

DIN EN ISO 15118-4



ICS 43.120

Entwurf

Einsprüche bis 2021-11-17
Vorgesehen als Ersatz für
DIN EN ISO 15118-4:2019-08

**Straßenfahrzeuge –
Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation –
Teil 4: Konformitätsprüfungen für das Netzwerk- und
Anwendungsprotokoll (ISO/DIS 15118-4:2021);
Englische Fassung prEN ISO 15118-4:2021, nur auf CD-ROM**

Road vehicles –

Vehicle to grid communication interface –

Part 4: Network and application protocol conformance test (ISO/DIS 15118-4:2021);

English version prEN ISO 15118-4:2021, only on CD-ROM

Véhicules routiers –

Interface de communication entre véhicule et réseau électrique –

Partie 4: Essai de conformité du protocole d'application et du réseau (ISO/DIS 15118-4:2021);

Version anglaise prEN ISO 15118-4:2021, seulement en CD-ROM

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2021-09-17 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfs besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal von DIN unter www.din.de/go/entwuerfe bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an naautomobil@din.de möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/go/stellungnahmen-norm-entwuerfe oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an den DIN-Normenausschuss Automobiltechnik (NAAutomobil), 10004 Berlin, Postfach 8 04 62 oder Behrenstr. 35, 10117 Berlin.

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 1593 Seiten

DIN-Normenausschuss Automobiltechnik (NAAutomobil)

Nationales Vorwort

Der Text von ISO/DIS 15118-4:2021 wurde vom Technischen Komitee ISO/TC 22 „Road vehicles“ der Internationalen Organisation für Normung (ISO) erarbeitet und als EN ISO 15118-8:2020 durch das Technische Komitee CEN/TC 301 „Straßenfahrzeuge“ übernommen, dessen Sekretariat von AFNOR (Frankreich) gehalten wird.

Das zuständige deutsche Normungsgremium ist der Arbeitsausschuss NA 052-00-31 AA „Datenkommunikation“ des DIN-Normenausschusses Automobiltechnik (NAAutomobil).

Dieses Dokument ist derzeit zur parallelen Abstimmung vorgelegt.

Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die Englische Fassung von EN ISO 15118-4:2021.

Das DIN-Präsidium hat mit seinem Beschluss 1/2004 festgelegt, dass von dem in den Regeln der europäischen Normungsarbeit von CEN/CENELEC verankerten Grundsatz, wonach Europäische Normen in den drei offiziellen Sprachen Deutsch, Englisch und Französisch veröffentlicht werden, in begründeten Ausnahmefällen abgewichen und auf die deutsche Sprachfassung verzichtet werden kann.

Die Genehmigung dafür hat die DIN-Geschäftsleitung entsprechend ihren in Anlage 1 zu dem DIN-Rundschreiben A 5/2004 festgelegten Kriterien für die vorliegende Norm auf Antrag des NA 052 NAAutomobil als Ergebnis einer Einzelfallentscheidung erteilt, zumal bereits dieser Norm zugrunde liegende Papiere überwiegend in englischer Sprache auch von den deutschen Marktteilnehmern angewendet werden.

Um den Energieverbrauch von Fahrzeugen zu senken, werden Fahrzeuge mit elektrischem Teil- oder Komplettantrieb entwickelt. Um die Batterien dieser Fahrzeuge aufladen zu können, wird eine spezielle Ladeinfrastruktur benötigt.

Während verschiedene Teilaspekte in der Normung von Elektrofahrzeugen und Infrastruktur bei ISO und IEC bereits behandelt wurden, beschäftigt sich diese Normenreihe mit dem Informationsaustausch zwischen Elektrofahrzeug und Ladeinfrastruktur. Kommunikation ist für das effektive Aufladen von Fahrzeugen sowie die Entwicklung effizienter und komfortabler Abrechnungssysteme unabdingbar.

Dieser Teil der Normenreihe beschreibt spezifische Prüfungen basierend auf den Kommunikationsanforderungen, die in ISO 15118-2 beschrieben sind. Die Norm dient Systemlieferanten als Grundlage, um die Systemkonformität von Kommunikationssteuerungen entweder in Elektrofahrzeugen oder in Ladesäulen nachzuweisen.

Für die in diesem Dokument zitierten Dokumente wird im Folgenden auf die entsprechenden deutschen Dokumente hingewiesen:

ISO 15118-1	siehe	DIN EN ISO 15118-1
ISO 15118-2:2014	siehe	DIN EN ISO 15118-2:2016-08
ISO 15118-3	Siehe	DIN EN ISO 15118-3

Änderungen

Gegenüber DIN EN ISO 15118-4:2019-08 wurden folgende Änderungen vorgenommen:

- a) Abschnitt 7.3.5 wurde gelöscht (Prüfüberwachung);
- b) Qualität und Lesbarkeit der Bilder wurde gesteigert;
- c) Allgemeine Fehlerkorrekturen wurde im gesamten Dokument durchgeführt;
- d) Neue Abschnitte für Zuverlässigkeits- und Belastbarkeitsprüffälle wurden ergänzt (Abschnitt 11 und Anhang E).

Nationaler Anhang NA (informativ)

Begriffe

Die Benummerung der folgenden Begriffe und Abkürzungen ist identisch mit der Benummerung in der englischen Fassung.

Für die Anwendung dieses Dokuments gelten die Begriffe nach ISO 15118-1, ISO 15118-2, ISO 15118-3 und die folgenden Begriffe.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- IEC Electropedia: verfügbar unter <http://www.electropedia.org/>
- ISO Online Browsing Platform: verfügbar unter <http://www.iso.org/obp>

3.1
abstrakter Prüffall
(en: abstract test case)
vollständige und unabhängige Spezifikation von Aktionen, die notwendig sind, um einen speziellen Prüfzweck sicherzustellen

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

Anmerkung 2 zum Begriff: Diese Spezifikation ist auf dem Abstraktionsniveau für eine bestimmte abstrakte Prüfmethode festgelegt, wobei in einem stabilen Prüfzustand gestartet und in einem stabilen Prüfzustand geendet wird und dabei eine oder mehrere nachfolgende oder gleichzeitige Verbindungen eingebunden sein können.

Anmerkung 3 zum Begriff: Die Spezifikation sollte in der Art und Weise vollständig sein, um ein Prüfurteil zu ermöglichen, welches eindeutig jedem potenziell überwachbaren Prüfergebnis zugeordnet werden kann (d.h. Reihe von Prüfergebnissen).

Anmerkung 4 zum Begriff: Die Spezifikation sollte in der Art und Weise unabhängig sein, dass es möglich ist, den abgeleiteten ausführbaren Prüffall isoliert von anderen Prüffällen dieser Art auszuführen (d.h. die Spezifikation sollte immer die Möglichkeit des Startens und Beendens im Zustand „Leerlauf“ beinhalten).

3.2
abstrakte Prüfreihe
ATS, en: abstract test suite
Prüfreihe, die sich aus abstrakten Prüffällen zusammensetzt

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

3.3
Black-Box-Prüfung
(en: black box testing)
Prüfverfahren, welches das Verhalten eines SUT untersucht, ohne dabei die interne Implementierung und Struktur des SUT zu berücksichtigen und sich somit auf die offenen Prüfschnittstellen am SUT verlässt

3.4

Konformitätsanforderungen

(en: conformance requirements)

Konformität eines realen Systems, bestehend aus der Konformität zu jeder Anforderung und der Konformität zur Reihe

Anmerkung 1 zum Begriff: Reihe von zusammenhängenden Anforderungen, die zusammen das Verhalten des Systems und dessen Kommunikation festlegen. Konformität eines realen Systems wird deshalb auf zwei Ebenen ausgedrückt: Konformität zu jeder individuellen Anforderung und Konformität zur Reihe. Anwendbare ISO 15118-4 Konformitätsprüfungen beinhalten Anforderungen und Anforderungen an die Übertragungssyntax, soweit diese mittels Black-Box-Prüfung bestätigt werden können.

Anmerkung 2 zum Begriff: Siehe auch *statische Konformitätsanforderungen* (3.4) und *dynamische Konformitätsanforderungen* (3.6).

3.5

normgerechte Implementierung

(en: conforming implementation)

IUT, welche sowohl statische als auch dynamische Konformitätsanforderungen befriedigt, die mit den in der (den) PICS(s) genannten Fähigkeiten in Einklang sind

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

3.6

dynamische Konformitätsanforderungen

(en: dynamic conformance requirements)

eine der Anforderungen, die festlegt, welches überwachbare Verhalten nach der (den) relevanten Spezifikation(en) in Bezug auf die Kommunikation erlaubt ist

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

Anmerkung 2 zum Begriff: Die Anforderungen für diese Konformitätsspezifikation sind in ISO 15118-2 festgelegt.

3.7

ausführbarer Prüffall

(en: executable test case)

Umsetzung eines abstrakten Prüffalls

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

3.8

erwartetes Verhalten

(en: expected behavior)

genaue Antwort des SUT, anhand der zugrunde liegenden Protokollspezifikation, auf den Stimulus, der im Prüfverhalten festgelegt ist

3.9

Konformitätsaussage zur Implementierung

ICS, en: implementation conformance statement

Aussage des Lieferanten einer Implementierung oder eines Systems, deren (dessen) Konformität mit einer gegebenen Spezifikation erklärt wird, die ausdrückt, welche Fähigkeiten implementiert wurden

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

Anmerkung 2 zum Begriff: Das gegebene Dokument für diese Konformitätsspezifikation ist ISO 15118-2.

3.10

zusätzliche Prüfinformation zur Implementierung

IXIT, en: implementation extra information for testing

Aussage, die von einem Lieferanten oder Umsetzer einer IUT getroffen wurde, die alle Informationen (zusätzlich zu den in der ICS gegebenen) bezogen auf die IUT und deren Testumgebung beinhaltet oder referenziert und dem Prüflabor ermöglicht, eine geeignete Prüfreihe gegen die IUT durchzuführen

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

3.11

zu prüfende Implementierung

IUT, en: implementation under test

Implementierung eines oder mehrerer OSI-Protokolle in einer angrenzenden Nutzer/Anbieter-Beziehung als der Teil eines realen offenen Systems, welcher durch die Prüfung untersucht wird

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

3.12

Hauptprüfkomponente

MTC, en: main test component

einzelne Prüfkomponente in einer Prüfkomponentenkonfiguration, verantwortlich für die Erstellung und Steuerung *paralleler Prüfkomponenten* sowie für die Berechnung und Zuordnung des Prüfurteils

Anmerkung 1 zum Begriff: Siehe ITU-T X.292.

3.13

parallele Prüfkomponente

PTC, en: parallel test component

Prüfkomponente, die von der Hauptprüfkomponente erstellt wurde

Anmerkung 1 zum Begriff: Siehe ITU-T X.292.

3.14

Nachbedingung

(en: post-condition)

Prüfschritte, die für die Festlegung des Weges vom Ende des *Prüfverhaltens* bis zum finalen stabilen Zustand des Prüffalls benötigt werden

Anmerkung 1 zum Begriff: Siehe auch *Prüfverhalten* (3.23).

3.15

Vorbedingung

(en: pre-condition)

Prüfschritte, die für die Festlegung des Weges vom beginnenden stabilen Zustand des Prüffalls bis zum initialen Zustand, an dem das Prüfverhalten beginnt, benötigt werden

Anmerkung 1 zum Begriff: Siehe auch *Prüfverhalten* (3.23).

3.16

Erklärung zur Konformität der Protokollimplementierung

PICS, en: protocol implementation conformance statement

ICS für eine Implementierung oder ein System, deren (dessen) Konformität mit einer gegebenen Protokollspezifikation erklärt wird

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

Anmerkung 2 zum Begriff: Das gegebene Protokolldokument für diese Konformitätsspezifikation ist ISO 15118-2.

3.17

Zusatzinformation für die Prüfung der Protokollimplementierung

PIXIT, en: protocol implementation extra information for testing

IXIT, die auf die Konformitätsprüfung nach einer gegebenen Protokollspezifikation bezogen ist

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

Anmerkung 2 zum Begriff: Das gegebene Protokolldokument für diese Konformitätsspezifikation ist ISO 15118-2.

3.18

Laufzeitumgebung

(en: runtime environment)

eine Umgebung, die das Betriebssystem und entsprechende Plattform-Anforderungen eines Systems beschreibt

BEISPIEL Prüfsystem.

3.19

semantisch ungültiges Prüfverhalten

SemITB, en: semantically invaild test behavior

Prüfschritte, bei denen das Prüfsystem Stimuli an das SUT sendet, welche nach den Protokollanforderungen semantisch ungültig sind

Anmerkung 1 zum Begriff: Diese Art von Prüfverhalten ist in dieser Konformitätsnorm festgelegt und beinhaltet ausdrücklich Anforderungen, die das entsprechende Fehlerverhalten des SUT festlegen.

3.20

statische Konformitätsanforderungen

(en: static conformance requirements)

eine der Anforderungen, die festlegt, welche Limitierungen der zulässigen Kombinationen von implementierten Fähigkeiten in einem realen offenen System bestehen, dessen Konformität mit der (den) relevanten Spezifikation(en) behauptet wird.

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

3.21

zu prüfendes System

SUT, en: system under test

reales offenes System, das die IUT beinhaltet

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

3.22

syntaktisch ungültiges Prüfverhalten

SynITB, en: syntactically invaild test behavior

Prüfschritte, bei denen das Prüfsystem Stimuli an das SUT sendet, die nach den Protokollanforderungen syntaktisch ungültig sind

Anmerkung 1 zum Begriff: Diese Art von Prüfverhalten ist nicht in dieser Konformitätsnorm festgelegt, siehe Codec-Anforderungen.

3.23

Prüfverhalten

(en: test behavior)

Reihe von Prüfschritten (Prüfkörper), die notwendig sind, um den Prüfzweck sicherzustellen und um Urteile den möglichen Ergebnissen zuzuordnen

3.24

Prüfausführung

(en: test execution)

Interpretation oder Ausführung einer abstrakten Prüfreihe

Anmerkung 1 zum Begriff: Konzeptionell kann die Prüfausführung in drei interagierende Einheiten unterteilt werden: eine ausführbare Prüfreihe (ETS, en: executable test suite), einen Prüffrahmen (TFW, en: test framework) und ein optionales internes Kodierungs-/Dekodierungssystem (EDS, en: encoding/decoding system).

Anmerkung 2 zum Begriff: Siehe auch ETSI ES 201 873-5 V4.6.1.

3.25

Prüffrahmen

TFW, en: test framework

Einheit, die alle Aktionen von Prüffällen oder Funktionen ausführt

Anmerkung 1 zum Begriff: Der Prüffrahmen interagiert mit den Einheiten Prüfsteuerung (TM, en: test management), SUT-Adapter (SA) und Programmadapter (PA) über die Prüfsteuerungsschnittstelle (TCI, en: test control interface) und die Prüflaufzeitschnittstelle (TRI, en: test runtime interface). Zusätzlich steuert der Prüffrahmen die ausführbare Prüfreihe (ETS) und das Kodierungs-/Dekodierungssystem (EDS). Der Prüffrahmen initialisiert die Adapter sowie die ETS- und EDS-Einheiten. Diese Einheit führt alle notwendigen Aktionen aus, um einen Prüffall oder eine Funktion mit Parametern in der ETS-Einheit ordnungsgemäß auszuführen. Er befragt die Prüfsteuerungseinheit nach Modulparameterwerten, die für die ETS notwendig sind und sendet aufgezeichnete Informationen dorthin. Der Prüffrahmen sammelt und löst zugeordnete Urteile, die von der ETS-Einheit zurückgegeben werden.

Anmerkung 2 zum Begriff: Siehe auch ETSI ES 201 873-5 V4.6.1.

Anmerkung 3 zum Begriff: In diesem Dokument wird das Laufzeitsystem für den Prüffrahmen TTCN-3 (T3RTS) verwendet, um eine Prüffrahmen-Funktionalität zu erläutern.

3.26

Prüfziel

(en: test purpose)

Prosabeschreibung eines hinreichend festgelegten Prüfziels, welche sich auf eine einzelne Konformitätsanforderung oder einen Satz von in Beziehung stehenden Konformitätsanforderungen konzentriert, die in der entsprechenden OSI-Spezifikation festgelegt sind

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

BEISPIEL Überprüfung, ob ein spezifischer Wert eines spezifischen Parameters unterstützt wird.

3.27

Prüfsystem

(en: test system)

reales System, welches den Prüffrahmen, die abstrakte Prüfreihe, die Prüfausführung und die Adapter sowie die Codecs umfasst

Anmerkung 1 zum Begriff: Typischerweise beinhaltet es auch eine gemeinsame Laufzeitumgebung, basierend auf einem Betriebssystem.

3.28

Prüfssteuerungsschnittstelle

TCI, en: test control interface

vier Schnittstellen, welche die Interaktion der TTCN-3-Software mit der Prüfsteuerung, die Kodierung und Dekodierung, den Umgang mit den Prüfkomponenten und die Aufzeichnung in einem Prüfsystem festlegen

Anmerkung 1 zum Begriff: Siehe ETSI ES 201 873-5 V4.6.1.

3.29

Prüflaufzeitschnittstelle

TRI, en: test runtime interface

zwei Schnittstellen, welche die TTCN-3-Prüfsystem Software zwischen dem SUT und dem Programmadapter (PA) sowie dem Systemadapter (SA) in einem Prüfsystem festlegen

Anmerkung 1 zum Begriff: Siehe ETSI ES 201 873-5 V4.6.1.

3.30

Prüfsystemschnittstelle

TSI, en: test system interface

Prüfkomponente, welche die Zuordnung der im (abstrakten) TTCN-3-Prüfsystem verfügbaren Ports zu denjenigen bereitstellt, welche von einem realen System angeboten werden

Anmerkung 1 zum Begriff: Siehe ETSI ES 201 873-5 V4.6.1.

3.31

gültiges Prüfverhalten

VTB, en: valid test behavior

Prüfschritte, bei denen das Prüfsystem Stimuli an das SUT sendet, die nach den Protokollanforderungen (syntaktisch und semantisch) gültig sind

Anmerkung 1 zum Begriff: Diese Art von Prüfverhalten ist in diesem Konformitätsdokument festgelegt.

Anmerkung 2 zum Begriff: Die Protokollanforderungen für diese Konformitätsspezifikation sind in ISO 15118-2 festgelegt.

3.32

Urteil

Prüfurteil

(en: verdict, test verdict)

Aussage „bestanden“, „fehlgeschlagen“ oder „ergebnislos“, wie in einem abstrakten Prüffall festgelegt, hinsichtlich der Konformität einer IUT bezogen auf diesen Prüffall, wenn dieser gerade ausgeführt wird

Anmerkung 1 zum Begriff: Siehe ITU-T X.290.

Nationaler Anhang NB (informativ)

Literaturhinweise

DIN EN ISO 15118-1, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 1: Allgemeine Informationen und Festlegungen der Anwendungsfälle*

DIN EN ISO 15118-2:2016-08, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 2: Anforderungen an das Netzwerk- und Anwendungsprotokoll*

DIN EN ISO 15118-3, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 3: Anforderungen an physikalische- und Datenverbindungsschnittstelle*

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Foreword

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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.

The main changes compared to the previous edition 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 reliability and robustness test cases added (Clause 11 and Annex E).

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.

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 part of the standard 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 standard. Hence this standard 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 part of the standard 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 Part 5 of this standard. 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 International Standard 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 standard 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 may restrict testing even further. Hence, the purpose of this part 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 an implementation has the required capabilities and that its behavior conforms consistently in representative instances of communication.

NOTE 2 This standard 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.

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*

IEC 61851-1:2017, *Electric vehicle conductive charging system — Part 1: General requirements (Ed 3.0, 2017)*

ITU-T X.290, *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications — General concepts (April 1995)*

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 Edition 2, this document references IEC 61851-1:2017 Edition 3 because of applicability on the market.

3 Terms and definitions

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 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

abstract test case

complete and independent specification of the actions required to achieve a specific test purpose

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 may involve one or more consecutive or concurrent connections.

Note 3 to entry: The specification should be 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 should be independent in the sense that it should be possible to execute the derived executable test case in isolation from other such test cases (i.e. the specification should always include the possibility of starting and finishing in the “idle” state).

3.2

abstract test suite

ATS

test suite composed of abstract test cases

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

3.3

black box testing

method of testing that examines the behavior of an SUT without considering the internal implementation and structure of the SUT, thus relying on the SUT's open interface for testing

3.4

conformance requirements

conformance of a real system consisting of conformance to each requirement and conformance to the set

Note 1 to entry: Set of interrelated requirements which together define the behavior of the system and its communication. Conformance of a real system will, therefore, be expressed at two levels, conformance to each individual requirement and conformance to the set. Applicable ISO 15118-4 conformance tests include requirements and transfer syntax requirements as far as they can be validated by black box testing.

Note 2 to entry: See also *static conformance requirements* (3.4) and *dynamic conformance requirements* (3.6).

3.5

conforming implementation

IUT which satisfies both static and dynamic conformance requirements, consistent with the capabilities stated in the PICS(s)

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

3.6

dynamic conformance requirements

one of the requirements which specifies what observable behavior is permitted by the relevant specification(s) in instances of communication

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

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

3.7

executable test case

realization of an abstract test case

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

3.8

expected behavior

exact response of the SUT according to the underlying protocol specification to the stimulus defined in the test behavior

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.

3.10

implementation extra information for testing

IXIT

statement made by a supplier or implementer of an IUT which contains or references all information (in addition to that given in the ICS) related to the IUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the IUT

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

3.11
implementation under test
IUT

implementation of one or more OSI 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* and computing and assigning the test verdict

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

3.13
parallel test component
PTC

test component created by the main test component

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* up to the finishing stable state for the test case

Note 1 to entry: See also *test behavior* (3.23).

3.15
pre-condition

test steps needed to define the path from the starting stable state of the test case up to the initial state from which the *test behavior* will start

Note 1 to entry: See also *test behavior* (3.23).

3.16
protocol implementation conformance statements
PICS

ICS 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.

3.17
protocol implementation extra information for testing
PIXIT

IXIT related to testing for conformance 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.

3.18

runtime environment

an environment that describes the operating system and corresponding platform requirements of a system

EXAMPLE Test system.

3.19

semantically invalid test behavior

SemITB

test steps where the test system sends stimuli to the SUT that are semantically invalid according to the protocol requirements

Note 1 to entry: This type of test behavior is defined in this conformance standard and explicitly includes requirements which define the appropriate error handling of the SUT.

3.20

static conformance requirements

one of the requirements that specify the limitations on the combinations of implemented capabilities permitted in a real open system which is claimed to conform to the relevant specification(s)

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

3.21

system under test

SUT

real open system in which the IUT resides

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

3.22

syntactically invalid test behavior

SynITB

test steps where the test system sends stimuli to the SUT that are syntactically invalid according to the protocol requirements

Note 1 to entry: This type of test behavior is not defined in this conformance standard, see codec requirements.

3.23

test behavior

set of test steps (test body) which are essential in order to achieve the test purpose and assign verdicts to the possible outcomes

3.24

test execution

interpretation or execution of an abstract test suite

Note 1 to entry: Conceptually, the TE can be decomposed into three interacting entities: an Executable Test Suite (ETS), a Test Framework (TFW) and an optional internal Encoding/Decoding System (EDS) entity.

Note 2 to entry: See also ETSI ES 201 873-5 V4.6.1.

3.25

test framework

TFW

an entity to perform all actions of test cases or functions

Note 1 to entry: The Test Framework interacts with the test management (TM), SUT adaptor (SA) and platform adaptor (PA) entities via test control interface (TCI) and test runtime interface (TRI) and additionally manages the executable test suite (ETS) and encoding/decoding system (EDS) entities. It initializes adaptors as well as ETS and EDS entities. This entity

performs all the actions necessary to properly start the execution of a test case or function with parameters in the ETS entity. It queries the TM entity for module parameter values required by the ETS and sends logging information to it. It also collects and resolves associated verdicts returned by the ETS entity.

Note 2 to entry: See also ETSI ES 201 873-5 V4.6.1.

Note 3 to entry: In this document, the test framework TTCN-3 runtime dystem (T3RTS) is used to explain a test framework functionality.

3.26

test purpose

prose description of a well-defined objective of testing, focusing on a single conformance requirement or a set of related conformance requirements as specified in the appropriate OSI specification

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

EXAMPLE Verifying the support of a specific value of a specific parameter.

3.27

test system

real system combining the test framework, abstract test suite, test execution and adapters as well as codecs

Note 1 to entry: Typically also containing a common runtime environment based on an operating system

3.28

test control interface

TCI

four interfaces that define the interaction of the TTCN-3 Executable with the test management, the coding and decoding, the test component handling and the logging in a test system

Note 1 to entry: See ETSI ES 201 873-6 V4.6.1.

3.29

test runtime interface

TRI

two interfaces that define the interaction of the TTCN-3 executable between the SUT and the platform adapter (PA) and the system adapter (SA) in a test system

Note 1 to entry: See ETSI ES 201 873-6 V4.6.1.

3.30

test system interface

TSI

test component that provides a mapping of the ports available in the (abstract) TTCN-3 test system to those offered by a real test system

Note 1 to entry: See ETSI ES 201 873-6 V4.6.1.

3.31

valid test behavior

VTB

test steps where the test system sends stimuli to the SUT that are valid (syntactically and semantically) according to the protocol requirements

Note 1 to entry: This type of test behavior is defined in this conformance standard.

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

3.32

verdict

test verdict

statement of “pass”, “fail” or “inconclusive”, as specified in an abstract test case, concerning conformance of an IUT with respect to that test case when it is executed

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

4 Symbols (and abbreviated terms)

For the purpose of this document, the following abbreviations apply:

ALM	Application Layer Message
ATS	Abstract Test Suite
BEV	Battery Electric Vehicle
CA	Certificate Authority
CPL	Control Pilot Line
CRL	Certificate Revocation List
DH	Diffie Hellman
DER	Distinguished Encoding Rules
ECDSA	Elliptic Curve Digital Signature Algorithm
EDS	Encoding/Decoding System
EIM	External Identification Means
EMAID	E-Mobility Account Identifier
ETS	Executable Test Suite
EV	Electric Vehicle
EVCC	Electric Vehicle Communication Controller
EVSE	Electric Vehicle Supply Equipment
EXI	Efficient XML Interchange
HAL	Hardware Abstraction Layer
ICS	Implementation Conformance Statement
ID(s)	Identifier(s)
IUT	Implementation under Test
IXIT	Implementation eXtra Information for Testing
OCSP	Online Certificate Status Protocol
OEM	Original Equipment Manufacturer
MTC	Main Test Component
NACK	Negative Acknowledgement
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
PKI	Public Key Infrastructure
PLC	Power Line Communication
PnC	Plug and Charge
PTC	Parallel Test Component
SA	Secondary Actor
SDP	SECC Discovery Protocol
SECC	Supply Equipment Communication Controller
SLAC	Signal Level Attenuation Characterization

SUT	System Under Test
TC	Test Case
TCI	Test Control Interface
TCP	Transmission Control Protocol
TE	Test Execution
TFW	Test Framework
TP	Test Purpose
TRI	Test Runtime Interface
TSI	Test System Interface
TSS	Test Suite Structure
TTCN-3	Testing and Test Control Notation version 3
V2G	Vehicle-to-Grid
V2G CI	V2G Communication Interface
V2GTP	V2G Transfer Protocol
VTB	Valid Test Behavior
UDP	User Datagram Protocol
XML	Extensible Markup Language

5 Conventions

5.1 Requirement structure

This document uses unique number identifiers for each individual requirement. This requirement structure allows for easier requirement tracking and management. The following format is used throughout this document:

"[V2G"Y"-"XXX"]" requirement text

Where:

- "V2G" represents the ISO 15118 set of standards,
- "Y" represents the document part of the ISO 15118 document set, for this document Y = 4
- "XXX" represents the individual requirement number and
- "requirement text" includes the actual text of the requirement.

5.2 Test system description

TTCN-3 is used in this document to define the test system and the test cases inside the test suite. However, using TTCN-3 is not mandatory for the implementation of conformance tests of ISO 15118-2.

[V2G4-001] The implementers of conformance tests shall verify that all test objectives implemented in their environment are identical to those described in this document.

6 Test architecture reference model

6.1 General information

Figure 1 provides an overview on the test architecture for this standard. The following sub clauses define the interface requirements marked black in Figure 1 for platform and SUT adapters (see 6.2 and 6.3) as well as the codecs (see 6.4). The Test Suite is defined in detail in the remainder of this document.

Figure 1 — Test architecture reference model for testing of ISO 15118-2

For the scope of this document only the "ISO 15118-2 – Messaging" interface to the SUT and its dependencies to the corresponding "IEC 61851-1, Annex A – PWM Signaling" interface are relevant. This document therefore limits its scope to the respective SUT adapters and codecs.

6.2 Platform adapter interface

The platform adapter within the test system is responsible for timers and external functions. Besides means for timers, which are typically provided as part of the test framework, no external functions are defined for ISO 15118-2 conformance testing.

[V2G4-002] The platform adapter of the test system shall implement the TriPlatformPA and the TriPlatformTE interfaces as defined in ETSI ES 201 873-5 V4.6.1 sub clause 6.5.3.

6.3 SUT adapter interfaces

The SUT adapter within the test system adapts the TTCN-3 communication operations to the SUT based on an abstract test system interface and implements the real test system interface. It is responsible to propagate message requests and procedure-based calls from the Test Execution (see Figure 1) to the SUT, and to notify the Test Execution of any received test events by appending them to its port queues.

[V2G4-003] The SUT adapters of the test system shall implement the TriCommunicationSA and the TriCommunicationTE interfaces as defined in ETSI ES 201 873-5 V4.6.1, 6.5.2.

NOTE 1 The actual implementation of these adapters is out of scope of this standard.

[V2G4-004] The IEC 61851-1 SUT adapter shall adapt the HAL 61851-1 functions to a PWM Signal defined in 7.7.7.

NOTE 2 The IEC 61851-1 SUT adapter may need additional hardware for adapting the message-based HAL 61851-1 communication to PWM Signaling according to IEC 61851-1 Annex A.

[V2G4-005] The ISO 15118-2 SUT adapter shall adapt and send/receive the encoded SDP requests/responses through UDP messages to/from the SUT as defined in ISO 15118-2 sub clauses 7.7.2 and 7.10.1.

[V2G4-006] The ISO 15118-2 SUT adapter shall adapt and send/receive the encoded V2G messages through a TCP or TLS connection to/from the SUT as defined in ISO 15118-2, 7.7.1 and 7.7.3.

[V2G4-007] The ISO 15118-2 SUT adapter shall adapt the internal port control messages for TCP and TLS connection management as defined in Annex P.3

NOTE 3 The TCP/TLS connection management includes the following functionality:

- Control for TCP/TLS port disconnection handling
- Control for receiving information / status on a given TCP/TLS connection
- Notification of TCP/TLS connection status events
- Notification of TLS Handshake status events

[V2G4-008] The ISO 15118-2 SUT adapter shall provide a port map operation (refer to 7.3.2) with additional parameters for TCP and TLS connection configuration as defined in Annex P.3.

NOTE 4 The TCP/TLS connection configuration includes the following functionality:

- Configuration for IP address and port
- Configuration for usage of security (TCP/TLS)
- Configuration for cipherSuite
- Configuration for TLS protocol version
- Configuration for TLS certificate

NOTE 5 The ISO 15118-3 adapter is defined in Part 5 of this standard. It may need additional hardware to adapt between different Layer 2 communication technologies (e.g. Ethernet to HomePlug Green PHY)

6.4 Codecs

A codec is responsible for the external encoding and decoding of TTCN-3 values into bit strings suitable to be sent to the SUT. The Test Execution (TE) determines which codec shall be used and passes the TTCN-3 data to the appropriate encoder to obtain the encoded data. Received data is decoded in this entity by using the appropriate decoder, which translates the received data into TTCN-3 values cf. ETSI ES 201 873-6 V4.5.1, that can be matched against expected behaviors in the form of templates.

[V2G4-009] All codecs in this standard shall implement the TCI-CD interface as defined in ETSI ES 201 873-6 V4.6.1, 7.3.2.

NOTE 1 For ISO 15118-2 conformance testing three codecs (V2G-EXI, SDP, V2GTP, see Figure 1) are used to encode or decode messages consumable by the tester into bit strings / signals consumable by the SUT.

NOTE 2 The exact implementation of these codecs is out of scope of this standard.

[V2G4-010] The V2G-EXI codec shall encode TTCN-3 values as defined in Annex P.6 into corresponding EXI streams as defined in ISO 15118-2, 7.9.1.

[V2G4-011] The V2G-EXI Security codec shall encode TTCN-3 values for X.509 Certificates as defined in Annex P.6 into a corresponding Base64 representation suitable for EXI streams according to ISO 15118-2, 7.9.1.

- [V2G4-012] The V2G-EXI codec shall decode EXI streams as defined in ISO 15118-2, 7.9.1 into TTCN-3 values as defined in Annex P.6.
- [V2G4-013] The V2G-EXI Security codec shall decode Base64 representation from EXI streams according to ISO 15118-2 sub clause 7.9.1 into TTCN-3 values for X.509 Certificates as defined in Annex P.6.
- [V2G4-014] The SDP codec shall encode TTCN-3 values as defined in Annex P.5 into corresponding SDP requests/responses as defined in ISO 15118-2, 7.10.1.3, 7.10.1.4 and 7.10.1.5.
- [V2G4-015] The SDP codec shall decode SDP requests/responses as defined in ISO 15118-2 sub clauses 7.10.1.3, 7.10.1.4 and 7.10.1.5 into TTCN-3 values as defined in Annex P.4.
- [V2G4-016] The V2GTP codec shall encode TTCN-3 values as defined in Annex P.4 into corresponding V2GTP envelopes as defined in ISO 15118-2, 7.8.3.1.
- [V2G4-017] The V2GTP codec shall decode V2GTP envelopes as defined in ISO 15118-2, 7.8.3.1 into TTCN-3 values as defined in Annex P.4.

7 Test suite conventions

7.1 General information

This clause defines all conventions that are relevant for conformance tests of SUTs implementing ISO 15118-2.

7.2 Test suite structure (TSS)

A test suite is a complete set of test cases, possibly combined into groups or modules (e.g. for use cases or domains like AC, DC charging), that are necessary to perform conformance testing for a given SUT.

In each test case, the SUT is stimulated with specific inputs and the reactions are observed and evaluated. Depending on the test purpose different pre-conditions and post-conditions must be considered for the formulation of the test behavior. The pre-conditions, post-conditions as well as test behaviors are encapsulated into individual functions and stored within separate modules. Thus, a complete test case is composed by the actual test behavior enveloped by pre- and post-conditions (see 7.7.5 for detail). The corresponding grouping of functions can therefore be assigned to the lowest abstract hierarchical level (see Figure 2). The test cases are defined on the second level.

Figure 2 — General overview of the Test Suite Structure (TSS)

The test profile is a collection of self-contained test cases as well as PICS (see 7.3.3) and PIXIT (see 7.3.4) in order to represent a given use case. The selection is based on the use cases of the ISO 15118 series and its corresponding requirements.

Hence the test suite structure (TSS) is segmented into subgroups according to the use cases defined in ISO 15118-1 for conformance testing. Table 1 shows these subgroups, which are used for the organization of the test case specifications as well as for the test suite identifiers (see 7.4 for detail).

Table 1 — Identifiers within the Test Suite Structure (TSS)

Identifiers	Values	Description
<sut>		System under Test
	EVCC	Electric Vehicle Communication Controller
	SECC	Supply Equipment Communication Controller
<dom>		Domain
	AC	AC specific behaviors
	DC	DC specific behaviors
	IN	Inductive specific behaviors
	CMN	Common behaviors
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)

NOTE The domain for inductive charging is not relevant for this standard but was introduced for future purposes.

Table 2 describes the Annexes derived for this document.

Table 2 — Test suite structure – Annexes description

Annexes	Description
Configuration Annex A	The configuration annex contains constant definitions timers, PICS and PIXIT definitions. The configuration described in Annex A shall be applied.
Control Part Annex B	The control part annex describes the execution order of modeled test cases (test groups). The EVCC control part sub clauses contain the test groups if the SUT is an EVCC. The SECC control part sub clauses contain the test groups if the SUT is an SECC. The control part in Annex A shall be followed.
Test Cases Annex C - E	The test case annexes contain the TTCN-3 test case files. The EVCC sub clauses contain the test cases if the SUT is an EVCC. The SECC sub clauses contain the test cases if the SUT is an SECC. The test cases in Annex B - Annex D shall be considered.
Functions Annex F – I	The function annexes contain methods for supporting the test execution as well as the actual pre-, post-conditions and test behaviors of the ISO 15118 conformance tests. The EVCC sub clauses contain the test behavior if the SUT is an EVCC. The SECC sub clauses contain the test behavior if the SUT is an SECC. The Pre-condition sub clause contains functions that are used for defining the pre-conditions of a test behavior. The Post-condition sub clause contains functions that are used to establish the post-conditions of a test case. The Library Functions sub clause contains utility functions used across the test suite for various purposes. This functions in Annex F - Annex I shall be considered.

Templates Annex J - N	The templates sub clause contains the TTCN-3 template files for matching a SUT's reaction on a stimulus against its expected behavior. The templates in Annex K - Annex O shall be considered.
Data Structures Annex O	The data structures sub clause contains data structures that are needed additionally to the data structures of the ISO 15118 series, e.g. used for X.509 certificates. The data structures in Annex P shall be considered.

7.3 Test profiles

This sub clause defines test profiles for conformance with ISO 15118-2. A test profile consists of a test configuration as well as a selection and assignment of PICS/PIXIT. Depending on the test configuration a set of test components and ports are defined. The test profile furthermore includes a test group defining the set of relevant test cases and the sequence in which they are executed in order to perform a conformance test for a given use case.

7.3.1 Test configurations

The test configuration reflects various ISO 15118 scenarios. Entities for the SUT, Tester and PTCs are:

- Electric Vehicle Communication Controller (EVCC)
- Supply Equipment Communication Controller (SECC)
- [PWM Signaling (61851)]

Table 3 shows combinations of such entities defining valid test configurations for this standard (CF_Part_ID).

Table 3 — ISO 15118-4 test configurations

CF_Part_ID	SUT	Tester	PTCs
CF_04_001	SECC	EVCC	PTC1=61851
CF_04_002	EVCC	SECC	PTC1=61851

7.3.2 Components and ports

In correspondence to the identified set of relevant test configurations this sub clause defines test components which reflect the main entities needed for stimulation of the SUT with respect to ISO 15118. Ports are used to connect these components with each other and the SUT. The components are predefined in the configuration module and are summarized in Table 4. Port types define which kind of messages can be sent or received by this port. The corresponding port type definitions are summarized in Table 5.

Table 4 — Component definitions

Components	Description
SECC_Tester (MTC)	This component type is the main type for the tests of an SECC. A V2G_TCP_TLS_ALM_SECC_Port , V2G_UDP_SDP_Port, HAL_61851_Port and a HAL_61851_Internal_Port (see Table 5) are assigned to this component type.

EVCC_Tester (MTC)	This component type is the main type for the tests of an EVCC. A V2G_TCP_TLS_ALM_EVCC_Port , V2G_UDP_SDP_Port, HAL_61851_Port and a HAL_61851_Internal_Port (see Table 5) are assigned to this component type.
HAL_61851_Listener (PTC)	The HAL_61851_Listener is responsible for watching the correct IEC 61851 behavior and is used in the form of a parallel test component (PTC). This component uses the HAL_61851_Port (see Table 5) to communicate with an IEC 61851-1 SUT Adapter and the HAL_61851_Internal_Port to communicate with the MTC.

Table 5 — Port type definitions

Port Type	Description
V2G_TCP_TLS_ALM_SECC_Port	<p>This port is used to send and receive V2G- Application Layer Messages (ALM) or supportedAppProtocol messages via TCP/TLS defined in ISO 15118-2 to/from an SECC.</p> <p>This port is also used to send and receive internal TCP/TLS port control messages defined in Annex P.</p>
V2G_TCP_TLS_ALM_EVCC_Port	<p>This port is used to send and receive V2G- Application Layer Messages (ALM) or supportedAppProtocol messages via TCP/TLS defined in ISO 15118-2 to/from an EVCC.</p> <p>This port is also used to send and receive internal TCP/TLS port control messages defined in Annex P.</p>
V2G_UDP_SDP_Port	This port is used to send and receive SDP messages via UDP defined in ISO 15118-2 to/from an EVCC or SECC.
HAL_61851_Port	This port is used to send or receive messages to an IEC 61851 communication unit. The communication unit will interpret these messages and will set the corresponding signaling to the SUT (SECC/EVCC). The specification of the IEC 61851 communication unit is out of scope of this standard.
HAL_61851_Internal_Port	This port is used to synchronize the status of the IEC 61851-1 PWM signal between the MTC (SECC_Tester or EVCC_Tester) and PTC (HAL_61851_Listener_Port). It enables the MTC and PTC to send and receive HAL 61851-1 messages.

These components and ports compose relevant test configurations for this standard. Whether the type EVCC_Tester or SECC_Tester shall be used as MTC depends on the type of the SUT. If the SUT is an EVCC, the MTC shall use the type EVCC_Tester. If the SUT is an SECC, the MTC shall use the type SECC_Tester. The HAL_61851_Listener combines all necessary listener functionality into one component, independent on whether the MTC represents an SECC_Tester or an EVCC_Tester. The MTC always contains a TTCN-3 test configuration and delimits the lifeline during test execution. Next to using ports for communication purposes, local timers, variables or constants may be assigned to components to store dynamic information during test case execution.

In addition to the MTC and PTC and their corresponding port type definitions, a test configuration also consists of respective Test System Interfaces (TSI). An abstract Test System Interface (TSI) is specified as a collection

of ports. A TSI has no local timers, constants or variables. Only ports are assigned to it. During the test case execution test components ports can be mapped dynamically to the TSI ports to establish communication channel to the real test system interface. In the test configuration the TSI uses the type System_EVCC or System_SECC depending on the type of the SUT. If the SUT is an EVCC, the TSI uses the type System_EVCC. If the SUT is an SECC, the TSI uses the type System_SECC.

The test configuration is illustrated in Figure 3. The type of the V2G components and ports (EVCC or SECC) depends on the SUT type.

Figure 3 — ISO 15118-4 test configuration

As shown in Figure 3 the port mappings are defined statically as follows:

- The port `pt_V2G_TCP_TLS_ALM_EVCC_Port` of the TSI is always mapped to port `pt_V2G_TCP_TLS_ALM_EVCC_Port` of the MTC.
- The port `pt_V2G_TCP_TLS_ALM_SECC_Port` of the TSI is always mapped to port `pt_V2G_TCP_TLS_ALM_SECC_Port` of the MTC.
- The port `pt_V2G_UDP_SDP_Port` of the TSI is always mapped to port `pt_V2G_UDP_SDP_Port` of the MTC.
- The port `pt_HAL_61851_Port` of the TSI is always mapped to port `pt_HAL_61851_Port` of the MTC.
- The port `pt_HAL_61851_Listener_Port` of the TSI is always mapped to port `pt_HAL_61851_Listener_Port` of the `v_HAL_61851_Listener`. The `pt_HAL_61851_Listener_Port` is from the same type `HAL_61851_Port` as the `pt_HAL_61851_Port`.

- The internal port pt_HAL_61851_Internal_Port is not mapped to the TSI. This port is connected between the MTC and PTC.

7.3.3 Protocol Implementation Conformance Statement (PICS) Definition

To evaluate the conformance of a particular implementation, it is necessary to have a statement of the capabilities and options which have been implemented, and any features which have been omitted, so that the implementation can be tested for conformance against relevant requirements, and against those requirements only. Such a statement is called a Protocol Implementation Conformance Statement (PICS) cf. [ITU-T X.290].

All PICS defined in the ATS are summarized in Table 6 - Table 8.

**Table 6 — PICS for test system configurations CF_04_001 and CF_04_002
(SUT either SECC or EVCC)**

PICS	Description
PICS_CMN_CMN_CombinedTesting	Indication for enabling combined testing including SLAC association & V2G messaging
PICS_CMN_CMN_ChargingMode	Indication for testing either AC or DC charging mode
PICS_CMN_CMN_IdentificationMode	Indication for testing either EIM or PnC identification mode
PICS_CMN_CMN_PlugType	Indication for testing either type1 or type2 plug type
PICS_CMN_AC_CableCapability	Indication for used AC cable type Choice: i) capability13A, ii) capability20A, iii) capability32A, iv) capability63A, v) capability70A
PICS_CMN_CMN_WakeUp	Indication for the pre-defined wake-up time of the test system within a paused session (test system wakes up the SUT)
PICS_CMN_CMN_Renegotiation	Indication for explicit testing of Renegotiation
PICS_CMN_CMN_RenegotiationLoopIndication	Indicates the number of iterations of the ChargingStatus (AC) or CurrentDemand (DC) loop, when the renegotiation shall be triggered by the test system (shall be smaller or equal to PICS_CMN_CMN_LoopCounter).
PICS_CMN_CMN_LoopCounter	Indicates the number of iterations of the ChargingStatus (AC) or CurrentDemand (DC) loop
PICS_CMN_CMN_PkiName	Indication for selected PKI Choice: i) PKI_1, ii) PKI_2, iii) PKI_3, iv) PKI_4, v) PKI_5, vi) PKI_6, vii) PKI_7

**Table 7 — PICS for test system configurations CF_04_001
(SUT equals SECC)**

PICS	Description
PICS_SECC_CMN_Pause	Indication for enabling a charging pause in SessionStopReq message (ChargingSession)
PICS_SECC_CMN_EIMDone	Indication for the defined state initiating an EIM Authorization Choice: i) beforePlugin, ii) afterPlugin, iii) duringSlac, iv) v2gAuthorization
PICS_SECC_CMN_EvStateInChargeProgress	Indication for explicit testing of State C or D of IEC 61851-1, Annex A during charging
PICS_SECC_DC_WeldingDetection	Indication for explicit testing of WeldingDetection
PICS_SECC_CMN_DepartureTime	Indication for using a departure time in ChargeParameterDiscoveryReq message
PICS_SECC_CMN_MaxEntriesSAScheduleTuple	Indication for enabling a maximal number of expected entries in the SAScheduleTuple (received in ChargeParameterDiscoveryRes message) by using the element MaxEntriesSAScheduleTuple in ChargeParameterDiscoveryReq message

**Table 8 — PICS for test system configurations CF_04_002
(SUT equals EVCC)**

PICS	Description
PICS_EVCC_CMN_PmaxSchedulewithZeroPow	Indication for enabling a PmaxScheduleList with a list element pMax = 0W in SAScheduleList in ChargeParameterDiscoveryRes message NOTE: For this approach the following assumption is considered: The EV triggers a paused session if the EVSE cannot provide power for a defined time period. This approach might NOT work for all EVs. In this case all relevant test cases with reference to PICS_EVCC_CMN_PmaxSchedulewithZeroPow are out of scope. Choice: i) sleepWithoutCharge (0W in first element of PmaxScheduleList), ii) sleepAfterCharge (0W in second element of PmaxScheduleList), iii) none_
PICS_EVCC_CMN_ReceiptRequired	Indication for explicit testing of MeteringReceipt message activated by the element ReceiptRequired in ChargingStatusRes (AC) or CurrentDemandRes (DC) message
PICS_CMN_EVCC_SalesTariff	Indication for using a SalesTariff in ChargeParameterDiscoveryRes message

7.3.4 Protocol Implementation extra Information for Testing (PIXIT) Definition

In order to ensure testability of each defined message pair defined in ISO 15118-2, the following set of PIXIT are defined in addition to PICS in this standard. PIXIT are used to indicate to the SUT that a specific capability of the SUT is tested.

NOTE Due to the black box test paradigm in this standard, it is not defined how to ensure that a corresponding PIXIT is set on the SUT side for a given test case execution.

All PIXIT defined in the ATS are summarized in Table 9 - Table 11.

**Table 9 — Selected PIXIT for test system configurations CF_04_001 and CF_04_002
(SUT either SECC or EVCC)**

PIXIT	Description
PIXIT_CMN_CMN_WakeUp	Indication for the wake-up time of the SUT within a paused session (SUT wakes up the test system)
PIXIT_CMN_CMN_PkiName	Indication for selected PKI Choice: i) PKI_1, ii) PKI_2, iii) PKI_3, iv) PKI_4, v) PKI_5, vi) PKI_6, vii) PKI_7
PIXIT_CMN_CMN_Renegotiation	Indication for explicit testing of Renegotiation initiated by the SUT Choice: i) renegotiation, ii) unknown
PIXIT_CMN_CMN_MeterReading	Indication for explicit testing of MeterReading element Choice: i) meterReading, ii) unknown

**Table 10 — Selected PIXIT for test system configurations CF_04_001
(SUT equals SECC)**

PIXIT	Description
PIXIT_SECC_CMN_VAS	Indication for explicit testing of ServiceDetail message (SUT shall send a serviceList within ServiceDiscoveryRes message) Choice: i) serviceDetail, ii) none_
PIXIT_SECC_CMN_ReceiptRequired	Indication for explicit testing of MeteringReceipt message
PIXIT_SECC_CMN_CertificateHandling	Indication for explicit testing of CertificateInstallation or CertificateUpdate message Choice: i) certInstall, ii) certUpdate, iii) none_
PIXIT_SECC_CMN_SalesTariff	Indication for explicit testing of Sales Tariff elements in ChargeParameterDiscoveryRes message Choice: i) salesTariff, ii) unknown
PIXIT_SECC_CMN_TLS	Indication for explicit testing of TLS in EIM mode

PIXIT_SECC_CMN_VersionNumberMinor	Indication for the supported VersionNumberMinor in SupportedAppProtocolRes message
PIXIT_SECC_CMN_InternetAccess	Indication for support of InternetAccess service in ServiceDiscoveryRes message Choice: i) internetAccess, ii) unknown
PIXIT_SECC_DC_CableCheckOngoing	Indication for explicit testing of the repetition of the CableCheck message sequence Choice: i) ongoing, ii) unknown
PIXIT_SECC_CMN_AuthorizationOngoing	Indication for explicit testing of the repetition of the Authorization message sequence (SUT should not be authorized in case of EIM) Choice: i) ongoing, ii) unknown
PIXIT_SECC_CMN_ChargeParameterDiscoveryOngoing	Indication for explicit testing of the repetition of the ChargeParameterDiscovery message sequence Choice: i) ongoing, ii) unknown
PIXIT_SECC_CMN_MeterInfo	Indication for explicit testing of MeterInfo element in ChargingStatusRes (AC) or CurrentDemandRes (DC) message Choice: i) meterInfo, ii) unknown
PIXIT_SECC_CMN_PaymentOption	Indication for supported payment option within ServiceDiscoveryRes message (Only one payment option possible) Choice: i) externalPayment, ii) contract

**Table 11 — Selected PIXIT for test system configurations CF_04_002
(SUT equals EVCC)**

PIXIT	Description
PIXIT_EVCC_CMN_VAS	Indication for explicit testing of ServiceDetail message (SUT shall send a ServiceDetailReq message for each service of the received serviceList) Choice: i) serviceDetail, ii) none_, iii) unknown
PIXIT_EVCC_CMN_Pause	Indication for enabling a charging pause in SessionStopReq message (ChargingSession) Choice: i) pause, ii) unknown, iii) none_
PIXIT_EVCC_DC_WeldingDetection	Indication for explicit testing of WeldingDetection message Choice: i) weldingDetection, ii) none_, iii) unknown

PIXIT_EVCC_CMN_TLS	Indication for explicit testing of TLS in EIM mode Choice: i) tls, ii) none_, iii) unknown
PIXIT_EVCC_CMN_CertificateHandling	Indication for explicit testing of CertificateInstallation or CertificateUpdate message Choice: i) certInstall, ii) certUpdate, iii) none_, iv) unknown NOTE: For an automated test execution of multiple certificate installation or certification update processes, a customer interaction in the SUT (e.g. Deletion of installed contract certificates) might be necessary.
PIXIT_EVCC_CMN_DepartureTime	Indication for explicit testing of DepartureTime element in ChargeParameterDiscoveryReq message Choice: i) departureTime, ii) none_, iii) unknown
PIXIT_EVCC_AC_MaxNumberOfPhasesInUse	Indication for explicit testing of MaxNumberOfPhasesInUse element in ChargeParameterDiscoveryReq message Choice: i) maxNumberOfPhasesInUse, ii) unknown
PIXIT_EVCC_CMN_ChargingProfileOptimization	Indication for the SUTs capability to optimize charging profiles based on the received SAScheduleList Choice: i) optimization, ii) none_, iii) unknown
PIXIT_EVCC_CMN_OldSAScheduleTupleID	Indication for explicit testing of using the previous SAScheduleTupleID after renegotiation in PowerDeliveryReq message Choice: i) oldSAScheduleTupleID, ii) unknown
PIXIT_EVCC_CMN_SAScheduleTupleIDMR	Indication for explicit testing SAScheduleTupleID within MeteringReceiptReq message Choice: i) sAScheduleTupleID, ii) unknown

7.4 Test suite identifiers

The selection of common naming conventions is one simple and often used mechanism to implement test suites which are consistent, maintainable and understandable for multiple users. Therefore, based on common ETSI naming conventions more specific naming conventions for the ISO 15118 conformance test suite are defined.

7.4.1 Module identifiers

All modules defined in the TSS shall start with a capital letter. The ISO 15118 test suite specific module identifier for template, function or test case modules is defined as:

<modtype>_<sut>_<ctx>

The segments of this identifier are defined in Table 12. An example for test case module identifier is:

TestCases_SECC_SupportedAppProtocol

Table 12 — ISO 15118 test suite naming convention for modules

Identifier	Values	Description
<modtype>		Module type
	TestCases	Module including test cases
	Functions	Module including functions
	Templates	Module including templates
<sut>		System under test
	EVCC	Electric Vehicle Communication Controller
	SECC	Supply Equipment Communication Controller
	CMN	Common (exclusively for template modules)
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)

NOTE 1 to entry For module types other than templates, functions or test cases there is no identifier format defined.

7.4.2 Test case identifiers

The naming conventions for test cases are using a prefix, which is defined by ETSI as shown in Table 13.

Table 13 — ETSI naming convention for test case names

Keyword	Definition	Example
testcase name	Every testcase begins with TC (TC_) TC_TestCaseName	TC_SupportedAppProtocol

The ISO 15118 test suite specific test case identifier is defined as:

TC_<sut>_<dom>_<typ>_<ctx>_<nn>

The segments of this identifier are described in Table 14. An example for test case identifier is:

TC_SECC_AC_VTB_SupportedAppProtocol_001

Table 14 — ISO 15118 test suite naming convention for test case identifiers

Identifier	Values	Description
<prefix>	TC	see Table 13
<sut>		System under test
	EVCC	Electric Vehicle Communication Controller
	SECC	Supply Equipment Communication Controller
<dom>		Domain
	AC	AC specific behaviors
	DC	DC specific behaviors
	CMN	Common
<ttyp>		Type of testing
	VTB	Valid test behavior
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)
<nn>	{xxx}	Sequential number from 001 to 999

7.4.3 Template identifiers

The naming conventions for templates are using a prefix, which is defined by ETSI as shown in Table 15.

Table 15 — ETSI naming convention for templates

Keyword	Context	Definition	Example
template name	Templates with concrete attribute values	Every template begins with keyword m (m_)	m_DNSRequest
template name	Templates with wildcards or matching expression	If a template contains or refers to templates with wildcards {[*]?} then template name begins with keyword mw (mw_)	mw_DNSResponse
template name	Templates with parameters, which do not assign or refer to templates with wildcards or matching expression	If a template contains attributes which are defined by parameters or constant values, then template name begins with keyword md (md_)	md_DNSResponse (integer ip)
template name	Templates with parameters, which do assign or refer to	If a template contains attributes which are defined by parameters, constant values or wildcards, then	mdw_DNSResponse (integer ip)

	templates with wildcards or matching expression	template name begins with keyword mdw (mdw_)	
--	---	--	--

The ISO 15118 test suite specific template identifier is defined as:

<prefix>_<sut>_<dom>_<dtyp>_<nn>

The segments of this identifier are described in Table 16. An example for template identifier is:

mdw_EVCC_CMN_SupportedAppProtocol_001

Table 16 — ISO 15118 test suite naming convention for template identifiers

Identifier	Values	Description
<prefix>		Type of template (see Table 15)
<sut>		System under test
	EVCC	Electric Vehicle Communication Controller
	SECC	Supply Equipment Communication Controller
	CMN	Common
<dom>		Domain
	AC	AC specific behaviors
	DC	DC specific behaviors
	CMN	Common
<dtyp>	{fullname}	Label of (root) data type according to standard
<nn>	{xxx}	Sequential number from 001 to 999

7.4.4 Function identifiers

The naming conventions for functions are using a prefix, which is defined by ETSI as shown in Table 17.

Table 17 — ETSI naming convention for function names

Keyword	Context	Definition	Example
function name	All functions	Every function begins with f (f_)	f_functionName

The ISO 15118 test suite naming convention for test case functions is defined as:

<prefix>_<sut>_<dom>_<ftyp>_<ttyp>_<ctx>_<nn>

The segments of this identifier are described in Table 18. An example for template identifier is:

f_EVCC_AC_TB_VTB_SessionSetup_001

Table 18 — ISO 15118 test suite naming convention for function names

Identifier	Values	Description
<prefix>		f_ (see Table 17)
<sut>		System under test
	EVCC	Electric Vehicle Communication Controller
	SECC	Supply Equipment Communication Controller
<dom>		Domain
	AC	AC specific behaviors
	DC	DC specific behaviors
	CMN	Common
<ftyp>		Function type
	PR	Pre-Condition
	TB	Testbehavior
	PO	Post-Condition
<ttyp>		Type of testing
	VTB	Valid test behavior
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)
<nn>	{xxx}	Sequential number from 001 to 999

7.4.5 Timer identifiers

The naming conventions for timers are using a prefix, which is defined by ETSI as shown in Table 19.

Table 19 — ETSI naming convention for timers

Keyword	Context	Definition	Example
timer name	t_	Local timer	t_wait
timer name	tc_	Timer defined within a component	tc_authMin

The ISO 15118 test suite specific timer identifier is defined as:

<prefix>_<ctx>

The segments of this identifier are described in Table 20. An example for timer identifier is:

tc_V2G_EVCC_Msg_Timer

Table 20 — ISO 15118 test suite naming convention for timer identifiers

Identifier	Values	Description
<prefix>		Type of timer (see Table 19)
<ctx>	{fullname}	Context (e.g. name of timer according to ISO 15118-2 or if not part of the standard any given name describing the context of the timer, e.g. EVCC_SDP_Timer)

7.4.6 PICS/PIXIT identifiers

The ISO 15118 test suite naming convention for PICS/PIXIT is defined as:

<pic>_<sut>_<dom>_<ctx>

The segments of this identifier are described in Table 21. An example for PICS/PIXIT identifier is:

PICS_CMN_CMN_IdentificationMode

Table 21 — ISO 15118 test suite naming convention for PICS/PIXIT identifiers

Identifier	Values	Description
<pic>		Protocol implementation capability
	PICS	Protocol Implementation Conformance Statement
	PIXIT	Protocol Implementation extra Information for Testing
<sut>		System under test
	EVCC	Electric Vehicle Communication Controller
	SECC	Supply Equipment Communication Controller
	CMN	Common
<dom>		Domain
	AC	AC specific behaviors
	DC	DC specific behaviors
	CMN	Common
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)

7.4.7 Verdict identifiers

In this sub clause the conventions for test verdicts are defined. The test verdicts defined in this standard are listed in Table 22.

Table 22 — ISO 15118 test suite conventions on verdict handling

Verdict type	TTCN-3 Definition	ISO 15118 Test Suite
none	Is implicitly assigned in the beginning of every test case by default and is reported as a final verdict in the absence of any other verdict assignment during the test case execution.	No TSS specific definition (see TTCN-3 definition).
pass	Means that everything is OK. A verdict given when the observed outcome satisfies the test purpose and is valid with respect to the relevant requirements and with respect to the PICS. [ITU-T X.290]	If in review of a requirement the SUT has a correct behavior, then this verdict type shall be used.
inconc	A verdict given when the observed outcome is valid with respect to the relevant requirements but prevents the	Means that neither pass nor fail can be reliably assigned.

	test purpose from being accomplished. [ITU-T X.290]	
fail	A verdict given when the observed outcome is syntactically invalid or inopportune with respect to the relevant requirements or the PICS/PIXIT. [ITU-T X.290]	If in review of a requirement the SUT has a wrong behavior, then this verdict type shall be used.

7.5 Test suite coverage

The following conditions apply in terms of test case coverage for this standard regarding requirements defined in ISO 15118-2:

- Requirements that are out of scope according to the conventions defined in this standard or cannot be tested in black-box tests are summarized in Table 23.
- Requirements that are not explicitly tested through a dedicated test case in the ATS but implicitly tested by the SUT Adapter/Codec are summarized in Table 24.

Table 23 — Requirements of ISO 15118-2 not considered in the ATS

List of requirement IDs	Comment (no consideration in ATS)
[V2G2 133], [V2G2 162], [V2G2 439], [V2G2 449], [V2G2 663], [V2G2 678], [V2G2 698], [V2G2 703], [V2G2 707], [V2G2 709], [V2G2 719], [V2G2 720], [V2G2 734], [V2G2 735], [V2G2 763], [V2G2 784], [V2G2 801], [V2G2 823], [V2G2 870], [V2G2 874], [V2G2 880], [V2G2 882], [V2G2 886], [V2G2 892], [V2G2 897], [V2G2 907], [V2G2 908], [V2G2 910], [V2G2 927], [V2G2 928]	Cannot be tested explicitly in EVCC black box test configuration
[V2G2 020], [V2G2 023], [V2G2 076], [V2G2 305], [V2G2 306], [V2G2 446], [V2G2 447], [V2G2 448]	Cannot be tested explicitly in EVCC black box test configuration due to strong configuration dependency on the SUT.
[V2G2 332], [V2G2 335], [V2G2 615], [V2G2 616]	Cannot be tested explicitly in EVCC black box test configuration for the profile defined in the respective column. Out of scope of this standard (PIXIT consideration leads to strong increase of TC quantity) for the profile defined in the respective column.
[V2G2 134], [V2G2 146], [V2G2 219], [V2G2 233], [V2G2 234], [V2G2 301], [V2G2 317], [V2G2 322], [V2G2 325], [V2G2 328], [V2G2 336], [V2G2 337], [V2G2 338], [V2G2 444], [V2G2 540], [V2G2 542], [V2G2 544], [V2G2 546], [V2G2 547], [V2G2 549],	Cannot be tested explicitly in SECC black box test configuration

List of requirement IDs	Comment (no consideration in ATS)
[V2G2 550], [V2G2 552], [V2G2 553], [V2G2 555], [V2G2 556], [V2G2 558], [V2G2 559], [V2G2 561], [V2G2 562], [V2G2 564], [V2G2 566], [V2G2 567], [V2G2 569], [V2G2 570], [V2G2 572], [V2G2 574], [V2G2 578], [V2G2 579], [V2G2 581], [V2G2 583], [V2G2 585], [V2G2 586], [V2G2 588], [V2G2 589], [V2G2 592], [V2G2 595], [V2G2 596], [V2G2 598], [V2G2 629], [V2G2 639], [V2G2 668], [V2G2 690], [V2G2 726], [V2G2 727], [V2G2 774], [V2G2 796], [V2G2 798], [V2G2 803], [V2G2 808], [V2G2 824], [V2G2 826], [V2G2 853], [V2G2 857], [V2G2 872], [V2G2 877], [V2G2 883], [V2G2 887], [V2G2 902], [V2G2 916], [V2G2 923]	
[V2G2 074], [V2G2 430], [V2G2 722], [V2G2 785], [V2G2 786], [V2G2 805]	Cannot be tested explicitly in SECC black box test configuration due to strong configuration dependency on the SUT.
[V2G2 011], [V2G2 012], [V2G2 089], [V2G2 090], [V2G2 092], [V2G2 094], [V2G2 096], [V2G2 135], [V2G2 640], [V2G2 760], [V2G2 830], [V2G2 835], [V2G2 868], [V2G2 869], [V2G2 878], [V2G2 911], [V2G2 925]	Cannot be tested explicitly in SECC/EVCC black box test configuration
[V2G2 867]	Cannot be tested explicitly in SECC/EVCC black box test configuration .
[V2G2 280], [V2G2 281]	Cannot be tested explicitly in SECC/EVCC black box test configuration due to strong configuration dependency on the SUT.
[V2G2 318], [V2G2 324], [V2G2 333], [V2G2 334], [V2G2 339], [V2G2 340], [V2G2 749], [V2G2 755], [V2G2 772], [V2G2 775], [V2G2 802], [V2G2 806], [V2G2 807]	Out of scope of this standard (PIXIT consideration leads to strong increase of TC quantity)
[V2G2 001], [V2G2 002], [V2G2 003], [V2G2 014], [V2G2 016], [V2G2 017], [V2G2 037], [V2G2 038], [V2G2 039], [V2G2 040], [V2G2 041], [V2G2 042], [V2G2 043], [V2G2 044], [V2G2 045], [V2G2 046], [V2G2 047], [V2G2 049],	Out of scope of this standard (Requirement refers to external RFCs, standards, etc.)

List of requirement IDs	Comment (no consideration in ATS)
[V2G2 050], [V2G2 051], [V2G2 052], [V2G2 053], [V2G2 054], [V2G2 055], [V2G2 057], [V2G2 058], [V2G2 059], [V2G2 060], [V2G2 061], [V2G2 062], [V2G2 063], [V2G2 064], [V2G2 065], [V2G2 067], [V2G2 070], [V2G2 071], [V2G2 163], [V2G2 164], [V2G2 638], [V2G2 649], [V2G2 650], [V2G2 693], [V2G2 694], [V2G2 695], [V2G2 810], [V2G2 811], [V2G2 843], [V2G2 844], [V2G2 850], [V2G2 873], [V2G2 876], [V2G2 885], [V2G2 924]	
[V2G2 289], [V2G2 290], [V2G2 291], [V2G2 292], [V2G2 314], [V2G2 315], [V2G2 329], [V2G2 330], [V2G2 480], [V2G2 643], [V2G2 644], [V2G2 674], [V2G2 676], [V2G2 743], [V2G2 761], [V2G2 777], [V2G2 833], [V2G2 834], [V2G2 837], [V2G2 838], [V2G2 851], [V2G2 858], [V2G2 859], [V2G2 860], [V2G2 862], [V2G2 863], [V2G2 865], [V2G2 866]	Out of scope of this standard (Requirement refers to power flow)
[V2G2 035], [V2G2 036]	Out of scope of this standard (Requirements refers to ISO 15118 5)

Table 24 — Requirements of ISO 15118-2 implicitly covered by the SUT adapters / codecs

List of requirement IDs	Comment (implicitly tested)
[V2G2 010]	Cannot be tested explicitly in SECC/EVCC black box test configuration for the profile defined in the respective column. Tested implicitly by V2G codec for the profile defined in the respective column
[V2G2 073], [V2G2 075], [V2G2 077], [V2G2 078], [V2G2 079], [V2G2 080], [V2G2 081], [V2G2 083], [V2G2 084], [V2G2 085], [V2G2 124], [V2G2 125], [V2G2 128], [V2G2 129], [V2G2 131], [V2G2 132], [V2G2 136], [V2G2 137], [V2G2 138], [V2G2 139], [V2G2 143], [V2G2 149], [V2G2 151], [V2G2 155], [V2G2 156], [V2G2 174], [V2G2 622], [V2G2 809], [V2G2 816]	Tested implicitly by 15118 2 SUT adapter
[V2G2 097], [V2G2 098], [V2G2 099], [V2G2 100],	Tested implicitly by V2G codec

List of requirement IDs	Comment (implicitly tested)
[V2G2 101], [V2G2 102], [V2G2 171], [V2G2 440], [V2G2 445], [V2G2 600], [V2G2 697], [V2G2 825]	
[V2G2 651]	Tested implicitly by V2G codec. Requirement is only testable if a corresponding PIXIT is considered for the profile defined in the respective column.

The resulting test suite coverage in this standard with reference to requirements in ISO 15118-2 is summarized in Table 25. It only includes requirements which are not listed for exclusion in Table 23 or Table 24. Table 25 defines the relevance of requirements of ISO 15118-2 for the ATS, based upon the type of SUT (EVCC or SECC), the authentication profile (EIM or PnC) and AC or DC charging. The following symbols are used in Table 25:

- X Indicates requirements that are covered in the ATS with one or more test cases.
- I Indicates requirements that are indirectly covered in the ATS but other than those listed in Table 24 can be directly associated to one or more test cases in the ATS.
- P Indicates requirements that are only partially covered by one or more test cases in the ATS.
- N Requirements that are not testable for the profile defined in the respective column.
- Requirements that are not applicable for the profile defined in the respective column.
- O Requirements that are out of scope for the profile defined in the respective column.

Table 25 — ATS coverage of requirements in ISO 15118-2

Requirement ID	Covered in Test Suite								TC ID(s) / Comment
	SECC				EVCC				
	EIM		PnC		EIM		PnC		
	AC	DC	AC	DC	AC	DC	AC	DC	
[V2G2 004]	N	N	X	X	N	N	X	X	Cannot be tested explicitly in SECC/EVCC black box test configuration for the profile defined in the respective column Group_[V2G2 353]_[V2G2 354]_[V2G2 004]_[V2G2 009]_[V2G2 656]_[V2G2 926]_[V2G2 822]
[V2G2 005]			P	P			X	X	The verification of this requirement consists of two different test cases, so the requirement can only be tested partially for the profile defined in the respective column Group_[V2G2 005]_[V2G2 007]
[V2G2 006]							X	X	Group_[V2G2 006]_[V2G2 652]_[V2G2 909]
[V2G2 007]			P	P			X	X	The verification of this requirement consists of two different test cases, so the requirement can only be tested partially for the profile defined in the respective column Group_[V2G2 005]_[V2G2 007]
[V2G2 008]					I	I	I	I	Tested indirectly through test for requirement [V2G2 166]. Requirement is only testable if a corresponding PIXIT is considered for the profile defined in the respective column TC_EVCC_CMN_VTB_SupportedAppProtocol_001
[V2G2 009]	N	N	X	X	N	N	X	X	Cannot be tested explicitly in SECC/EVCC black box test configuration for the profile defined in the respective column Group_[V2G2 353]_[V2G2 354]_[V2G2 004]_[V2G2 009]_[V2G2 656]_[V2G2 926]_[V2G2 822]

Requirement t ID	Covered in Test Suite								TC ID(s) / Comment
	SECC				EVCC				
	EIM		PnC		EIM		PnC		
	AC	DC	AC	DC	AC	DC	AC	DC	
[V2G2 018]					I	I	I	I	Tested indirectly through test for requirement [V2G2 142] Group_[V2G2 142]_[V2G2 623]_[V2G2 018]_[V2G2 019]
[V2G2 019]					I	I	I	I	Tested indirectly through test for requirement [V2G2 142] Group_[V2G2 142]_[V2G2 623]_[V2G2 018]_[V2G2 019]
[V2G2 021]					X	X	X	X	Requirement is only testable if a corresponding PIXIT is considered for the profile defined in the respective column TC_EVCC_CMN_VTB_SupportedAppProtocol_001
[V2G2 022]					P	P	P	P	Only one case can be considered, so the requirement can only be tested partially TC_EVCC_CMN_VTB_SupportedAppProtocol_001 TC_EVCC_CMN_VTB_SupportedAppProtocol_004 TC_EVCC_CMN_VTB_SupportedAppProtocol_005
[V2G2 024]					X	X	X	X	TC_EVCC_CMN_VTB_SupportedAppProtocol_001 TC_EVCC_CMN_VTB_SupportedAppProtocol_004 TC_EVCC_CMN_VTB_SupportedAppProtocol_005
[V2G2 025]					X	X	X	X	Group_[V2G2 728]_[V2G2 025]
[V2G2 026]	I	I	I	I					Tested indirectly through test for requirement [V2G2 168] TC_SECC_CMN_VTB_SupportedAppProtocol_001 TC_SECC_CMN_VTB_SupportedAppProtocol_002 TC_SECC_CMN_VTB_SupportedAppProtocol_006 TC_SECC_CMN_VTB_SupportedAppProtocol_004
[V2G2 027]	I	I	I	I					Tested indirectly through test for requirement [V2G2 027] TC_SECC_CMN_VTB_SDP_001 TC_SECC_CMN_VTB_SDP_002 TC_SECC_CMN_VTB_SDP_007 TC_SECC_CMN_VTB_SDP_003
[V2G2 029]	I	I	I	I					Tested indirectly through test for requirement [V2G2 723] TC_SECC_CMN_VTB_SDP_004 TC_SECC_CMN_VTB_SDP_005 TC_SECC_CMN_VTB_SDP_006
[V2G2 030]	I	I	I	I					Tested indirectly through test for requirement [V2G2 168] TC_SECC_CMN_VTB_SupportedAppProtocol_001 TC_SECC_CMN_VTB_SupportedAppProtocol_002 TC_SECC_CMN_VTB_SupportedAppProtocol_006 TC_SECC_CMN_VTB_SupportedAppProtocol_004
[V2G2 031]	I	I	I	I					Tested indirectly through test for requirement [V2G2 168] TC_SECC_CMN_VTB_SupportedAppProtocol_001 TC_SECC_CMN_VTB_SupportedAppProtocol_002 TC_SECC_CMN_VTB_SupportedAppProtocol_006 TC_SECC_CMN_VTB_SupportedAppProtocol_004
[V2G2 032]	I	I	I	I					Tested indirectly through test for requirement [V2G2 032] TC_SECC_CMN_VTB_SupportedAppProtocol_005
[V2G2 033]	I	I	I	I					Tested indirectly through test for requirement [V2G2 168] TC_SECC_CMN_VTB_SupportedAppProtocol_001 TC_SECC_CMN_VTB_SupportedAppProtocol_002 TC_SECC_CMN_VTB_SupportedAppProtocol_006 TC_SECC_CMN_VTB_SupportedAppProtocol_004
[V2G2 034]	X	X	X	X					Group_[V2G2 729]_[V2G2 034]

Requirement ID	Covered in Test Suite								TC ID(s) / Comment
	SECC				EVCC				
	EIM		PnC		EIM		PnC		
	AC	DC	AC	DC	AC	DC	AC	DC	
[V2G2 068]	I	I	I	I					Tested indirectly through test for requirement [V2G2 168]. Requirement is only testable if a corresponding PIXIT is considered for the profile defined in the respective column TC SECC CMN VTB SupportedAppProtocol 001 TC SECC CMN VTB SupportedAppProtocol 002 TC SECC CMN VTB SupportedAppProtocol 006 TC_SECC_CMN_VTB_SupportedAppProtocol_004
[V2G2 082]	X	X	X	X	X	X	X	X	Group_[V2G2 082]_[V2G2 086]
[V2G2 086]	X	X	X	X	X	X	X	X	Group_[V2G2 082]_[V2G2 086]
[V2G2 087]	P	P	P	P	P	P	P	P	Table 9 and Table 10 can only be tested partially TC EVCC CMN VTB V2GTPSDP 001 TC EVCC CMN VTB V2GTPSessionSetup 001 TC SECC CMN VTB V2GTPSDP 001 TC_SECC_CMN_VTB_V2GTPSessionSetup_001
[V2G2 088]	P	P	P	P	P	P	P	P	Requirement definition considers various possible scenarios, so the requirement can only be tested partially for exemplarily selected cases TC EVCC CMN VTB V2GTPSessionSetup 001 TC_SECC_CMN_VTB_V2GTPSessionSetup_001
[V2G2 103]			X	X			X	X	Group_[V2G2 103]_[V2G2 104]
[V2G2 104]			P	P			P	P	Internal states cannot be tested explicitly in EVCC black box configuration, so the requirement can only be tested partially Group_[V2G2 103]_[V2G2 104]
[V2G2 108]							X	X	TC EVCC CMN VTB PaymentDetails 001 TC_EVCC_CMN_VTB_PaymentDetails_002
[V2G2 117]							X	X	Group [V2G2 117] [V2G2 119] [V2G2 764] [V2G2 765] [V2G2 766] [V2G2 767] [V2G2 768] [V2G2 769] [V2G2 770] [V2G2 771]
[V2G2 119]							X	X	Group [V2G2 117] [V2G2 119] [V2G2 764] [V2G2 765] [V2G2 766] [V2G2 767] [V2G2 768] [V2G2 769] [V2G2 770] [V2G2 771]
[V2G2 121]							I	I	Tested indirectly through test for requirement [V2G2 500]/[V2G2 501] and [V2G2 503] TC EVCC CMN VTB Authorization 010 TC_EVCC_CMN_VTB_Authorization_011
[V2G2 122]							I	I	Tested indirectly through test for requirement [V2G2 500]/[V2G2 501] and [V2G2 503] TC_EVCC_CMN_VTB_Authorization_010 TC_EVCC_CMN_VTB_Authorization_011
[V2G2 123]	X	X	X	X					TC SECC CMN VTB SDP 001 TC_SECC_CMN_VTB_SDP_002 TC SECC CMN VTB SDP 007 TC_SECC_CMN_VTB_SDP_003
[V2G2 126]					X	X	X	X	TC_EVCC_CMN_VTB_SDP_006
[V2G2 127]					P	P	P	P	Subclause 7.8.3.1 can only be tested partially TC_EVCC_CMN_VTB_V2GTPSDP_001
[V2G2 130]	P	P	P	P					Subclause 7.8.3.1 can only be tested partially TC_SECC_CMN_VTB_V2GTPSDP 001

Requirement t ID	Covered in Test Suite								TC ID(s) / Comment
	SECC				EVCC				
	EIM		PnC		EIM		PnC		
	AC	DC	AC	DC	AC	DC	AC	DC	
[V2G2 140]					X	X	X	X	TC_EVCC_CMN_VTB_V2GTPSDP_001
[V2G2 141]					X	X	X	X	TC_EVCC_CMN_VTB_V2GTPSDP_001
[V2G2 142]					X	X	X	X	Group_[V2G2 142]_[V2G2 623]_[V2G2 018]_[V2G2 019]
[V2G2 144]	P	P	P	P					Requirement definition considers various possible scenarios, so the requirement can only be tested partially for exemplarily selected cases TC_SECC_CMN_VTB_SDP_001 TC_SECC_CMN_VTB_SDP_002 TC_SECC_CMN_VTB_SDP_007 TC_SECC_CMN_VTB_SDP_003
[V2G2 145]					P	P	P	P	Requirement definition considers various possible scenarios, so the requirement can only be tested partially for exemplarily selected cases TC_EVCC_CMN_VTB_SDP_007
[V2G2 147]	X	X	X	X					TC_SECC_CMN_VTB_SDP_001 TC_SECC_CMN_VTB_SDP_002 TC_SECC_CMN_VTB_SDP_007 TC_SECC_CMN_VTB_SDP_003
[V2G2 150]	X	X	X	X					TC_SECC_CMN_VTB_SDP_001 TC_SECC_CMN_VTB_SDP_002 TC_SECC_CMN_VTB_SDP_007 TC_SECC_CMN_VTB_SDP_003
[V2G2 152]	X	X	X	X					TC_SECC_CMN_VTB_V2GTPSDP_001
[V2G2 153]	X	X	X	X					TC_SECC_CMN_VTB_V2GTPSDP_001
[V2G2 154]	X	X	X	X					TC_SECC_CMN_VTB_SDP_001 TC_SECC_CMN_VTB_SDP_002 TC_SECC_CMN_VTB_SDP_007 TC_SECC_CMN_VTB_SDP_003
[V2G2 157]					I	I	I	I	Tested indirectly through test for requirement [V2G2 161] Group_[V2G2 157]_[V2G2 160]_[V2G2 161]
[V2G2 158]					I	I	I	I	Tested indirectly through test for requirement [V2G2 157] and an initiated paused session. Requirement is only testable if a corresponding PIXIT is considered Group_[V2G2 158]_[V2G2 731]
[V2G2 159]					I	I	I	I	Tested indirectly through test for requirement [V2G2 160] Group_[V2G2 159]
[V2G2 160]					X	X	X	X	Group_[V2G2 157]_[V2G2 160]_[V2G2 161]
[V2G2 161]					I	I	I	I	Group_[V2G2 157]_[V2G2 160]_[V2G2 161] Group_[V2G2 161]
[V2G2 165]	X	X	X	X	X	X	X	X	Group_[V2G2 165]_[V2G2 178]
[V2G2 166]					X	X	X	X	TC_EVCC_CMN_VTB_SupportedAppProtocol_001 TC_EVCC_CMN_VTB_SupportedAppProtocol_004 TC_EVCC_CMN_VTB_SupportedAppProtocol_005
[V2G2 167]					X	X	X	X	TC_EVCC_CMN_VTB_SupportedAppProtocol_001 TC_EVCC_CMN_VTB_SupportedAppProtocol_004 TC_EVCC_CMN_VTB_SupportedAppProtocol_005
[V2G2 168]	X	X	X	X					TC_SECC_CMN_VTB_SupportedAppProtocol_001