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Federal Office for Customs and Border Security FOCBS
Foundations Directorate

Supplement 2 to Annex 1 to the FDF EETS and Fuel Card Providers Ordinance

LSVA Compliance Check Communication

Contents

1 Introduction

1.1 Scope

This document is a supplement to Annex 1 and specifies the compliance check communication (CCC) transaction using dedicated short-range communication (DSRC) between the EETS OBE and the LSVA border and enforcement beacons (RSE) according to ISO 12813.

With each CCC-DSRC transaction between the EETS OBE and an LSVA beacon, the following checks will be performed:

- The EETS contract is retrieved and verified.
- The suitability for EETS journey recording of the EETS OBE is verified (red/green).

In addition, based on the transaction the following information will be collected from the OBE:

- Based on the beacon function, the entry into, the use of or the exit of the LSVA toll domain for the vehicle will be registered.
- The tariff determining parameters of the vehicle will be read-out of the OBE.

1.2 List of changes

Version	Date	Section	Change
2.0	01.03.2020		First published version
2.1	21.08.2020	2.2.6 2.2.10	VehicleWeightLimits and trailerMaxLadenWeight Rounding rule according to Annex 1
2.2	01.01.2022	various	Renaming of the Federal Customs Administration (FCA) to the Federal Office for Customs and Border Security (FOCBS)

1.3 References

The CCC transaction specified within this document are based on the standards and documents listed below:

Document	
[1]	Annex 1 to the FDF EETS and Fuel Card Providers Ordinance: Technical and Operational Requirements for EETS Provider
[2]	ISO 12813 2019; Electronic fee collection - Compliance check communication for autonomous systems
[3]	ISO 14906 2018; Electronic fee collection - Application interface definition for dedicated short range communication. 2018; Electronic fee collection - Application interface definition for dedicated short range communication Amendment 1
[4]	EN 15509 2014; Electronic fee collection - Interoperability application profile for DSRC

Document	
[5]	Supplement 3 to annex 1: EETS Provider Interface
[6]	Supplement 5 to annex 1: CCC Integration Test Specification - Level 2

1.4 Terms and abbreviations

Term/Abbreviation	Meaning
CCC	Compliance check communication (ISO 12813)
DSRC	Dedicated short-range communication: technology for communication between recording device and beacon
EETS	European Electronic Toll Service
EETS contract	The unambiguous identification of a contractual relationship between an EETS provider approved for the EETS Service and an EETS User for a single vehicle.
EETS journey	The journey of a vehicle in the LSVA toll domain subject to a charge is recorded via EETS and the charge due is paid via EETS. An EETS journey begins with the entry into the LSVA toll domain and ends with the exit of the vehicle from the LSVA toll domain.
EETS OBE	On-board equipment (On-board unit), the device supplied by the EETS provider and installed in the vehicle for recording the EETS journey.
EETS provider (EP)	A service provider accredited by the FOCBS for the LSVA with its approved EETS OBE.
EETS User	Customer subscribing to an EETS contract with the EETS provider
exception list	A list either of type black list or of white list.
FCA	Federal Customs Administration (Toll Charger of the LSVA) replaced by Federal Office for Customs and Border Security (FOCBS) at 01.01.2022
FOCBS	Federal Office for Customs and Border Security (Toll Charger of the LSVA)
license plate	Number plate of the vehicle including country code.
LSVA	Performance-related heavy vehicle charge
LSVA toll domain	The area in which the LSVA is levied. The LSVA is levied for the use of all public roads in Switzerland and the Principality of Liechtenstein, Büsingen, Campione and the "Flughafenstrasse" in Basel.
OBU	On-board equipment = On-board unit = OBU
RSE	Roadside Equipment (boarder and enforcement DSRC beacons)

2 Requirements

2.1 General

The EETS OBE and RSE shall implement for the LSVA toll domain an interface based on ISO 12813 using the 5.8 GHz CEN DSRC communication stack.

- The OBU shall implement either EN ISO 12813:2015 or ISO 12813:2019[1]
- The RSE shall support both EN ISO 12813:2015 and ISO 12813:2019[1].

Remarks to backwards compatibility:

Due to the fact, that the LSVA CCC Transaction does not read the attribute GnssStatus, the RSE is not required to know the OBE CCC version. Implementing the CCC according to ISO 12813 in the RSE fulfils the RSE requirement above.

2.2 Attributes

2.2.1 Overview

The attributes listed below, with the associated AttributeID in parenthesis, shall be available in the OBE:

- CCC-ContextMark (0)
- VehicleLicencePlateNumber (16)
- VehicleClass (17)
- VehicleAxles (19)
- VehicleWeightLimits (20)
- VehicleSpecificCharacteristics (22)
- EquipmentOBUId (24)
- PaymentMeans (32)
- TrailerCharacteristics (46)
- OBEStatusHistory (53)
- ExtendedVehicleAxlesHistory (62)

The following sections define, based on ISO 12813 (clause 7 and Annex A) and the underlying EN 15509 and ISO 14906, the content and use of the attributes in the LSVA toll context.

The Statement "Not used in the LSVA toll domain" in the following sections means that this value of an attribute is neither verified nor used by the toll charger.

[1] as defined in clauses 5.2-4, clause 5.5.2, clauses 6-8 and Annex A.

2.2.2 Attribute 0: CCC-ContextMark

The CCC-ContextMark denotes the CCC context in the OBE, comprising the organization that issued the contract, the type of contract and the context version. CCC-ContextMark data is transmitted in vehicle service table (VST) as part of the ApplicationContextMark to enable the RSE to select the suitable EFC application as well as the appropriate OBE data elements.

The numbering of TypeOfContract and ContextVersion for the OBE shall be agreed between EETS provider and Toll Charger. In order to distinguish test contracts from genuine operational contracts, different data elements for TypeOfContract and ContextVersion for testing and regular operation can be defined and personalised.

Data element	Definition	Length in octets
ContractProvider	Identifies the organization that issued the service rights given in the Contract. Numbers shall be assigned on a national basis.	3
TypeOfContract	ContractProvider-specific designation of the rules that apply to the Contract.	2
ContextVersion	ContextVersion denotes the implementation version of the concerned contract within the context of the given ContractProvider, value assigned at the discretion of the ContractProvider.	1
	Total length	6

2.2.3 Attribute 16: VehicleLicencePlateNumber

The usage is according to EN 15509. Claimed licence plate number of the vehicle, the length of the padded LPN should be between 10 octets to 14 octets (i.e. 13 octets to 17 octets including the country code, alphabet indicator, length determinant and the LPN). A LPN, which is shorter than 10 characters, is padded with NUL characters so as to achieve a total of 10 characters.

For the LPN only Latin Alphabet No. 1 (according to ISO 8859-1) upper case letters and numbers shall be used.

Non Latin Alphabet No. 1 characters used in a LPN with the latinAlphabetNo1 (i.e. characters from ISO 8859-2 Latin Alphabet No. 2 and ISO 8859-5 Latin/Cyrillic alphabet) shall be coded as lower case letters applying the translation table in Annex D of ISO 14906.

Data element	Definition	Length in octets
CountryCode	Two letter countryCode (ISO 3166-1-alpha-2 code) coded in ITA-2 alphabet acc. to EN 14816 Example: Country code = SE = 1010010000’B'	2
AlphabetIndicator	Alphabet indicator = LatinAlphabethNo1 = 000000’B	
Length determinant	Length determinant, example 10 octets = 0000 1010’B	1
LPN	Minimal 10 significant characters padded with NULL, max 14 characters Example = OCD560 = 4F 43 44 35 36 30 00 00 00 00’H	10 to 14
	Total length	13 to 17

2.2.4 Attribute 17: VehicleClass

The attribute VehicleClass is holding information about trailer presence and the classification of the vehicle according to the Harmonized European Vehicle Classes and Local Vehicles Classes.

The VehicleClass according to EN 15509 has the bit ordered substructure TCCC LLLL, where:

T = Trailer Indicator

CCC = Harmonized European Vehicle Classes

LLLL = Local Vehicle Classes

Data element	Definition	Length in octets
T Trailer Indicator	0'B = no trailer, also used the default value 1'B = trailer present In the LSVA context the trailer indicator shall indicate the trailer in both cases, simple and weight based trailer declaration, see 2.2.10 Attribute 46: TrailerCharacteristics.	1
CCC European Vehicle Group	CCC usage: 000'B = No entry 001'B = Group 1 - Small passenger vehicles (the United Nations Economic Commission for Europe, UNECE, class M 1) 010'B = Group 2 - Light Goods Vehicles (UNECE class N 1) 011'B = Group 3 - Large passenger vehicles (UNECE class M 2, M 3) 100'B = Group 4 - Heavy Goods Vehicles up to 12 t (UNECE class N 2) 101'B = Group 5 - Heavy Goods Vehicles over 12 t (UNECE class N 3) 110'B = Group 6 - Motorcycles (UNECE class L) 111'B = Group 7 - Other vehicles including vehicles above 3,5 t not included in previous groups	
LLLL Local Vehicle Class	**Not used in the LSVA toll domain.**	
	Total length	1

2.2.5 Attribute 19: VehicleAxles

The attribute VehicleAxles is holding information about the number of axles (including drop axles) for tractor vehicle and trailer in the LSVA toll context.

Data element	Definition	Length in octets
VehicleFirstAxleHeight	Vehicle first axle height (8 bits): Example 00'H : not specified **Not used in the LSVA toll domain.**	1
VehicleAxlesNumber. TyreTyp	Tyre type (2 bits) : Example 00'B = not specified **Not used in the LSVA toll domain.**	1
VehicleAxlesNumber. NumberOfAxles.Trailer	Number of trailer axles (3 bits). Example: 3 axles is coded as 011'B	
VehicleAxlesNumber. NumberOfAxles.Tractor	Number of tractor axles (3 bits). Example : 2 axles is coded as 010'B	

Total length	2

2.2.6 Attribute 20: VehicleWeightLimits

Usage according to ISO 14906. Includes vehicle max laden weight, vehicle train max weight and vehicle weight unladen.

Data element	Definition	Length in octets
vehicleMaxLadenWeight	Maximum permissible laden mass of the vehicle in service in the Member State of registration (F.2) in 10 kg units, rounding rule according to Annex 1.	2
vehicleTrainMaxi-mumWeight	Maximum permissible laden mass of the whole vehicle in service in the Member State of registration (F.3) in 10 kg units, rounding rule according to Annex 1.	2
vehicleWeightUnladen	Mass of the vehicle in service with bodywork, and with coupling device in the case of a towing vehicle in service from any category other than M1 (G), in 10 kg units, rounding rule according to Annex 1. If the weight has not been registered, the value 0 shall be set.	2
	Total length	6

2.2.7 Attribute 22: VehicleSpecificCharacteristics

The attribute VehicleSpecificCharacteristics is holding information about environmental characteristic (emission class), engine type and other vehicle characteristics.

Data element	Definition	Length in octets
environmentalCharacter-istics.euroValue	Indication of the environmental category of EC type-approval. The European registration certificate element V.9. Euro value (4 bits): 0 = not present, 1 = EURO 1, 2 = EURO 2, 3 = EURO 3, 4 = EURO 4, 5 = EURO 5, 6 = EURO 6, 15 = EEV. EURO emission class (according to the current version of Directive 70/220 / EEC or 88/77 / EEC) or EEV (according to Directive 2005/55 / EEC (Annex I, section 6.2.1). EUR-Class VI as defined in Regulation (EC) No 595/2009.	1
environmentalCharacter-istics.copValue	CO_2 (in g/km) value. The European registration certificate element V.7. Cop value as defined in EC directive 2003/127/EC - (4 bits): noEntry (0) = default if value is unknown co2class1 (1) = below 101 g/km co2class2 (2) = 101 to 120 g/km co2class3 (3) = 121 to 140 g/km co2class4 (4) = 141 to 160 g/km co2class5 (5) = 161 to 200 g/km co2class6 (6) = 201 to 250 g/km co2class7 (7) = above 250 g/km reservedforUse (8) = reserved for future CEN and ISO use Remark: For future use in the LSVA toll domain.	

Data element	Definition	Length in octets
engineCharacteristics	Type of fuel or power source. The European registration certificate element P.3. Type of fuel or power source: 0 = noEntry = default if value is unknown 1 = noEngine 2 = petrolUnleaded 3 = petrolLeaded 4 = diesel 5 = lPG 6 = battery 7 = solar 8 = hybrid 9 = hydrogen 10-255 are reserved for future CEN use Remark: For future use in The LSVA toll domain.	1
descriptiveCharacteristics	**Not used in the LSVA toll domain.**	1
futureCharacteristics	**Not used in the LSVA toll domain.**	1
	Total length	4

2.2.8 Attribute 24: EquipmentOBUId

The EquipmentOBUId shall be a unique identification number assigned to a specific OBE by the manufacturer.

Data element	Definition	Length in octets
EquipmentOBUId	Coding and personalization by the manufacturer. Usage according to EN 15509 [4] coded as an octet string with a length determinant = 4.	5

The EquipmentOBUId is used to identify a specific OBE together with the ManufacturerId attribute of the system element in the VST.

2.2.9 Attribute 32: PaymentMeans

Usage according to ISO 14906. The attribute PaymentMeans holds contract data as personal account number (PAN), expiry date and usage control.

Data element	Definition	Length in octets
personalAccountNumber (PAN)	PersonalAccountNumber ::= OCTET STRING (SIZE(10)) Issuer identification number (IIN, 6 BCD), identifies the issuers of the PAN. The individual account number shall be assigned by the card issuing institution. The first 6 digits are the IIN.	10

paymentMeans-Expi-ryDate	Expiring date of payment means. Payment means expires at 24h of PaymentMeans ExpiryDate Example : 1st of March 2003 is encoded as year (1990..2117); 000 1101'B month (0..12); 0011'B date (0..31); 0 0001'B	2
paymentMeansUsage-Control	Indicates issuer's specified restrictions on the geographic usage and services allowed for the applications. **Not used in the LSVA toll domain.**	2
	Total length	14

2.2.10 Attribute 46: TrailerCharacteristics

The usage is according to ISO 14906. It is probably up to the EETS provider to decide whether to implement a detailed trailer weight declaration or the simplified trailer declaration (trailer available / no trailer).

In cases of simple trailer declaration trailerMaxLadenWeight shall be set to 0 in any case. In case of simple trailer declaration, it does not matter if a present trailer is declared by a value 1 (trailer) or 2 (semitrailer) in trailerDetails.trailerType.

In case of trailer weight declaration the value of trailerMaxLadenWeight shall hold the Maximum permissible total weight according to the data element F.2 of the European registration certificate and the value of trailer.Type shall hold the correct value corresponding to the present type of trailer.

Data element	**Definition**	**Length in octets**
trailerDetails.trailerType	In the LSVA context the trailerType shall define the trailer type: notPresent (0), -- trailer not present trailer (1), -- also known as pull-bar trailer semitrailer (2) -- also known as articulate trailer	1
trailerDetails.trailerAxles	Number of trailer axles (3 bits). Example: 3 axles is coded as 011'B Shall be the same value than in VehicleAxles.VehicleAxlesNumber. NumberOfAxles.Trailer (see section 2.2.5).	
trailerMaxLadenWeight	Trailer weight declaration: Maximum permissible total weight (F.2) of the trailer including payload in 10 kg units, rounding rule according to Annex 1 / 0 = no trailer Simple trailer declaration: Set to 0	2
trailerWeightUnladen	Mass of the vehicle in service with bodywork, and with coupling device in the case of a towing vehicle in service from any category other than M1. **Not used in the LSVA toll domain.**	2
	Total length	5

2.2.11 Attribute 53: OBEStatusHistory

Usage according to ISO 12813. The data element statusIndicator contains information on the correct functioning of the OBE and the fulfilment of the user obligations to cooperate with toll scheme requirements.

Data element	Definition	Length in octets
statusIndicator	List of status and its impact on the EETS contract validation at the LSVA toll domain entry: *Status value:* — *Contract validation result:* 0 = noGo — - no valid EETS contract **1 = go — - EETS contract OK** 2 = noGoContractual — - no valid EETS contract 3 = noGoUserSwitchedOff — - no valid EETS contract 4 = noGoPaymentMeans — - no valid EETS contract **5 = goSuspicion — - EETS contract OK** 6 … 255 shall not be used — - no valid EETS contract	1
timeWhenChanged	Time when GO/NO-GO status was changed to current status. The data element shall be set 0 if no previousStatusIndicator is available.	4
timeWhenActived	Last time the OBE started to evaluate current time, place and other parameters to determine if any toll context rules apply, and in this case start to operate accordingly.	4
timeWhenObePowered	Last time the OBE was connected to vehicle power.	4
	Total length	13

2.2.12 Attribute 62: ExtendedVehicleAxlesHistory

Usage according to ISO 12813. Holds information that allows to check if a change of the declared number of axles occurred during the trip, e.g. just before a CCC.

Data element	Definition	Length in octets
timeWhenChanged	Date and time of the last change of the value of any data element of the attribute VehicleAxles	4
previousVehicleAxles	Value of the attribute VehicleAxles before last change. If there was no change, same value as in VehicleAxles. See section 2.2.5 Attribute 19: VehicleAxles	2
timeWhenChangedToPrevious	Shall contain the time of the change of the data element previousVehicleAxles. The data element shall be set 0 if previousVehicleAxles is the same as current VehicleAxles (see section 2.2.5).	4
	Total length	10

2.3 Security

The RSE and EETS OBE shall implement the security requirements according to clause 6.2 in ISO 12813 for authentication and non-repudiation security level 0 and for access credentials security level 1.

Each RSE shall have a master key set for each EETS contract, in order to perform the CCC transactions successfully. The number of key sets to be supported per RSE shall be at least 1024.

2.4 EETS contract verification

The EETS contract verification in the RSE for an EETS OBE shall start if the following conditions of the VST are fulfilled:

- The EETS OBE CCC-ContextMark (ContractProvider, the TypeOfContract and the ContextVersion) is supported, i.e. matches the bitmask (see Supplement 3, section 2.9 DSRC contract data) from the EETS provider.

- The manufacturerID and the equipmentClass are assigned to the CCC-ContextMark by the EETS provider (see Supplement 3, section 2.9 DSRC contract data).

The verification of the EETS contract for a valid combination of CCC-ContextMark, manufacturerID and equipmentClass comprises the following four individual verifications:

1. Checking of the status of the EETS OBE. The verification is considered successful if the status is GO (OBEStatusHistory.StatusIndicator = go or goSuspicous).

2. Checking of MAC_Authentication transmitted by the EETS OBE. The verification is considered successful if the authenticator is successfully verified (i.e. recalculated by the beacon)

3. Checking of the expiry date of the contract. The verification is considered successful if the expiry date is in the future (PaymentMeans.PaymentMeansExpiryDate = in the future compared to the current date of the RSE).

4. Comparison with the EETS provider's exception list: The verification is considered successful if the PAN of the EETS contract is not included as invalid in the exception list (black list).

The EETS contract shall be deemed invalid unless all listed verifications above are successful.

If the CCC-ContextMark in combination with manufacturerID and equipmentClass is not supported by the RSE, then the RSE shall terminate the CCC transaction with the OBE, by sending a Release command to the OBE.

2.5 Set_MM.request

The SET_MMI shall comply with 6.1 in ISO 12813.

The action parameter shall be configurable according to the following EETS contract verification results:

a) Valid EETS contract

b) Valid CCC-ContextMark but not valid EETS contract (i.e. not all listed verifications of the EETS contract in 2.4 were successful)

c) All other cases where the transaction includes a Set_MMI.request

The action parameter for the Set_MMI.request shall be configurable for the three values ok(0), nok(1) and noSignalling(255) for the three different beacon types:

- Swiss entry border beacon

- Swiss exit boarder beacon

- Enforcement beacon

The default value of the action parameter shall be according to the table below:

Beacon type	a) Valid EETS contract	b) Valid CCC-ContextMark but not valid EETS contract	c) All other cases
Swiss entry border beacon	ok (0)	nok (1)	noSignalling (255)
Swiss exit boarder beacon	noSignalling (255)	noSignalling (255)	noSignalling (255)
Enforcement beacon	noSignalling (255)	noSignalling (255)	noSignalling (255)

2.6 EETS OBE HMI

The EETS OBE HMI shall signal GO ("green") if OBEStatusHistory.statusIndicator is go or goSuspicios. It shall signal NO-GO ("red") in all other cases.

A CCC transaction that includes a SET_MMI.request with one of the ActionParameter ok(0), nok(1) or notSignalling(255) shall trigger the following HMI behaviour of the EETS OBE:

- ok(0), provide an OK signal to the driver.
- nok(1), provide a NOT OK signal to the driver.
- noSignalling(255), do not produce a signal at all.

3 Transaction

3.1 Core transaction

Step	Beacon Service primitive	DSRC link	OBE Service primitive
	Initialisation phase		
1 Initialisation	**INITIALISATION.request** (BST)	→	
		←	**INITIALISATION.response** (VST) – CCC-Context Mark: – AC_CR-KeyReference – RndOBE – EquipmentClass – ManufacturerID
	Transaction phase		
2a Presentation	**GET_STAMPED.request** AC_CR – PaymentMeans (RndRSE, KeyRef_Auth) **GET.request** AC_CR – EquipmentOBUId – Static vehicle data: – VehicleLicensePlateNumber – VehicleWeightLimits – VehicleSpecificCharacteristics	→	
		←	**GET_STAMPED.response** – MAC_Authentication **GET.response**
2b S	**GET_STAMPED.request**	→	

	AC_CR – PaymentMeans (RndRSE, KeyRef_NonRep) **GET.request** AC_CR – Dynamic vehicle data: – VehicleAxles – ExtendedVehicleAxlesHistory – VehicleClass – TrailerCharacteristics – Status data: – OBEStatusHistory		
		←	**GET_STAMPED.response** – MAC_NonRepudiation **GET.response**
3 MMI	**Set_MMI.request**	→	
		←	**Set_MMI.response**

For Set_MMI.request action parameter see section 2.5.

3.2 Tracking (optional)

Optionally, a tracking phase can be carried out by the beacon.

Step	**Beacon** Service primitive	DSRC link	**OBE** Service primitive
	Tracking phase		
1 Tracking	**ECHO.request**	→	
		←	**ECHO.response**

Note: Step 1 can be repeated several times, controlled by the beacon.

3.3 Release (optional)

Optionally, a release command can be sent to the OBE from the beacon.

Step	**Beacon** Service primitive	DSRC link	**OBE** Service primitive
	Release phase		
1 Closing	**EVENT_REPORT.request (Release)**	→	

4 EETS CCC interface testing

The test requirements are defined in Supplement 5.