
**Road vehicles — Vehicle to grid
communication interface —**

**Part 4:
Network and application protocol
conformance test**

*Véhicules routiers — Interface de communication entre véhicule et
réseau électrique —*

Partie 4: Essai de conformité du protocole d'application et du réseau





COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents	Page
Foreword.....	vii
Introduction.....	viii
1 Scope	1
2 Normative references	2
3 Terms and definitions.....	2
4 Symbols (and abbreviated terms)	7
5 Conventions	8
5.1 Requirement structure.....	8
5.2 Test system description	9
6 Test architecture reference model.....	9
6.1 General information	9
6.2 Platform adapter interface.....	10
6.3 SUT adapter interfaces	10
6.4 Codecs	11
7 Test suite conventions	11
7.1 General information	11
7.2 Test suite structure (TSS).....	11
7.3 Test profiles.....	13
7.4 Test suite identifiers.....	62
7.5 Test suite coverage	67
7.6 Test case description.....	184
7.7 Test case specification	185
8 Test case descriptions for 15118-2 V2GTP	198
8.1 General information	198
8.2 SECC test cases	198
8.3 EVCC test cases.....	202
9 Test case descriptions for 15118-2 SDP messages.....	208
9.1 General information	208
9.2 SECC test cases	208
9.3 EVCC test cases.....	211
10 Test case descriptions for 15118-2 V2G application layer messages.....	236
10.1 General information	236
10.2 SECC test cases	236
10.3 EVCC test cases.....	405
Annex A (normative) Configuration specifications	671
A.1 Timer configuration	671
A.2 PICS configuration.....	671

A.3	PIXIT configuration	673
Annex B (normative) Control part specification.....		675
B.1	SECC control parts.....	675
B.1.1	AC specific control parts.....	675
B.1.2	DC specific control parts.....	675
B.2	EVCC control parts	688
B.2.1	AC specific control parts	702
B.2.2	DC specific control parts.....	702
Annex C (normative) Test-case specifications for 15118-2 V2GTP		745
C.1	SECC test cases.....	745
C.2	EVCC test cases	745
Annex D (normative) Test-case specifications for 15118-2 SDP messages		752
D.1	SECC test cases.....	752
D.2	EVCC test cases	752
Annex E (normative) Test-case specifications for 15118-2 V2G application layer messages.....		773
E.1	SECC test cases.....	773
E.1.1	V2G protocol handshake	773
E.1.1.1	SECC test cases for SupportedAppProtocol.....	773
E.1.2	V2G messages	773
E.1.2.1	SECC test cases for SessionSetup	775
E.1.2.2	SECC test cases for ServiceDiscovery	775
E.1.2.3	SECC test cases for ServiceDetail	782
E.1.2.4	SECC test cases for PaymentServiceSelection	784
E.1.2.5	SECC test cases for PaymentDetails	788
E.1.2.6	SECC test cases for Authorization.....	794
E.1.2.7	SECC test cases for ChargeParameterDiscovery	794
E.1.2.8	SECC test cases for PowerDelivery	799
E.1.2.9	SECC test cases for CertificateUpdate.....	824
E.1.2.10	SECC test cases for CertificateInstallation	839
E.1.2.11	SECC test cases for SessionStop.....	839
E.1.2.12	SECC test cases for ChargingStatus	842
E.1.2.13	SECC test cases for MeteringReceipt	846
E.1.2.14	SECC test cases for CableCheck	848
E.1.2.15	SECC test cases for PreCharge	852
E.1.2.16	SECC test cases for CurrentDemand	855
E.1.2.17	SECC test cases for WeldingDetection	859
E.2	EVCC test cases	860
Annex F (normative) Function specifications for supporting test execution		1009

F.1	Configuration functions	1009
F.2	Pre-condition functions	1009
F.2.1	SECC functions	1011
F.2.2	EVCC functions	1027
F.3	Post-condition functions	1027
F.3.1	SECC functions	1038
F.3.2	EVCC functions	1038
F.4	Common behavior functions	1039
F.4.1	SECC functions	1040
F.4.2	EVCC functions	1042
F.5	Library functions	1044
Annex G (normative) Function specifications for 15118-2 V2GTP		1051
G.1	SECC functions	1051
G.2	EVCC functions	1053
Annex H (normative) Function specifications for 15118-2 SDP messages		1056
H.1	SECC functions	1056
H.2	EVCC functions	1057
Annex I (normative) Function specifications for 15118-2 V2G application layer messages		1061
I.1	SECC functions	1061
I.1.1	V2G protocol handshake	1061
I.1.1.1	SECC functions for SupportedAppProtocol	1061
I.1.2	V2G messages	1063
I.1.2.1	SECC functions for SessionSetup	1063
I.1.2.2	SECC functions for ServiceDiscovery	1064
I.1.2.3	SECC functions for ServiceDetail	1072
I.1.2.4	SECC functions for PaymentServiceSelection	1080
I.1.2.5	SECC functions for PaymentDetails	1087
I.1.2.6	SECC functions for Authorization	1091
I.1.2.7	SECC functions for ChargeParameterDiscovery	1104
I.1.2.8	SECC functions for PowerDelivery	1140
I.1.2.9	SECC functions for CertificateUpdate	1154
I.1.2.10	SECC functions for CertificateInstallation	1167
I.1.2.11	SECC functions for SessionStop	1176
I.1.2.12	SECC functions for ChargingStatus	1176
I.1.2.13	SECC functions for MeteringReceipt	1185
I.1.2.14	SECC functions for CableCheck	1197
I.1.2.15	SECC functions for PreCharge	1203
I.1.2.16	SECC functions for CurrentDemand	1207

I.1.2.17	SECC functions for WeldingDetection.....	1213
I.2	EVCC functions.....	1217
Annex J (normative) Template specifications for V2G TCP/TLS Port Control		1373
Annex K (normative) Template specifications for 15118-2 V2GTP.....		1375
K.1	Common templates.....	1375
Annex L (normative) Template specifications for 15118-2 SDP messages.....		1376
L.1	Common templates.....	1376
Annex M (normative) Template specifications for 15118-2 V2G application layer messages		1377
M.1	Common templates.....	1377
M.1.1	V2G protocol handshake	1378
M.1.1.1	CMN templates for SupportedAppProtocol.....	1378
M.1.2	V2G messages	1378
M.1.2.1	CMN templates for SessionSetup.....	1378
M.1.2.2	CMN templates for ServiceDiscovery.....	1378
M.1.2.3	CMN templates for Authorization	1381
M.1.2.4	CMN templates for PowerDelivery	1381
M.1.2.5	CMN templates for SessionStop	1383
M.1.2.6	CMN templates for ChargingStatus.....	1384
M.1.2.7	CMN templates for CableCheck.....	1384
M.1.2.8	CMN templates for PreCharge	1385
M.1.2.9	CMN templates for CurrentDemand.....	1385
M.1.2.10	CMN templates for WeldingDetection	1387
M.2	SECC templates.....	1387
M.3	EVCC templates	1397
Annex N (normative) Template specifications for Security.....		1430
N.1	Common templates.....	1430
Annex O (normative) Data type definitions.....		1434
O.1	Data types for PICS.....	1434
O.2	Data types for PIXIT	1434
O.3	Data types for V2G TCP/TLS Port Control	1436
O.4	Data types for V2GTP	1437
O.5	Data types for SDP messages.....	1438
O.6	Data types for V2G messages	1438
O.7	Data types for Security	1457

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 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 the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Electrical and electronic equipment*, and Technical Committee IEC/TC 69 *Electric road vehicles and electric industrial trucks*. The draft was circulated for voting to the national bodies of both ISO and IEC.

A list of all parts in the ISO 15118 series can be found on the ISO website.

Introduction

The first three parts of ISO 15118 describe the use cases and the technical specification of the Vehicle-to-Grid Communication Interface which is intended for the optimized use of energy resources so that electric road vehicles can recharge in the most economic or most energy efficient way. It is furthermore required to develop efficient and convenient billing systems in order to cover the resulting micro-payments. The necessary communication channel may serve in the future to contribute to the stabilization of the electrical grid as well as to support additional information services required to operate electric vehicles efficiently and economically.

The complexity resulting from the network and application protocol requirements defined in the second part of the standard requires a considerable amount of testing in order to enable interoperability between independent implementations. This document therefore defines a conformance test suite for the network and application layer protocols in order to derive a common and agreed basis for conformance tests. The resulting test suite is a necessary prerequisite for downstream interoperability tests. Since interoperability furthermore involves the actual application logic of an implementation those tests are beyond the scope of this document. Hence this document focuses on the interface aspects and the corresponding requirements given in part two only.

Road vehicles — Vehicle to grid communication interface — Part 4: Network and application protocol conformance test

1 Scope

This document specifies conformance tests in the form of an Abstract Test Suite (ATS) for a System Under Test (SUT) implementing an EVCC or SECC according to ISO 15118-2. These conformance tests specify the testing of capabilities and behaviors of an SUT as well as checking what is observed against the conformance requirements specified in ISO 15118-2 and against what the supplier states the SUT implementation's capabilities are.

The capability tests within the ATS check that the observable capabilities of the SUT are in accordance with the static conformance requirements defined in ISO 15118-2. The behavior tests of the ATS examine an implementation as thoroughly as is practical over the full range of dynamic conformance requirements defined in ISO 15118-2 and within the capabilities of the SUT (see NOTE).

A test architecture is described in correspondence to the ATS. The conformance test cases in this document are described leveraging this test architecture and are specified in TTCN-3 Core Language for ISO/OSI Network Layer (Layer 3) and above. The conformance test cases for the Data Link Layer (Layer 2) and Physical Layer (Layer 1) are described in ISO 15118-5. Test cases with overlapping scopes are explicitly detailed.

This document does not include specific tests of other standards referenced within ISO 15118-2, e.g. IETF RFCs. Furthermore, the conformance tests specified in this document do not include the assessment of performance nor robustness or reliability of an implementation. They cannot provide judgments on the physical realization of abstract service primitives, how a system is implemented, how it provides any requested service, nor the environment of the protocol implementation. Furthermore, the test cases defined in this document only consider the communication protocol defined ISO 15118-2. Power flow between the EVSE and the EV is not considered.

NOTE 1 Practical limitations make it impossible to define an exhaustive test suite, and economic considerations can restrict testing even further. Hence, the purpose of this document is to increase the probability that different implementations are able to interwork. This is achieved by verifying them by means of a protocol test suite, thereby increasing the confidence that each implementation conforms to the protocol specification. However, the specified protocol test suite cannot guarantee conformance to the specification since it detects errors rather than their absence. Thus conformance to a test suite alone cannot guarantee interworking. What it does do is give confidence that an implementation has the required capabilities and that its behavior conforms consistently in representative instances of communication.

NOTE 2 This document has some interdependencies to the conformance tests defined in ISO 15118-5 which result from ISO/OSI cross layer dependencies in the underlying protocol specification (e.g. for sleep mode)

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.

IEC 61851-1:2017, *Electric vehicle conductive charging system — Part 1: General requirements*

ISO 15118-1:2013, *Road vehicles — Vehicle to grid communication interface — Part 1: General information and use-case definition*

ISO 15118-2:2014, *Road vehicles — Vehicle-to-Grid Communication Interface — Part 2: Network and application protocol requirements*

ISO 15118-3:2015, *Road vehicles — Vehicle-to-Grid Communication Interface — Part 3: Physical and data link layer requirements*

ETSI ES 201 873-5 V4.6.1, *TTCN-3: TTCN-3 Runtime Interface (June 2014)*

ETSI ES 201 873-6 V4.6.1, *TTCN-3: TTCN-3 Control Interface (June 2014)*

NOTE 1 Even though the technical specification ISO 15118-2:2014, which is the baseline for this conformance test document, explicitly references IEC 61851-1:2011, this document references IEC 61851-1:2017 because of applicability on the market.