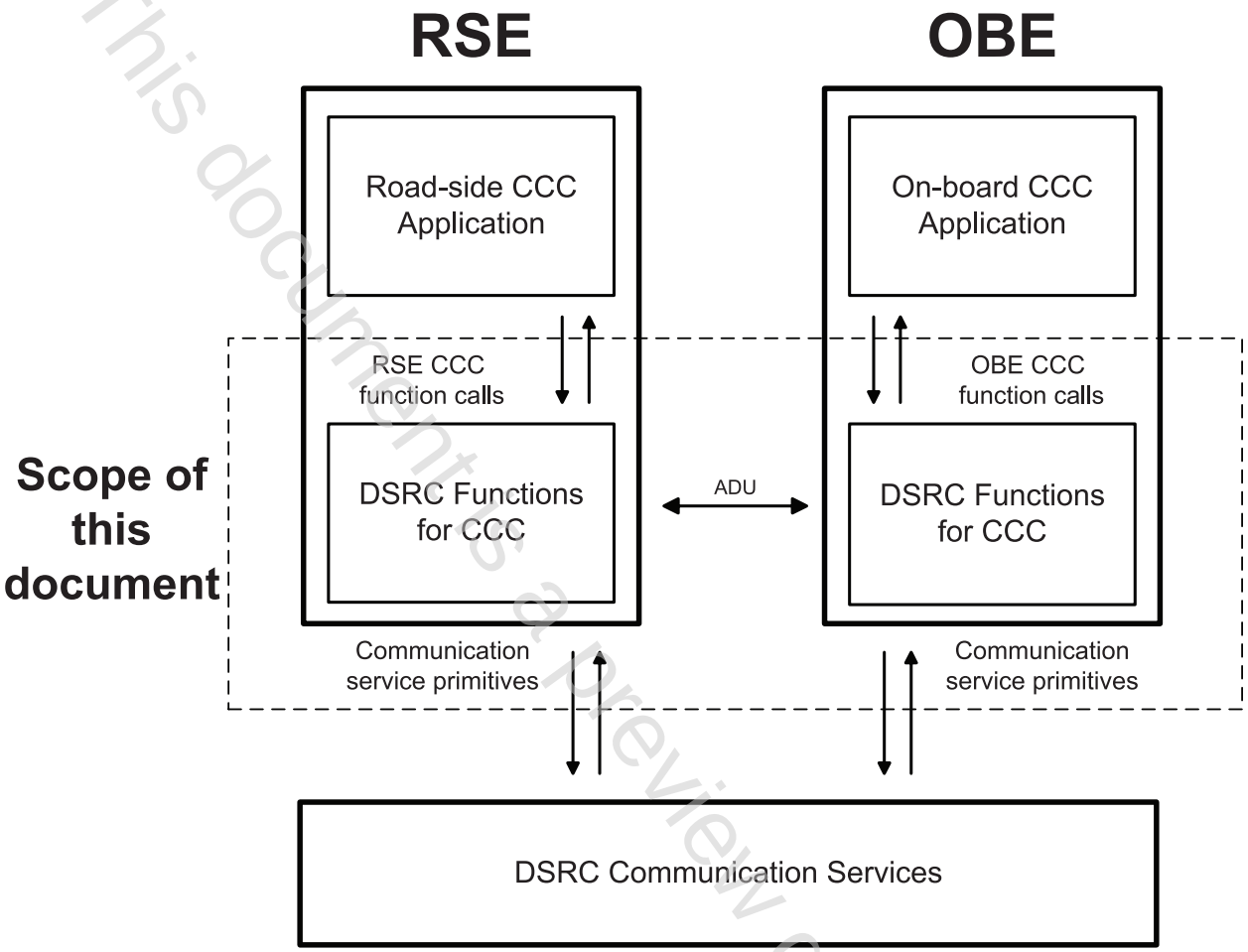

Figure 2 — CCC application interface

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 8824-1:2015, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO/IEC 8825-2:2015, *Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) — Part 2*

ISO 14906:2018, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO 14906:2018/Amd 1[2)], *Electronic fee collection — Application interface definition for dedicated short-range communication — Amendment 1*

2) To be published. Current stage: 40.99.

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ISO 17575-3:2016, *Electronic fee collection — Application interface definition for autonomous systems — Part 3: Context data*

ISO 15628:2013, *Intelligent transport systems — Dedicated short range communication (DSRC) — DSRC application layer*

EN 12834:2003, *Road transport and traffic telematics — Dedicated Short Range Communication (DSRC) — DSRC application layer*

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

NIMA Technical Report TR8350.2 version 3 — *Department of Defense World Geodetic System* 1984*, Its Definition and Relationships With Local Geodetic Systems*

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:

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

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

3.1
access credentials
AC_CR
trusted attestation or secure module that establishes the claimed identity of an object or application

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

3.3
authentication
security mechanism allowing verification of the provided identity

[SOURCE: EN 301 175 V1.1.1:1998, 3]

3.4
authenticator
data, possibly encrypted, that is used for authentication

3.5
data integrity
property that data has not been altered or destroyed in an unauthorized manner

[SOURCE: ISO 7498-2:1989, 3.3.21]

3.6
fixed roadside equipment
roadside equipment located at a fixed position

3.7
mobile roadside equipment
equipment mounted on a mobile unit or handheld equipment to be used along the road

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