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TECHNICAL SPECIFICATION

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Pan-European eCall In-Vehicle Systems;
Guidelines for IVS conformity assessment**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Mobile Standards Group (MSG).

Modal verbs terminology

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Introduction

Pan European eCall IVS devices are subject to vehicle type approval regulations. Mandatory test procedures are required to fulfill the delegated acts of the European commission (EU) 2015/758 [i.1] and (EU) 2017/79 [i.5]. The type approval procedures are seen as the minimum set of test points to ensure compliant behaviour of the embedded IVS and ability to carry out eCall in the applicable user scenarios.

Nevertheless, additional test procedures to the delegated acts are necessary to check IVS device conformity relating to different protocols involved in the eCall process chain. These are described in detail in the end-to-end conformance testing specification ETSI TS 103 412 [i.3] and in the interoperability test specification ETSI TS 103 428 [i.4] and would also be considered as an essential part of the preparation for the type approval homologation.

On the basis of these existing requirements and test procedures the present document compiles conformance relevant tests as a guideline for a voluntary conformance declaration process for type approval. Therefore, the present document refers to existing requirements and test cases indicated by number and cross-referenced to published documents.

1 Scope

The scope of the present document is to provide technical guidelines for assessing device conformity to Pan-European eCall (according to CEN EN 16072:2015 [i.2]) and essential performance (CEN EN 16072 [i.3], ETSI TS 103 428 [i.4] and CEN EN 15722:2015 [i.6]). The present document compiles existing test cases / procedures and guides device suppliers and integrators by differentiating between regulatory and functional test cases. The resulting compilation of test procedures is a guideline towards regulatory conformance declaration mandated by the EU commission and IVS full functional conformance self-declaration in regards to Pan-European eCall. This assessment is also seen as a suitable preparation for the type approval homologation.

The main purpose of the present document is to:

   a) Analyse existing regulations on Pan European eCall and provide a conformance relevant list of test cases based on existing specifications.

   b) Guide device supplier and integrators by evaluating test case relevance (regulatory and functional). This provides an efficient method for indication of Pan-European eCall conformance.

   c) Assist device suppliers and integrators in the vehicle type approval homologation.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

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2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

   NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long-term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

   [i.1]   Regulation (EU) 2015/758 of the European Parliament and of the Council of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in-vehicle system based on the 112 service and amending Directive 2007/46/EC.

   NOTE: Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2015.123.01.0077.01.ENG.

[i.2] CEN EN 16072:2015: "Intelligent transport systems - eSafety - Pan-European eCall operating requirements".

NOTE: Available at:
https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:41797,6259&cs=19806BB25539A82E8156B31E463B1D5B9.

[i.3] ETSI TS 103 412: "Mobile Standards Group (MSG); Pan-European eCall end to end and in-band modem conformance testing; Prose test specification".

[i.4] ETSI TS 103 428: "Mobile Standards Group (MSG); eCall HLAP Interoperability Testing".

[i.5] Commission Delegated Regulation (EU) 2017/79 of 12 September 2016 establishing detailed technical requirements and test procedures for the EC type-approval of motor vehicles with respect to their 112 based eCall in-vehicles system, of 112-based eCall in-vehicle seperate technical units and components and supplementing and amending Regulation (EU) 2015/758 of the European Parliament and of the council with regard to the exemptions and applicable standards.

NOTE: Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2017.012.01.0044.01.ENG

[i.6] CEN EN 15722:2015: "Intelligent Transport Systems - ESafety - eCall minimum set of data".

NOTE: Available at
https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:41808,6259&cs=1F769328F59BFAA4FE011A984FF6A2CEB.

[i.7] CEN EN 16454:2015: "Intelligent Transport Systems - ESafety - eCall end to end conformance testing".

NOTE: Available at
https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:39943,6259&cs=1E3F2D6EF78EAA4A98748757E72557FB4.

[i.8] ETSI TS 102 936-1: "eCall Network Access Device (NAD) conformance specification; Part 1: Protocol test specification".

[i.9] ETSI TS 102 936-2: "eCall Network Access Device (NAD) conformance specification; Part 2: Test suites".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

category A: requirement category to ensure compliant functionality according to Regulation (EU) 2017/79 [i.5]

category B: requirement category to ensure functional conformity regarding CEN specification represented by ETSI TS 103 412 [i.3] and ETSI TS 103 428 [i.4]

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

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ACK        ACKnowledgement
AL         Application Layer
AL-ACK     Application Layer ACKnowledgement
AT         ATtention
CEN        European Committee for Standardization
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CTP	Conformance Test Point
EGNOS	European Geographic Navigation Overlay System
EN	European Norm
GNSS	Global Navigation Satellite System
GSM	Global System for Mobile communications
HLAP	Higher Layer Application Protocol
IVS	In-Vehicle System
MSD	Minimum Set of Data
MSG	Mobile Standards Group
NEC	Network Echo Canceller
PCM	Pulse Code Modulation
PE	Pan-European
PLMN	Public Land Mobile Network
PSAP	Public Safety Answering Point
SIM	Subscriber Identity Module
STU	Seperate Technical Unit
TBD	To Be Defined
TC	Test Case
TPS	Third Party Service supported ecall systems
USIM	Universal Subscriber Identification/Identity Module

4   IVS conformance assessment

4.0   General

This clause compiles conformance safety related requirements and test procedures relevant to Pan European eCall. It further includes category assignment to each test case. This information shall be used by device manufacturers and integrators for regulatory conformance indication (Category A), as well as for functional conformance self-declaration (Category B). Therefore, Category A tests are mandatory and Category B tests are recommend to proof full conformity and interoperability.

The referenced ETSI TS 103 412 [i.3] and ETSI TS 103 428 [i.4] below are compiled out of the CEN EN 16454:2015 [i.7] and experiences of several ERTICO/ETSI Plug Test Events. The CEN EN 16454:2015 [i.7] lists test procedures at a more abstract level but in a granularity which have been refined more precisely and more reproducible by the ETSI TS 103 412 [i.3].

4.1   Prerequisites

Devices used in the IVS conformance assessment procedure are CE certified. This implicitly indicates European conformity to health, safety, and environment protection throughout the EEA allowing devices to be traded in the EEA.

4.2   Commission Delegated Regulation (EU) 2017/79

This clause is based on the Commission Delegated Regulation (EU) 2017/79 [i.5]

4.2.1   Sled tests - (EU) 2017/79 Annex I

Following test cases are specified in Commission Delegated Regulation (EU) 2017/79 [i.5] and more specifically "Annex I - Technical requirements and procedures for testing the resistance of eCall in-vehicle systems to severe crashes (high-severity deceleration test)".

Table 4.2.1-1: Sled tests

TC	Name	Category
2.3.	Deceleration/acceleration procedure	A
2.4.	Verification procedure	A
2.5.	Positioning test procedure	A
2.6.	Antenna test procedure	A
2.8.	Verification procedures for components	A

4.2.2 Coexistence tests - Regulation (EU) 2017/79 Annex IV

Following test cases are specified in Commission Delegated Regulation (EU) 2017/79 [i.5] and more specifically "Annex IV - Co-existence of third party services (TPS) with the 112-based eCall in-vehicle systems".

Table 4.2.2-1: Coexistence tests

TC	Name	Category
2.3.	Deactivation of the 112-based system while the TPS system is active	A
2.4.	Fall-back procedure in a condition where the TPS system does not function	A

4.2.3 GNSS tests - Regulation (EU) 2017/79 Annex VI

Following test cases are specified in Commission Delegated Regulation (EU) 2017/79 [i.5] and more specifically "Annex VI - Technical requirements for compatibility of eCall in-vehicle systems with the positioning services provided by the Galileo and the EGNOS systems".

Table 4.2.3-1: GNSS tests

TC	Name	Category
2.2.1.	NMEA-0183 messages output test	A
2.2.2.	Assessment of positioning accuracy in autonomous static mode	A
2.2.3.	Assessment of positioning accuracy in autonomous dynamic mode.	A
2.2.4.	Movement in shadow areas, areas of intermittent reception of navigation signals and urban canyons	A
2.2.5.	Cold start time to first fix test	A
2.2.6.	Test of re-acquisition time of tracking signals after block out of 60 seconds	A
2.2.7.	Test of GNSS receiver sensitivity in cold start mode, tracking mode, and re-acquisition scenario	A

4.2.4 In-vehicle system self-test - Regulation (EU) 2017/79 Annex VII

Following test cases are specified in Commission Delegated Regulation (EU) 2017/79 [i.5] and more specifically "Annex VII - In-vehicle system self-test".

Table 4.2.4-1: Self-test

TC	Name	Category
2.1	Self-test function verification test	A

4.2.5 Privacy and data protection tests - Regulation (EU) 2017/79 Annex VIII

Following test cases are specified in Commission Delegated Regulation (EU) 2017/79 [i.5] and more specifically "Annex VIII - Technical requirements and test procedures related to privacy and data protection". Conformance declarations from Pan-European eCall device manufacturers are recommended.

Table 4.2.5-1: Privacy and data protection tests

TC	Name	Category
Part I	Procedure for verifying the lack of traceability of an eCall in-vehicle system or STU	A
Part II	Procedure for verifying the length of time an eCall log file is stored by the eCall in-vehicle system or STU	A
Part III	Procedure for verifying the automatic and continuous removal of data in the internal memory of an eCall in-vehicle system or STU	A
Part IV	Procedure for verifying the non-exchange of personal data between an eCall in-vehicle system or STU and third party services systems	A

4.3 Pan-European eCall end to end and in-band modem conformance testing

Following test cases are specified in ETSI TS 103 412 [i.3] prose test specification.

4.3.1 Conformance tests for IVS eCall user equipment

Table 4.3.1-1: End to end tests

Clause	TC	Name	Category
7.1.1.1	CTP 1.1.0.1	Conformance to ETSI TS 102 936-1 [i.8] and ETSI TS 102 936-2 [i.9] - PE eCall IVS	B
7.1.1.2a	CTP 1.1.0.2	Test for conformance to valid SIM/USIM - PE eCall capable IVS	B
7.1.1.2b	CTP 1.1.0.2	Test for conformance to valid SIM/USIM - PE eCall only IVS	B
7.1.1.3	CTP 1.1.0.3	Automatic eCall triggering does not occur when ignition OFF - PE eCall IVS	B
7.1.1.4	CTP 1.1.1.1	Power on and self test - PE eCall IVS	B
7.1.1.5	CTP 1.1.2.1	eCall automatically activated - PE eCall IVS	B
7.1.1.6	CTP 1.1.2.2	Automatically triggered eCall in progress was not disconnected upon a new eCall trigger - PE eCall IVS	B
7.1.1.7	CTP 1.1.2.3	Post-side-crash performance of automatic trigger - IVS	B
7.1.1.8	CTP 1.1.2.4	Post-frontal-crash performance of automatic trigger - IVS	B
7.1.1.9	CTP 1.1.2.5	Performance of automatic trigger - different crash types - IVS	B
7.1.1.10	CTP 1.1.3.1	eCall manually activated - PE eCall IVS	B
7.1.1.11	CTP 1.1.3.2	Manually triggered eCall in progress was not disconnected upon a new eCall trigger - PE eCall IVS	B
7.1.1.12	CTP 1.1.4.1	Test eCall activated - PE eCall IVS	B
7.1.1.13	CTP 1.1.5.1	Network registration - PE eCall IVS	B
7.1.1.14	CTP 1.1.5.2	Manual termination of eCall by vehicle occupants not allowed (automatically triggered eCall) - PE eCall IVS	B
7.1.1.15	CTP 1.1.5.3	Manual termination of eCall by vehicle occupants not allowed (manually triggered eCall) - PE eCall IVS	B
7.1.1.16	CTP 1.1.5.4	Automatically triggered eCall in progress was not disconnected when ignition is switched to OFF - PE eCall IVS	B
7.1.1.17	CTP 1.1.5.5	Manually triggered eCall in progress was not disconnected when ignition is switched to OFF - PE eCall IVS	B
7.1.1.18	CTP 1.1.5.6	Priority over conflicting communication - PE eCall IVS	B
7.1.1.19	CTP 1.1.5.7	Network registration is re-tried when network registration attempt was not successful - PE eCall IVS	B
7.1.1.20a	CTP 1.1.6.1	Mute IVS and vehicle audio - PE eCall capable IVS	B
7.1.1.20b	CTP 1.1.6.1	Mute IVS and vehicle audio - PE eCall only IVS	B
7.1.1.21	CTP 1.1.7.1	Set-up TS12 call with eCall identifier (flag) set to "automatic" - PE eCall IVS	B
7.1.1.22	CTP 1.1.8.1	Set-up TS12 call with eCall identifier (flag) set to "manual" - PE eCall IVS	B
7.1.1.23	CTP 1.1.9.1	Set-up TS11 call to test number - PE eCall IVS	B
7.1.1.24a	CTP 1.1.10.1	eCall is attempted when no networks are available (limited service condition with forbidden PLMN on SIM/USIM) - PE eCall IVS	B

Clause	TC	Name	Category
7.1.1.24b	CTP 1.1.10.1	eCall is attempted when no networks are available (limited service condition, location update rejected by network) - PE eCall IVS	B
7.1.1.25	CTP 1.1.10.2	Re-dial attempt completed within 2 minutes after eCall is dropped - PE eCall IVS	B
7.1.1.26	CTP 1.1.10.3	Duration of eCall Initiation signal - PE eCall IVS	B
7.1.1.27	CTP 1.1.11.1	Send MSD with indicator set to "Automatically Initiated eCall" (AIeC) - PE eCall IVS	B
7.1.1.28	CTP 1.1.12.1	Send MSD with indicator set to "Manually Initiated eCall" (MIeC) - PE eCall IVS	B
7.1.1.29	CTP 1.1.13.1	Send MSD with indicator set to "Test eCall" - PE eCall IVS	B
7.1.1.30	CTP 1.1.14.1	Verify MSD transfer - PE eCall IVS	B
7.1.1.31	CTP 1.1.14.2	Un-mute IVS audio when AL-ACK received - PE eCall IVS	B
7.1.1.32	CTP 1.1.15.1	Establish voice link to PSAP - PE eCall IVS	B
7.1.1.33	CTP 1.1.15.2	MSD transfer request while eCall conversation in progress - PE eCall IVS	B
7.1.1.34	CTP 1.1.15.3	eCall continuation when SEND MSD request not received (T5 expired) - PE eCall IVS	B
7.1.1.35	CTP 1.1.15.4	Call continuation when AL-ACK not received (T6 expired) - PE eCall IVS	B
7.1.1.36	CTP 1.1.15.5	MSD is transferred continuously until T7 expires and IVS reconnects loudspeaker and microphone on its expiry - PE eCall IVS	B
7.1.1.37	CTP 1.1.16.1	Clear down call automatically - PE eCall IVS	B
7.1.1.38	CTP 1.1.16.2	IVS clears down the eCall upon T2 expiry - PE eCall IVS	B
7.1.1.39	CTP 1.1.16.3	IVS registers recent eCalls - PE eCall IVS	B
7.1.1.40	CTP 1.1.17.1	Call-back allowed and able to be answered by IVS - PE eCall IVS	B
7.1.1.41	CTP 1.1.17.2	Call-back answered by IVS in the event of abnormal termination - PE eCall IVS	B
7.1.1.42	CTP 1.1.17.3	MSD transfer occurs upon PSAP request during call-back - PE eCall IVS	B
7.1.1.43	CTP 1.1.17.4	Remain registered for ≥ 1 hr - PE eCall IVS	B

4.3.2   Conformance tests for IVS eCall user equipment - additional tests for eCall only systems

Table 4.3.2-1: Additional End to end tests for eCall only systems

Clause	TC	Name	Category
7.1.2.1	CTP 1.1.1.2	IVS does not perform registration after power-up - PE eCall only IVS	B
7.1.2.2	CTP 1.1.1.3	IVS periodically scans and maintains a list of available PLMNs - PE eCall only IVS	B
7.1.2.3	CTP 1.1.10.4	Verify that PLMN registration procedure is executed upon initiating an eCall - PE eCall only IVS	B
7.1.2.4	CTP 1.1.17.5	Remain registered for ≥ 1 hr ≤ 12 hr - PE eCall only IVS	B

4.3.3   Minimum Performance requirements for in-vehicle user equipment for Pan-European eCall

Table 4.3.3-1: In-band modem performance tests

TC	Name	Category
7.1.4.1	MSD transmission time for different channel conditions	B
7.1.4.2	MSD transmission time in noisy conditions	TBD
7.1.4.3	MSD transmission time with scaling of PCM signals	TBD

4.4 eCall HLAP interoperability testing

Following test cases are specified in ETSI TS 103 428 [i.4] eCall HLAP Interoperability Testing specification.

Table 4.4-1: Interoperability tests

Clause	TC	Name	Category
7.1.1	TD_MAN_1	MSD transmission / reception / acknowledgement with PSAP in Pull mode	B
7.1.2	TD_MAN_2	MSD transmission / reception / acknowledgement with PSAP in Push mode	B
7.1.3	TD_MAN_3	Voice communication after receipt of AL-ACK	B
7.1.4	TD_MAN_4	Retransmission of MSD on request from PSAP	B
7.1.5	TD_MAN_5	Voice Communication after retransmission of MSD	B
7.1.6	TD_MAN_6	Clear-down / PSAP initiated network clear-down	B
7.1.7	TD_MAN_7	Clear-down / PSAP initiated application layer AL-ACK clear-down	B
7.1.8	TD_MAN_8	Call Back / PSAP initiated call back to IVS and re-send MSD	B
7.1.9	TD_MAN_9	PSAP correct handling of voice call in case of in-band modem resources busy or out of service	B
7.1.10	TD_MAN_10	MSD activation type indicator set to 'Automatic'	B
7.1.11	TD_MAN_11	MSD activation type indicator set to 'Manual'	B
7.1.12	TD_MAN_12	MSD call type indicator set to 'Test Call'	B
7.1.13	TD_MAN_13	Mute IVS audio during MSD transmission and un-mute after application layer acknowledgement	B
7.1.14	TD_MAN_14	Mute PSAP audio during MSD request / MSD transfer and un-mute after application layer acknowledgement	B
7.1.15	TD_MAN_15	Format of encoded and decoded MSD in accordance with CEN EN 15722 [i.6]	B
7.1.16	TD_MAN_16	MSD transmission following NEC disabling tone with PSAP in Pull mode	B
7.1.17	TD_MAN_17	MSD transmission following NEC disabling tone with PSAP in Push mode	B
7.2.1	TD_OPT_01_IVS	Auto redial following busy during call set-up	B
7.2.2	TD_OPT_02_IVS	Auto redial following no-answer during call set-up	B
7.2.3	TD_OPT_03_IVS	IVS configured for eCall 'only' service (restricted)	B

4.5 Additional restrictions and risks

CEN EN 15722:2015 [i.6] specifies that the last known real direction of the IVS should be included in the eCall MSD in 2 degree steps referenced to the magnetic north. Nevertheless, due to the use case of eCall IVS systems (on land maps) a fixed reference is needed which is the geodetic north for land navigation. Therefore, it is recommended to use the geodetic north reference instead in the type approval procedures. This facilitates the IVS to provide correct direction without external computational complexity in calculating magnetic north to geodetic north resulting in faster direction feedback which is crucial in eCall use scenarios.

History

Document history		
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