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Cestna vozila - Komunikacijski vmesnik med vozilom in omrežjem - 4. del: Preskus skladnosti omrežja in aplikacijskega protokola (ISO/DIS 15118-4:2024)

Road vehicles - Vehicle to grid communication interface - Part 4: Network and application protocol conformance test (ISO/DIS 15118-4:2024)

Straßenfahrzeuge - Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation - Teil 4: Konformitätsprüfungen für das Netzwerk- und Anwendungsprotokoll (ISO/DIS 15118-4:2024)

Véhicules routiers - Interface de communication entre véhicule et réseau électrique - Partie 4: Essai de conformité du protocole d'application et du réseau (ISO/DIS 15118-4:2024)

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DRAFT International Standard

ISO/DIS 15118-4

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

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ICS: 43.120

ISO/TC **22**/SC **31**

Secretariat: **DIN**

Voting begins on:
2024-11-28

Voting terminates on:
2025-02-20

This document is circulated as received from the committee secretariat.

This draft is submitted to a parallel vote in ISO and in IEC.

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Published in Switzerland

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Contents

Page

1 Scope 1
2 Normative references 2
3 Terms and definitions 2
4 Abbreviated terms 7
5 Conventions 8
5.1 Requirement structure 8
5.2 Test system description 8
6 Test architecture reference model 8
6.1 General information 8
6.2 Platform adapter interface 9
6.3 SUT adapter interfaces 9
6.4 Codecs 12
7 Test suite conventions 12
7.1 General information 12
7.2 Test suite structure (TSS) 13
7.3 Test profiles 15
7.4 Test suite identifiers 23
7.5 Test suite coverage 29
7.6 Test case description 171
7.7 Test case specification 172
8 Test case descriptions for 15118-2 V2GTP 186
8.1 General information 186
8.2 SECC test cases 186
8.3 EVCC test cases 190
9 Test case descriptions for 15118-2 SDP messages 196
9.1 General information 196
9.2 SECC test cases 196
9.3 EVCC test cases 199
10 Test case descriptions for 15118-2 V2G application layer messages 234
10.1 General information 234
10.2 SECC test cases 234
10.3 EVCC test cases 412
11 Reliability and Robustness Testing 682
11.1 General information 682
11.2 SECC test cases 682
11.3 EVCC test cases 685
Annex A (normative) Configuration specifications 692
A.1 General information 692
A.2 Parameter configuration 692
A.3 Timer configuration 698
A.4 PICS configuration 699
A.5 PIXIT configuration 700
Annex B (normative) Test-case specifications for 15118-2 V2GTP 703
B.1 General information 703
B.2 SECC test cases 703
B.3 EVCC test cases 706

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(https://standards.iteh.ai)
Document Preview
oSIST prEN ISO 15118-4:2025
https://standards.iteh.ai/catalog/standards/sist/1e5f0f75-5a4b-4f7e-a0ad-e8a0ae2e1ddb/osist-pren-iso-15118-4-2025

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Annex C (normative) Test-case specifications for 15118-2 SDP messages 711
C.1 General information 711
C.2 SECC test cases 711
C.3 EVCC test cases 713

Annex D (normative) Test-case specifications for 15118-2 V2G application layer messages 736
D.1 General information 736
D.2 SECC test cases 736
D.3 EVCC test cases 836

Annex E (normative) Test-case specifications for 15118-2 Reliability and Robustness Testing 1005
E.1 General information 1005
E.2 SECC test cases 1005
E.3 EVCC test cases 1009

Annex F (normative) Function specifications for supporting test execution 1017
F.1 General information 1017
F.2 Configuration functions 1017
F.3 Pre-condition functions 1019
F.4 Post-condition functions 1051
F.5 Common behavior functions 1053
F.6 Library functions 1058

Annex G (normative) Function specifications for 15118-2 V2GTP 1068
G.1 General information 1068
G.2 SECC functions 1068
G.3 EVCC functions 1070

Annex H (normative) Function specifications for 15118-2 SDP messages 1074
H.1 General information 1074
H.2 SECC functions 1074
H.3 EVCC functions 1076

Annex I (normative) Function specifications for 15118-2 V2G application layer messages 1080
I.1 General information 1080
I.2 SECC functions 1080
I.3 EVCC functions 1276

Annex J (normative) Function specifications for 15118-2 Reliability and Robustness Testing 1477
J.1 General information 1477
J.2 SECC functions 1477
J.3 EVCC functions 1483

Annex K (normative) Template specifications for V2G TCP/TLS Port Control 1510
K.1 General information 1510
K.2 V2G TCP/TLS port control templates 1510

Annex L (normative) Template specifications for 15118-2 V2GTP 1512
L.1 General information 1512
L.2 Common templates 1512

Annex M (normative) Template specifications for 15118-2 SDP messages 1514
M.1 General information 1514
M.2 Common templates 1514

Annex N (normative) Template specifications for 15118-2 V2G application layer messages ... 1515
N.1 General information 1515
N.2 Common templates 1515
N.3 SECC templates 1527
N.4 EVCC templates 1539

Annex O (normative) Template specifications for Security 1568
O.1 General information 1568
O.2 Common templates 1568

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(https://standards.iteh.ai)
Document Preview
oSIST prEN ISO 15118-4:2025
https://standards.iteh.ai/catalog/standards/sist/71a40647-84c5-4ec0-9bda-e89660c0e2e4/osist-pren-iso-15118-4-2025

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Annex P (normative) Data type definitions **1573**
P.1 General information **1573**
P.2 Data types for PICS **1573**
P.3 Data types for PIXIT **1574**
P.4 Data types for V2G TCP/TLS Port Control **1576**
P.5 Data types for V2GTP **1576**
P.6 Data types for SDP messages **1577**
P.7 Data types for V2G messages **1578**
P.8 Data types for Security **1598**
Annex Q (informative) Overview of changed test cases compared to ISO 15118-4:2018 ..... **1600**
Bibliography **1612**

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(https://standards.iteh.ai)
Document Preview

oSIST prEN ISO 15118-4:2025
https://standards.iteh.ai/catalog/standards/sist/71e40647-84a5-4ac0-9bda-c89669a9e2c1/osist-pren-iso-15118-4-2025

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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 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 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

This second edition cancels and replaces the first edition (ISO 15118-4:2018), which has been technically revised.

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The main changes are as follows:

— test control section removed to align with more atomic testing approach (7.3.5 in Ed. 1);

— quality and readability of all Figures improved;

— general error corrections and/or improvements for better consistency in test objective descriptions in Clauses 8, 9 and 10;

— general error corrections and /or improvements for better consistency in TTCN-3 test case specification in the Annexes;

— new clause on configuration of electrical parameters and power flow related data added (7.7.9)

— new clause on reliability and robustness test cases added (Clause 11 and Annex E);

— complete list of new, removed and updated test cases in this document is provided in Annex Q.

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

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

The complexity resulting from the network and application protocol requirements specified in ISO 15118-2 for the Vehicle-to-Grid Communication Interface (V2G CI) requires a considerable amount of testing to enable interoperability between electric vehicles and charging stations. This document therefore specifies a conformance test suite for the network and application layer protocols of the V2G CI to derive a common and agreed basis for conformance tests. The resulting test suite is a 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 (see NOTE 1). Hence this document focuses on the communication interface and the corresponding requirements given in ISO 15118-2 only.

NOTE 1 Practical limitations make it impossible to specify 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 can 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 a conforming implementation has the required capabilities and that its behavior conforms consistently in representative instances of communication.

NOTE 2 This document generally refers to system under test (SUT) instead of implementation under test (IUT), due to the black box testing paradigm adopted in this document and related certification processes.

NOTE 3 This document has some interdependencies to the conformance tests specified in ISO 15118-5 which result from ISO/OSI cross layer dependencies in the underlying protocol specification (e.g. for sleep mode).

NOTE 4 Even though ISO 15118-2:2014 references IEC 61851-1:2011 Edition 2, this document references IEC 61851-1:2017 Edition 3 because of applicability on the market.

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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 specified 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 specified in ISO 15118-2 and within the capabilities of the SUT.

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 the performance 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 abstract test cases specified in this document only consider the communication protocol specified ISO 15118-2. Power flow between the EVSE and the EV is no prerequisite for the test cases specified in this document.

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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 15118-1, *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, *Road vehicles — Vehicle-to-Grid Communication Interface — Part 3: Physical and data link layer requirements*

ISO 15118-5, *Road vehicles — Vehicle to grid communication interface — Part 5: Physical layer and data link layer conformance test*

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

3 Terms and definitions

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For the purpose of this document, the terms and definitions given in ISO 15118-1, ISO 15118-2, ISO 15118-3 and the following apply.

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

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

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

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3.1
abstract test case
complete and independent specification of the actions required to achieve a specific *test purpose* (3.24)

Note 1 to entry: See ITU-T X.290.

Note 2 to entry: This specification is defined at the level of abstraction of a particular abstract test method, starting in a stable testing state and ending in a stable testing state and can involve one or more consecutive or concurrent connections.

Note 3 to entry: The specification is complete in the sense that it is sufficient to enable a test verdict to be assigned unambiguously to each potentially observable test outcome (i.e. sequence of test events).

Note 4 to entry: The specification is independent in the sense that it is possible to execute the derived executable test case in isolation from other such test cases (i.e. the specification always includes the possibility of starting and finishing in the “idle” state).

3.2
abstract test suite
ATS
a collection of *abstract test cases* (3.1) with reference to a given requirement specification

Note 1 to entry: See ITU-T X.290.

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3.3
black box testing
method of testing that examines the behaviour of a *system under test* (3.20) without considering the internal implementation and structure of the *system under test*, thus relying on the *system under test's* open interface for testing

3.4
conformance requirement
requirement for implementation of a real open system which is claimed to conform to the relevant specification(s) that can be validated by *black box testing* (3.3)

Note 1 to entry: The set of conformance requirements together define the behavior of the system and its communication. Conformance of a real open system is, therefore, expressed at two levels, conformance to each individual requirement and conformance to the set. In this document, applicable conformance tests include requirements as far as they can be validated by *black box testing* (3.3).

Note 2 to entry: See also *static conformance requirements* (3.20) and *dynamic conformance requirements* (3.6).

Note 3 to entry: The requirements for this conformance specification are specified in ISO 15118-2.

3.5
conforming implementation
system under test (3.20) which satisfies both *static conformance requirements* (3.19) and *dynamic conformance requirements* (3.6), consistent with the capabilities stated in the *protocol implementation conformance statements* (3.16)

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Note 1 to entry: See ITU-T X.290.

3.6
dynamic conformance requirement
requirement which specifies what observable behavior is permitted by the relevant specification(s) in instances of communication

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Note 1 to entry: See ITU-T X.290.

Note 2 to entry: The requirements for this conformance specification are specified in ISO 15118-2.

3.7
executable test case
realization of an *abstract test case* (3.1)

Note 1 to entry: See ITU-T X.290.

3.8
expected behavior
exact response of the SUT (3.20) according to the underlying protocol specification to the stimulus defined in the *test behavior* (3.21)

3.9
implementation conformance statement
ICS
statement made by the supplier of an implementation or system claimed to conform to a given specification, stating which capabilities have been implemented

Note 1 to entry: See ITU-T X.290.

Note 2 to entry: The given document for this conformance specification is ISO 15118-2.

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3.10
implementation extra information for testing
IXIT
statement made by a supplier or implementer of a *system under test* (3.20) which contains or references all information [in addition to that given in the *implementation conformance statements* (3.9)] related to the *system under test* and its testing environment, which will enable the test laboratory to run an appropriate test suite against the SUT

Note 1 to entry: See ITU-T X.290.

3.11
implementation under test
IUT
implementation of one or more open system interconnection protocols in an adjacent user/provider relationship, being part of a real open system, which is to be studied by testing

Note 1 to entry: See ITU-T X.290.

3.12
main test component
MTC
single test component in a test component configuration responsible for creating and controlling *parallel test components* (3.13) and computing and assigning the *test verdict* (3.30)

Note 1 to entry: See ITU-T X.292.

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3.13
parallel test component
PTC
test component created by the *main test component* (3.12)

Note 1 to entry: See ITU-T X.292.

3.14
post-condition
test steps needed to define the path from the end of the *test behavior* (3.21) up to the finishing stable state for the *abstract test case* (3.1)

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3.15
pre-condition
test steps needed to define the path from the starting stable state of the *abstract test case* (3.1)up to the initial state from which the *test bevavior* (3.21) will start

3.16
protocol implementation conformance statement
PICS
implementation conformance statement (3.9) for an implementation or system claimed to conform to a given protocol specification

Note 1 to entry: See ITU-T X.290.

Note 2 to entry: The given protocol document for this conformance specification is ISO 15118-2.

Note 3 to entry: In the context of this document, PICS specify the configuration of the Test System (e.g. what test cases need to be executed and what confiugration is required for each testcase)

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