

DIN EN ISO 15118-21



ICS 43.120

Einsprüche bis 2024-08-21

Entwurf

**Straßenfahrzeuge –
Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation –
Teil 21: Allgemeiner Konformitätsprüfplan für 2. Generation
Anforderungen an das Netzwerk- und Anwendungsprotokoll
(ISO/DIS 15118-21:2024);
Englische Fassung prEN ISO 15118-21:2024**

Road vehicles –

Vehicle to grid communication interface –

Part 21: Common 2nd generation network layer and application layer requirements
conformance test plan (ISO/DIS 15118-21:2024);

English version prEN ISO 15118-21:2024

Véhicules routiers –

Interface de communication entre véhicule et réseau électrique –

Partie 21: Plan de test de conformité aux exigences communes de la couche réseau et de la
couche application de 2ème génération (ISO/DIS 15118-21:2024);

Version anglaise prEN ISO 15118-21:2024

Anwendungswarnvermerk

Dieser Entwurf mit Erscheinungsdatum 2024-06-21 wird der Öffentlichkeit zur Prüfung und Stellungnahme
vorgelegt.

Weil das beabsichtigte Dokument 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 Auto und Mobilität (NAAutomobil), 10004 Berlin,
Postfach 8 04 62 oder Behrenstr. 35, 10117 Berlin.

Es wird gebeten, mit den Kommentaren zu diesem Entwurf jegliche relevanten Patentrechte, die bekannt sind,
mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 243 Seiten

DIN-Normenausschuss Auto und Mobilität (NAAutomobil)

Nationales Vorwort

Das Dokument prEN ISO 15118-21:2024 wurde vom Technischen Komitee ISO/TC 22 „Road vehicles“ in Zusammenarbeit mit dem Technischen Komitee CEN/TC 301 „Straßenfahrzeuge“, dessen Sekretariat von DIN (Deutschland) gehalten wird, erarbeitet.

Das zuständige nationale Normungsgremium ist der Arbeitsausschuss NA 052-00-31 AA „Datenkommunikation“ im DIN-Normenausschuss Auto und Mobilität (NAAutomobil).

Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die Englische Fassung von prEN ISO 15118-21:2024.

Der Bedarf für eine Deutsche Fassung wird derzeit beraten.

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 allgemeinen Kommunikationsanforderungen, die in ISO 15118-20 beschrieben sind. Das Dokument 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 15118-1:2019	siehe	DIN EN ISO 15118-1:2019-08
ISO 15118-3:2015	siehe	DIN EN ISO 15118-3:2016-08
ISO 15118-5:2018	siehe	DIN EN ISO 15118-3:2019-08
ISO 15118-9:2022	siehe	DIN EN ISO 15118-9:2024-01
ISO/DIS 15118-10	siehe	DIN EN ISO 15118-10
ISO 15118-20:2022	siehe	DIN EN ISO 15118-22:2022-12

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DIN (www.din.de) durch eine Suche nach der Dokumentennummer aufgerufen werden.

Nationaler Anhang NA (informativ)

Begriffe

Reihenfolge und Inhalt der folgenden Begriffe und Abkürzungen sind identisch mit denen in den Abschnitten Begriffe und Abkürzungen der Englischen Fassung.

Für die Anwendung dieses Dokuments gelten die Begriffe nach ISO 15118-1, ISO 15118-3, ISO 15118-8, ISO 15118-10, ISO 15118-20 und die folgenden Begriffe.

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

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

3.1

abstrakter Prüffall

en **abstract test case**

vollständige und unabhängige Spezifikation von Aktionen, die notwendig sind, um einen speziellen *Prüfzweck* (3.25) 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 Prüfereignissen).

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* (3.1) 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* (3.20) 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**

Implementierungsanforderung eines offenen, realen Systems, welches beansprucht konform zu der (den) relevanten Spezifikation(en) zu sein und durch *Black-Box-Prüfungen* (3.3) validiert werden können

Anmerkung 1 zum Begriff: Die Reihe von zusammenhängenden Anforderungen, die zusammen das Verhalten des Systems und dessen Kommunikation für ein reales offenes System festlegen, wird deshalb auf zwei Ebenen ausgedrückt: Konformität zu jeder individuellen Anforderung und Konformität zur Reihe. In diesem Dokument beinhalten Konformitätsprüfungen Anforderungen, soweit diese mittels *Black-Box-Prüfung* (3.3) bestätigt werden können.

Anmerkung 2 zum Begriff: Siehe auch *statische Konformitätsanforderungen* (3.20) und *dynamische Konformitätsanforderungen* (3.6).

Anmerkung 3 zum Begriff: Die Anforderungen für diese Konformitätsspezifikation sind in ISO 15118-20 festgelegt.

3.5

normgerechte Implementierung

en **conforming implementation**

SUT, welches sowohl *statische Konformitätsanforderungen* (3.19) als auch *dynamische Konformitätsanforderungen* (3.6) 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**

Anforderung, 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 15118-20 festgelegt.

3.7

ausführbarer Prüffall

en **executable test case**

Umsetzung eines *abstrakten Prüffalls* (3.1)

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

3.8

erwartetes Verhalten

en **expected behavior**

genaue Antwort des SUT (3.20), anhand der zugrunde liegenden Protokollspezifikation, auf den Stimulus, der im *Prüfverhalten* (3.21) 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 15118-20.

3.10

zusätzliche Prüfinformation zur Implementierung

IXIT, en: implementation extra information for testing

Aussage, die von einem Lieferanten oder Umsetzer eines *SUT* (3.20) getroffen wurde, die alle Informationen (zusätzlich zu den in der *ICS* (3.9) gegebenen) bezogen auf das SUT und deren Testumgebung beinhaltet oder referenziert und dem Prüflabor ermöglicht, eine geeignete Prüfreihe gegen das SUT 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* (3.12) 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* (3.21) bis zum finalen stabilen Zustand des *abstrakten Prüffalls* (3.1) benötigt werden

3.15

Vorbedingung

en **pre-condition**

Prüfschritte, die für die Festlegung des Weges vom beginnenden stabilen Zustand des *abstrakten Prüffalls* (3.1) bis zum initialen Zustand, an dem das *Prüfverhalten* (3.12) beginnt, benötigt werden

3.16

Erklärung zur Konformität der Protokollimplementierung

PICS, en: protocol implementation conformance statement

ICS (3.9) 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 vorgegebene Protokolldokument für diese Konformitätsspezifikation ist ISO 15118-20.

Anmerkung 3 zum Begriff: Bezogen auf dieses Dokument legt die PICS die Konfiguration des Prüfsystems fest (d. h. welche Prüffälle ausgeführt werden müssen und welche Konfiguration für jeden Prüffall notwendig ist).

3.17

Zusatzinformation für die Prüfung der Protokollimplementierung

PIXIT, en: protocol implementation extra information for testing

IXIT (3.10), die auf die Konformitätsprüfung nach einer gegebenen Protokollspezifikation bezogen ist

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

Anmerkung 2 zum Begriff: Das vorgegebene Protokolldokument für diese Konformitätsspezifikation ist ISO 15118-20.

Anmerkung 3 zum Begriff: Bezogen auf dieses Dokument legt die PIXIT die Konfiguration des zu prüfenden Systems (SUT) fest (d. h. welche Protokolloptionen implementiert wurden und welche Konfiguration für jeden Prüffall notwendig ist).

3.18

Laufzeitumgebung

en **runtime environment**

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

BEISPIEL Prüfsystem.

3.19

statische Konformitätsanforderungen

en **static conformance requirements**

Anforderung, 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.

Anmerkung 2 zum Begriff: Die Anforderungen für diese Konformitätsspezifikation sind in ISO 15118-20 festgelegt.

3.20

zu prüfendes System

SUT, en: system under test

reales offenes System, das die IUT beinhaltet

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

3.21

Prüfverhalten

en **test behavior**

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

3.22

Prüfsteuerungsschnittstelle

TCI, en: test control interface

vier Schnittstellen, welche die Interaktion des lauffähigen TTCN-3 mit dem Prüfsteuerung, die Kodierung und Dekodierung, die Umgang mit den Prüfkomponente und die Aufzeichnung in einem Prüfsystem festlegen

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

3.23

Prüfausführung

TE, en: test execution

Interpretation oder Ausführung einer *abstrakten Prüfreihe* (3.1)

Anmerkung 1 zum Begriff: Konzeptionell kann die Prüfausführung in drei interagierende Einheiten unterteilt werden: eine ausführbare Prüfreihe (ETS, en: executable test suite), einen Prüfrahmen (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.

3.24

Prüfrahmen

TFW, en: test framework

Einheit, die alle Aktionen von *ausführbaren Prüffällen* (3.7) oder Funktionen ausführt

Anmerkung 1 zum Begriff: Der Prüfrahmen 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 Prüfrahmen die ausführbare Prüfreihe (ETS) und das Kodierungs-/Dekodierungssystem (EDS). Der Prüfrahmen 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 Prüfrahmen 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 Prüfrahmen TTCN-3 (T3RTS) verwendet, um eine Prüfrahmen-Funktionalität zu erläutern.

3.25

Prüfziel

en **test purpose**

Prosabeschreibung eines hinreichend festgelegten Prüfziels, welche sich auf eine einzelne *statische Konformitätsanforderung* (3.19) oder *dynamische Konformitätsanforderung* (3.6), oder eine Menge 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.

3.26

Prüfsystem

en **test system**

reales System, welches den *Prüfrahmen* (3.24), die *abstrakte Prüfreihe* (3.2), die *Prüfausführung* (3.23) und die Adapter sowie die Codecs umfasst

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

3.27

Prüflaufzeitschnittstelle

TRI, en: test runtime interface

zwei Schnittstellen, welche Interaktion des lauffähigen TTCN-3 zwischen dem SUT und dem Programmadapter (PA) sowie dem Systemadapter (SA) in einem *Prüfsystem* (3.26) festlegen

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

3.28

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.

3.29

Urteil

Prüfurteil

en **verdict**

test verdict

Aussage „bestanden“, „fehlgeschlagen“ oder „ergebnislos“, wie in einem abstrakten *Prüffall* (3.1) festgelegt, hinsichtlich der Konformität eines *SUT* (3.20) bezogen auf diesen Prüffall, wenn dieser gerade ausgeführt wird

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

Nationaler Anhang NB (informativ)

Abkürzungen

AP	(drahloser) Zugriffspunkt (en: [wireless] access point)
APUT	zu prüfender Prüfpunkt (en: access point under test)
ATS	abstrakte Prüfreihe (en: abstract test suite)
ETSI	Europäisches Normungsinstitut für Telekommunikation (en: european telecommunication standards institute)
EV	Elektrofahrzeug (en: electric vehicle)
EVCC	Kommunikationssteuerung Elektrofahrzeug (en: electric vehicle communication controller)
EVSE	Versorgungseinrichtung Elektrofahrzeug (en: electric vehicle supply equipment)
HAL	Hardware Abstraktionsschicht (en: hardware abstraction layer)
ICS	Konformitätsaussage zur Implementierung (en: implementation conformance statement)
IUT	zu prüfende Implementierung (en: implementation under test)
MTC	Hauptprüfkomponente (en: main test component)
PICS	Erklärung zur Konformität der Protokollimplementierung (en: protocol implementation conformance statement)
PIXIT	Zusatzinformation für die Prüfung der Protokollimplementierung (en: protocol implementation extra information for testing)
PTC	parallele Prüfkomponente (en: parallel test component)
SECC	Versorgungseinrichtung Kommunikationssteuerung (en: supply equipment communication controller)
STA	(drahtlose) Station (en: [wireless] station)
STAUT	zu prüfende Station (en: station under test)
SUT	zu prüfendes System (en: system under test)
TC	Prüffall (en: test case)
TCI	Prüfsteuerungsschnittstelle (en: test control interface)
TCI-CD	TCI-Kodierung und Dekodierung (en: TCI-coding and decoding)
TE	Prüfausführung (en: test execution)
TRI	TTCN-3 Laufzeitschnittstelle (en: TTCN-3 runtime interface)
TS	Prüfsystem (en: test system)
TSI	Prüfsystemschnittstelle (en: test system interface)
TSS	Prüfreiheitenstruktur (en: test suite structure)
TTCN-3	Prüfungs- und Prüfsteuerungsnotation Version 3 (en: testing and test control notation version 3)
V2G	Fahrzeug-zu-Ladesäule (en: vehicle-to-grid)

Nationaler Anhang NC (informativ)

Literaturhinweise

DIN EN ISO 15118-1:2019-08, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 1: Allgemeine Informationen und Festlegungen der Anwendungsfälle*

DIN EN ISO 15118-3:2016-08, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 3: Anforderungen an physikalische- und Datenverbindungsschnittstelle*

DIN EN ISO 15118-5:2019-08, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 5: Konformitätsprüfungen für die physikalische und Datenverbindungsschnittstelle*

DIN EN ISO 15118-9:2024-01, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 9: Konformitätsprüfungen für die Bitübertragungs- und Sicherungsschicht für drahtlose Kommunikation*

DIN EN ISO 15118-10, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 10: Anforderungen an die physikalische Schicht und Sicherungsschicht für Zweidraht Ethernet*

DIN EN ISO 15118-20:2024-01, *Straßenfahrzeuge — Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation — Teil 20: Anforderungen der 2. Generation an das Netzwerk- und Anwendungsprotokoll*

Contents

	Page
Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	2
3 Terms and definitions.....	2
4 Abbreviated terms.....	6
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
6.3.1 Requirements of IEC 61851-1 SUT adapter for SECC or EVCC testing.....	10
6.3.2 Requirements of IEC 61851-1 SUT adapter for SECC testing.....	11
6.3.3 Requirements of IEC 61851-1 SUT adapter for EVCC testing.....	11
6.3.4 Requirements of IEC 61851-1 PTC for SECC or EVCC testing.....	11
6.3.5 Requirements of IEC 61851-1 PTC for SECC testing.....	11
6.4 Codecs.....	12
6.5 Test system timer handling.....	13
6.5.1 Definition of test system timers & timeouts.....	13
6.5.2 Test system timer scenarios for SUT SECC.....	13
6.5.3 Test system timer scenarios for SUT EVCC.....	15
7 Test suite conventions.....	18
7.1 General information.....	18
7.2 Test suite structure (TSS).....	18
7.3 Test profiles.....	20
7.3.1 General information.....	20
7.3.2 Test configurations.....	20
7.3.3 Components and ports.....	20
7.3.4 Protocol implementation conformance statement (PICS) definition.....	22
7.3.5 Protocol implementation extra information for testing (PIXIT) definition.....	24
7.3.6 Test control.....	25
7.3.7 Test system template messages.....	26
7.4 Test suite identifiers.....	26
7.4.1 Test case identifiers.....	26
7.4.2 PICS/PIXIT identifiers.....	26
7.4.3 Verdict types.....	27
7.5 Test case specification.....	27
8 Test case specification for common ISO 15118-20 requirements.....	28
8.1 General information.....	28
8.2 Test cases for SUT SECC.....	29
8.2.1 SECC SDP test case specifications.....	29
8.2.2 SECC V2GTP test case specifications.....	30
8.2.3 SECC common message flow test case specifications.....	43
8.2.4 SECC common message error test case specifications.....	93
8.2.5 SECC common message timeout test case specifications.....	123
8.3 Test cases for SUT EVCC.....	128
8.3.1 EVCC SDP test case specifications.....	128
8.3.2 EVCC V2GTP test case specifications.....	129
8.3.3 EVCC common message flow test case specifications.....	140
8.3.4 EVCC common message timeout test case specifications.....	158

8.3.5	EVCC message warning test case specifications.....	165
Annex A	(informative) Test suite coverage	173
Annex B	(informative) Test system template messages for SUT type EVCC.....	206
Annex C	(informative) Test system template messages for SUT type SECC.....	216
Annex D	(informative) TS functions for dynamic data elements in template messages	225
Bibliography		229

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

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 document 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 or www.iec.ch/members_experts/refdocs).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC 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) or the IEC list of patent declarations received (see <https://patents.iec.ch>).

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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared jointly by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*, and Technical Committee IEC/TC 69, *Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks*.

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 and www.iec.ch/national-committees.

Introduction

Resulting from the 2nd generation network layer and application layer requirements for the vehicle to grid communication interface specified in ISO 15118-20, a corresponding set of abstract test cases is necessary to verify the conformance of implementations. Hence, this document specifies a conformance test suite for the 2nd generation network layer and application layer protocols in order to derive a common 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. Hence, this document focuses on the interface aspects and the corresponding requirements given in ISO 15118-20 only.

The layered structure of the conformance test documents with reference to ISO 15118-20 is shown in Figure 1. The complete set of relevant conformance test documents per charging type is composed of all the documents within its column according to Figure 1.

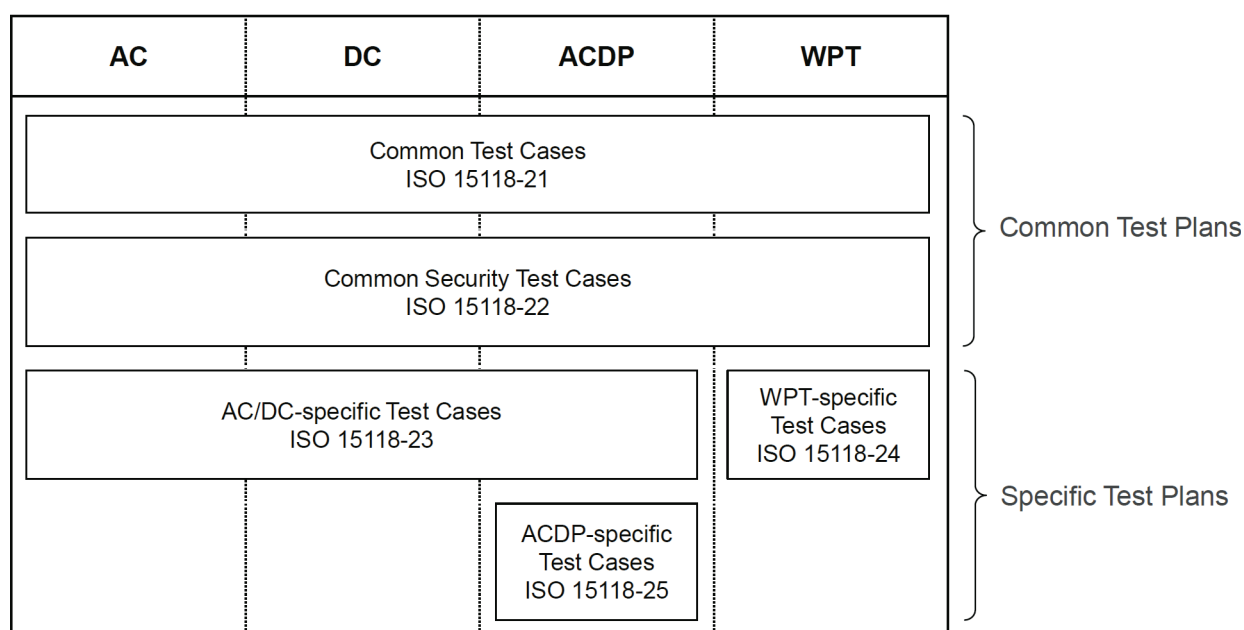


Figure 1 — Overview of mandatory set of conformance test plan documents per charging type

Example For a SUT supporting DC-charging the following conformance test plan documents apply:

- Common Test Cases specified in ISO 15118-21
- Common Security Test Cases specified in ISO 15118-22
- AC/DC specific Test Cases specified in ISO 15118-23 (only DC-specific subset applies)

Road vehicles — Vehicle to grid communication interface —

Part 21:

Common 2nd generation network layer and application layer requirements conformance test plan

1 Scope

This document specifies conformance tests in the form of an abstract test suite (ATS) for a system under test (SUT) implementing an electric-vehicle or supply-equipment communication controller (EVCC or SECC) for all common requirements that are independent of a particular charging type (AC, DC, ACD, WPT charging) according to ISO 15118-20 and against the background of ISO 15118-1. These conformance tests specify the testing of capabilities and behaviours of an SUT, as well as checking what is observed against the conformance requirements specified in ISO 15118-20 and against what the implementer 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 15118-20. The behaviour tests of the ATS examine an implementation as thoroughly as practical over the full range of dynamic conformance requirements specified in ISO 15118-20 and within the capabilities of the SUT (see NOTE 1).

A test architecture is described in correspondence to the ATS. The abstract test cases in this document are described leveraging this test architecture and are specified in descriptive tabular format covering the ISO/OSI layer 3 to 7 (network to application layers).

In terms of coverage, this document only covers normative sections and requirements in ISO 15118-20. This document can additionally refer to specific tests for requirements on referenced standards (e.g. IETF RFCs, W3C Recommendation, etc.) as long as they are relevant in terms of conformance for implementations according to ISO 15118-20. However, it is explicitly not intended to widen the scope of this conformance specification to such external standards, if it is not technically necessary for the purpose of conformance testing for ISO 15118-20. Furthermore, the conformance tests specified in this document do not include the assessment of performance nor robustness or reliability of an implementation. They cannot provide judgments on the physical realization of abstract service primitives, how a system is implemented, how it provides any requested service, nor the environment of the protocol implementation. Furthermore, the abstract test cases specified in this document only consider the communication protocol and the system's behaviour specified in ISO 15118-20. The power flow between the EVSE and the EV is not considered.

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 are able to interwork. This is achieved by verifying them by means of a protocol test suite, thereby increasing the confidence that each implementation conforms to the protocol specification. However, the specified protocol test suite cannot guarantee conformance to the specification since it detects errors rather than their absence. Thus, conformance to a test suite alone cannot guarantee interworking. Instead, it gives confidence that a conforming implementation has the required capabilities and that its behaviour 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 and ISO 15118-9 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 15118-1:2019, *Road vehicles — Vehicle to grid communication interface — Part 1: General information and use-case definition*

ISO 15118-3:2015, *Road vehicles — Vehicle to grid communication interface — Part 3: Physical and data link layer requirements*

ISO 15118-5:2018, *Road vehicles — Vehicle to grid communication interface — Part 5: Physical layer and data link layer conformance test*

ISO 15118-8:2020, *Road vehicles — Vehicle to grid communication interface — Part 8: Physical layer and data link layer requirements for wireless communication*

ISO 15118-9:2022, *Road vehicles — Vehicle to grid communication interface — Part 9: Physical and data link layer conformance test for wireless communication*

ISO/DIS 15118-10:2023, *Road vehicles — Vehicle to grid communication interface — Part 10: Physical layer and data link layer requirements for single-pair Ethernet*

ISO 15118-20:2022, *Road vehicles — Vehicle to grid communication interface — Part 20: 2nd generation network layer and application layer requirements*

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

ETSI ES 201 873-5 V4.9.1¹⁾, *Methods for Testing and Specification (MTS) — The Testing and Test Control Notation version 3 — Part 5: TTCN-3 Runtime Interface (TRI) (April 2022)*

ETSI ES 201 873-6, V4.13.1²⁾, *Methods for Testing and Specification (MTS) — The Testing and Test Control Notation version 3 — Part 6: TTCN-3 Control Interface (TCI) (April 2022)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15118-1, ISO 15118-3, ISO 15118-8, ISO 15118-10, ISO 15118-20 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/>

3.1

abstract test case

complete and independent specification of the actions required to achieve a specific *test purpose* (3.25)

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.

1) Available at https://www.etsi.org/deliver/etsi_es/201800_201899/20187305/04.09.01_60/es_20187305v040901p.pdf.

2) Available at https://www.etsi.org/deliver/etsi_es/201800_201899/20187306/04.13.01_60/es_20187306v041301p.pdf.

E DIN EN ISO 15118-21:2024-07
ISO/DIS 15118-21:2024(en)

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

test suite composed of *abstract test cases* (3.1)

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

3.3
black box testing

method of testing that examines the behaviour of an *SUT* (3.20) without considering the internal implementation and structure of the SUT, thus relying on the SUT'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 will, therefore, be 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 15118-20.

3.5
conforming implementation

SUT which satisfies both *static conformance requirements* (3.19) and *dynamic conformance requirements* (3.6), consistent with the capabilities stated in the PICS(s)

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

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.

3.10 implementation extra information for testing IXIT

statement made by a supplier or implementer of an *SUT* (3.20) which contains or references all information (in addition to that given in the *ICS* (3.9)) related to the *SUT* 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 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 *MTC* (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)

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 behavior* (3.21) will start

3.16 protocol implementation conformance statement PICS

ICS (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 15118-20.

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 configuration is required for each testcase)

3.17

protocol implementation extra information for testing

PIXIT

IXIT (3.10) 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 15118-20.

Note 3 to entry: In the context of this document, PIXIT specify the configuration of the System under Test (SUT) (e.g. what protocol options are implemented and what configuration is required for each testcase)

3.18

runtime environment

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

EXAMPLE Test system.

3.19

static conformance requirement

requirement that specifies 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.

Note 2 to entry: The requirements for this conformance specification are specified in ISO 15118-20.

3.20

system under test

SUT

real open system in which the *IUT* (3.11) resides

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

3.21

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

3.22

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.

3.23

test execution

TE

interpretation or execution of an *abstract test suite* (3.2)

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.

3.24

test framework

TFW

an entity to perform all actions of *executable test cases* (3.7) 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.

3.25

test purpose

prose description of a well-defined objective of testing, focusing on a single *static conformance requirement* (3.19) or *dynamic conformance requirement* (3.6) or a set 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.

3.26

test system

real system combining the *test framework* (3.24), *abstract test suite* (3.2), *test execution* (3.23) and adapters as well as codecs

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

3.27

test runtime interface

TRI

two interfaces that define the interaction of the TTCN-3 executable between the SUT and the platform adaptor (PA) and the system adaptor (SA) in a *test system* (3.26)

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

3.28

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.

3.29

verdict

test verdict

statement of “pass”, “fail” or “inconclusive”, as specified in an *abstract test case* (3.1), concerning conformance of an *SUT* (3.20) with respect to that test case when it is executed

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

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply:

AP	(wireless) access point
APUT	access point under test
ATS	abstract test suite
ETSI	european telecommunications standards institute
EV	electric vehicle
EVCC	electric vehicle communication controller
EVSE	electric vehicle supply equipment
HAL	hardware abstraction layer
ICS	implementation conformance statement
IUT	implementation under test
MTC	main test component
PICS	protocol implementation conformance statement
PIXIT	protocol implementation extra information for testing
PTC	parallel test component
SECC	supply equipment communication controller
STA	(wireless) station
STAUT	station under test
SUT	system under test
TC	test case
TCI	test control interface
TCI-CD	TCI-coding and decoding
TE	test execution
TRI	TTCN-3 runtime interface
TS	Test system
TSI	test system interface
TSS	test suite structure
TTCN-3	testing and test control notation version 3
V2G	vehicle-to-grid

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 series;
- Y represents the document part of the ISO 15118 series, for this document Y = 21;
- 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 specify the test system architecture and the conventions for the abstract test suite. TTCN-3 is, however, not mandatory for the implementation of a conformance test system according to this document.

[V2G21-001] The implementers of conformance tests shall verify that the test purposes implemented in their executable test cases are identical to the abstract test cases described in this document.

NOTE In this document, test cases are not programmatically specified in TTNC-3 core language. This will be revisited for the next edition of the document.

6 Test architecture reference model

6.1 General information

Figure 2 provides an overview of the test architecture for this document. The following subclauses specify the interface requirements for platform and SUT adapters (see 6.2 and 6.3) as well as the codecs (see 6.4). The test suite is specified in detail in the remainder of this document.

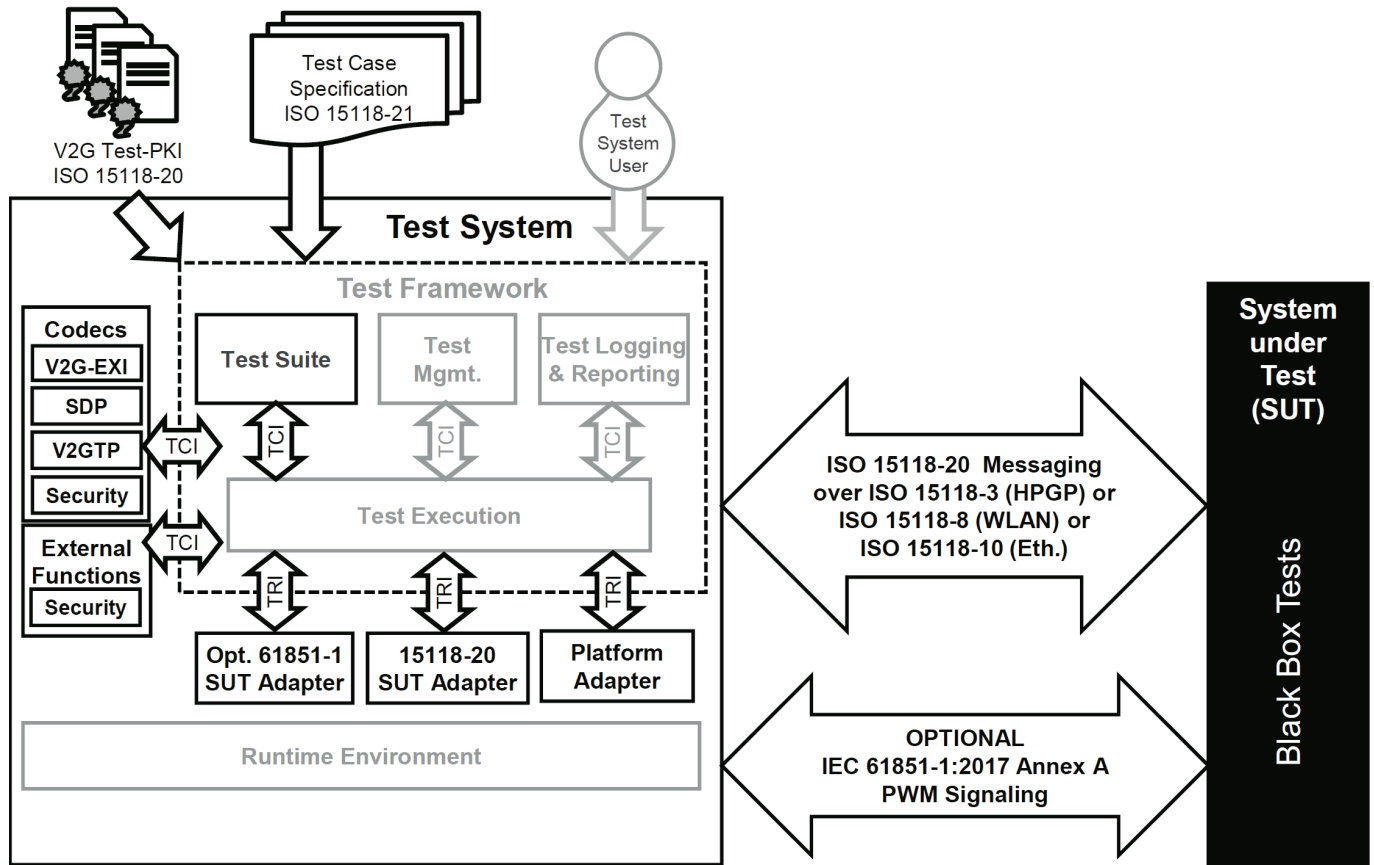


Figure 2 — Test architecture reference model

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 specified for this document.

[V2G21-002] The platform adapter of the test system shall implement the TriPlatformPA and the TriPlatformTE interfaces as specified in ETSI ES 201 873-5 V4.9.1:2022, 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 of propagating message requests and procedure-based calls from the test execution (see Figure 2) to the SUT, and of notifying the test execution of any received test events by appending them to its port queues.

[V2G21-003] Any SUT adapter of the test system shall implement the TriCommunicationSA and the TriCommunicationTE interfaces as specified in ETSI ES 201 873-5 V4.9.1:2022, 6.5.2.

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

[V2G21-004] The optional IEC 61851-1 SUT adapter shall adapt the HAL 61851-1 functions to a PWM Signal specified in subclauses 6.3.1 - 6.3.5.

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

**E DIN EN ISO 15118-21:2024-07
ISO/DIS 15118-21:2024(en)**

- [V2G21-005]** The ISO 15118-20 SUT adapter shall send/receive the encoded SDP requests/responses through UDP messages to/from the SUT as specified in ISO 15118-20:2022.
- [V2G21-006]** The ISO 15118-20 SUT adapter shall send/receive the encoded V2G messages through a TLS connection to/from the SUT as specified in ISO 15118-20:2022.
- [V2G21-007]** The ISO 15118-20 SUT adapter shall support the internal port control messages for TLS connection management.

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

1. control for TCP/TLS port disconnection handling;
2. control for receiving information / status on a given TCP/TLS connection;
3. notification of TCP connection status events;
4. notification of TLS Handshake status events.

- [V2G21-008]** The ISO 15118-20 SUT adapter shall provide a port map operation with additional parameters for TCP and TLS connection configuration.

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

5. configuration for IP address and port;
6. configuration for usage of security (TCP/TLS) ;
7. configuration for cipherSuite;
8. configuration for TLS protocol version;
9. configuration for TLS certificate.

NOTE 5 The ISO 15118-3 adapter is specified in ISO 15118-5.

NOTE 5 The ISO 15118-8 adapter is specified in ISO 15118-9.

6.3.1 Requirements of IEC 61851-1 SUT adapter for SECC or EVCC testing

- [V2G21-027]** The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a function to get the current PWM state or associated voltage level.
- [V2G21-028]** The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a call-back function which reports change events of the current PWM state or associated voltage level.
- [V2G21-029]** The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a function to set the proximity on SUT side.
- [V2G21-030]** The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a function to get the proximity resistor value from SUT side.
- [V2G21-031]** The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a call-back function which reports change events of the resistor value for the proximity from SUT side.
- [V2G21-032]** The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a function to get the duty cycle in [%].
- [V2G21-033]** The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a call-back function which reports changes of the duty cycle in [%].

- [V2G21-034] The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a function to get the frequency in [Hz].
- [V2G21-035] The IEC 61851-1 SUT adapter for SECC or EVCC testing shall provide a call-back function which reports change events of the frequency in [Hz].

6.3.2 Requirements of IEC 61851-1 SUT adapter for SECC testing

- [V2G21-036] The IEC 61851-1 SUT adapter for SECC testing shall provide a function to set the current PWM state or associated voltage level. State B, C and D or the associated voltage level shall be supported, other voltage level are optional.

6.3.3 Requirements of IEC 61851-1 SUT adapter for EVCC testing

- [V2G21-037] The IEC 61851-1 SUT adapter for EVCC testing shall provide a function to set the current PWM state or associated voltage level. State E and F or the associated voltage level shall be supported, other voltage levels are optional.
- [V2G21-038] The IEC 61851-1 SUT adapter for EVCC testing shall provide a function to set the current duty cycle in [%]. The values 5 %, and 7 %-98 % shall be supported, other values are optional.
- [V2G21-039] The IEC 61851-1 SUT adapter for EVCC testing shall provide a function to set current frequency in [Hz]. A value of 1 000 Hz +/- 5 % shall be supported, other values are optional.
- [V2G21-040] The IEC 61851-1 SUT adapter for EVCC testing shall provide a function to switch on/off the ControlPilot Line to simulate an un-plug or plug-in for the SUT. State A or the associated voltage level shall be supported, other voltage level is optional.

6.3.4 Requirements of IEC 61851-1 PTC for SECC or EVCC testing

- [V2G21-041] The IEC 61851 PTC for SECC or EVCC testing shall provide a function which activates the validity monitoring as specified in [V2G21-036], [V2G21-037], [V2G21-038], [V2G21-039], [V2G21-040], [V2G21-041].
- [V2G21-042] The IEC 61851-1 PTC for SECC or EVCC testing shall provide a function to confirm a change from/to a given PWM state. This function shall wait for receiving a state change event from IEC 61851-1 SUT adapter. If no change event occurs within a given time [ms], the function shall return an error.
- [V2G21-043] The IEC 61851-1 PTC for SECC or EVCC testing shall provide a function to change its valid PWM state condition. This function shall change the internal monitoring condition to a given PWM state, which the IEC 61851-1 PTC will consider as the next valid PWM state.
- [V2G21-044] The IEC 61851-1 PTC for SECC or EVCC testing shall provide a function to change its valid duty cycle range. This function shall change the internal monitoring condition to a given duty cycle range from [%] – to [%], which the IEC 61851-1 PTC will consider as the next valid duty cycle range.

6.3.5 Requirements of IEC 61851-1 PTC for SECC testing

- [V2G21-045] The IEC 61851-1 PTC for SECC testing shall provide a function to confirm a given duty cycle in [%]. This function shall wait for receiving a duty cycle change event from IEC 61851-1 SUT adapter. If no change event occurs within a given time [ms], the function shall report an error.
- [V2G21-046] The IEC 61851-1 PTC for SECC testing shall provide a function to change its valid frequency range. This function shall change the internal monitoring condition to a given frequency range from [Hz] – to [Hz], which the IEC 61851-1 PTC will consider as the next frequency range.

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 201 873-5 that can be matched against expected values or templates.

[V2G21-009] All codecs in this document shall implement the TCI-CD interface as specified in ETSI ES 201 873-6 V4.13.1:2022, 7.3.2.

NOTE 1 For conformance testing in this document, the IEEE 802.11n codec (see Figure 2) is used to encode or decode messages consumable by the tester into bit strings consumable by the SUT.

NOTE 2 The exact implementation of the IEEE 802.11n codec is out of scope of this document.

[V2G21-010] The V2G-EXI codec shall encode message values of the test system into corresponding EXI streams as specified in ISO 15118-20:2022.

[V2G21-011] The V2G-EXI Security codec shall encode message values of the test system for X.509 Certificates into a corresponding Base64 representation suitable for EXI streams according to ISO 15118-20:2022.

[V2G21-012] The V2G-EXI codec shall decode EXI streams as specified in ISO 15118-20:2022, into message values of the test system.

[V2G21-047] The V2G-EXI codec shall validate decoded EXI streams for correct grammar according to the XML schema specified in ISO 15118-20:2022 and indicate a fault if a decoded EXI stream is not well-formed.

[V2G21-013] The X.509 certificate codec shall decode Base64 representation of X.509 certificates from EXI streams and decode DER representation according to ISO 15118-20:2022 into message values of the test system for X.509 certificates.

[V2G21-014] The SDP codec shall encode message values of the test system into corresponding SDP requests/responses as specified in ISO 15118-20:2022.

[V2G21-015] The SDP codec shall decode SDP requests/responses as specified in ISO 15118-20:2022 into message values of the test system.

[V2G21-048] The SDP codec shall validate decoded SDP messages for correct format according to clause 7.10.1 specified in ISO 15118-20:2022 and indicate a fault if a decoded SDP message is not well-formed.

[V2G21-016] The V2GTP codec shall encode message values of the test system into corresponding V2GTP envelopes as specified ISO 15118-20:2022.

[V2G21-017] The V2GTP codec shall decode V2GTP envelopes as specified in ISO 15118-20:2022 into message values of the test system.

[V2G21-049] The V2GTP codec shall validate decoded V2GTP messages for correct format according to clause 7.8 specified in ISO 15118-20:2022 and indicate a fault if a decoded V2GTP message is not well-formed.

6.5 Test system timer handling

6.5.1 Definition of test system timers & timeouts

For test control and verdict building on timer related test cases, the test system uses internal timers, that are specified in this subclause. Table 1 lists all relevant test system specific observation and termination timers in this document.

Table 1 — ISO 15118-21 Test system timers

Time/Timeout	Description
SDP_Msg_Observation_Timer	SDP message observation timer in the EVCC
SDP_Sequence_Observation_Timer	SDP sequence observation timer in the SECC
V2G_EVCC_Msg_Observation_Timer	V2G message observation timer in the EVCC
V2G_SECC_CommunicationSetup_Observation_Timer	V2G CommunicationSetup observation timer in the SECC
V2G_SECC_Sequence_Observation_Timer	V2G sequence observation timer in the SECC
V2G_SECC_NotificationMaxDelay_Observation_Timer	V2G NotificationMaxDelay observation timer in the SECC
V2G_EVCC_Ongoing_Observation_Timer	V2G Ongoing observation timer in the EVCC
V2G_SECC_CommunicationSetup_Termination_Timer	V2G CommunicationSetup termination timer in the SECC
V2G_SECC_Sequence_Termination_Timer	V2G sequence termination timer in the SECC
V2G_EVCC_Msg_Termination_Timer	V2G message termination timer in the EVCC
TLS_Connection_Termination_Timer	Common TLS connection termination timer
T_match_leave_Termination_Timer	Common data link connection termination timer

Table 2 lists all relevant test system specific timeouts in this document.

Table 2 — ISO 15118-21 Test system timings and timeouts

Time/Timeout	Value in sec	Description
V2G_SECC_NotificationMaxDelay_Time	TBD	NotificationMaxDelay according to the format specified in [V2G20-1338].
TLS_Connection_Termination_Timeout	5	Timeout for the TLS connection termination
T_match_leave_Termination_Timeout	25	Timeout for the data link termination
SDP_Msg_Timeout	0.25	Timeout for receipt of SDP response message after SDP request message
SDP_Sequence_Timeout	TBD	Timeout for receipt of SDP request message after data link detection

6.5.2 Test system timer scenarios for SUT SECC

This clause specifies relevant timer handling scenarios for test system for SUT SECC with reference to the test system timers and timeouts specified in 6.5.1.

Figure 3 shows the TS timer handling for EVCC message timeout scenarios for SUT SECC.

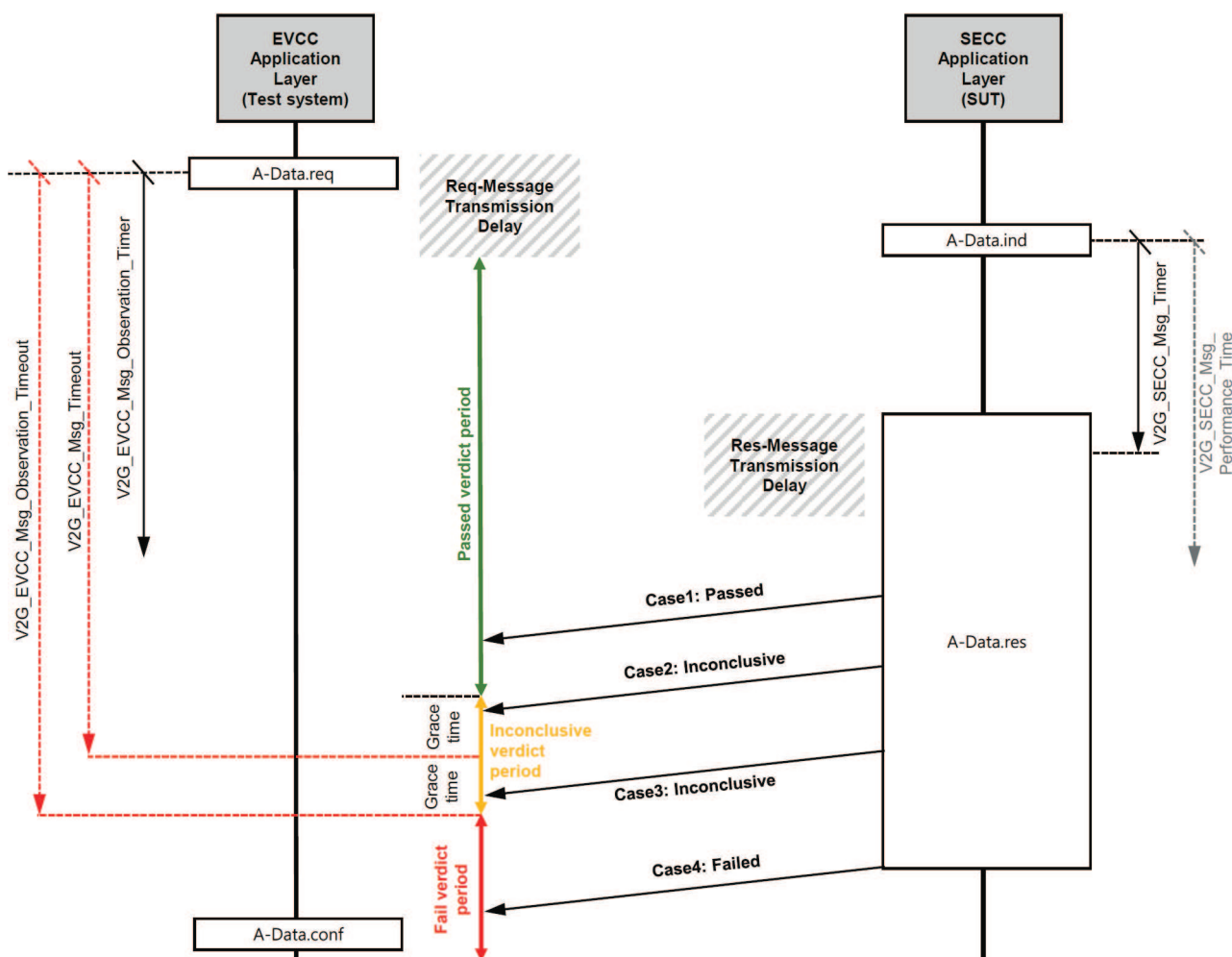


Figure 3 — Test system timer handling for EVCC message timeout scenarios for SUT SECC

Figure 4 shows the TS timer handling for SECC sequence timeout scenarios triggered by the SUT (SECC).

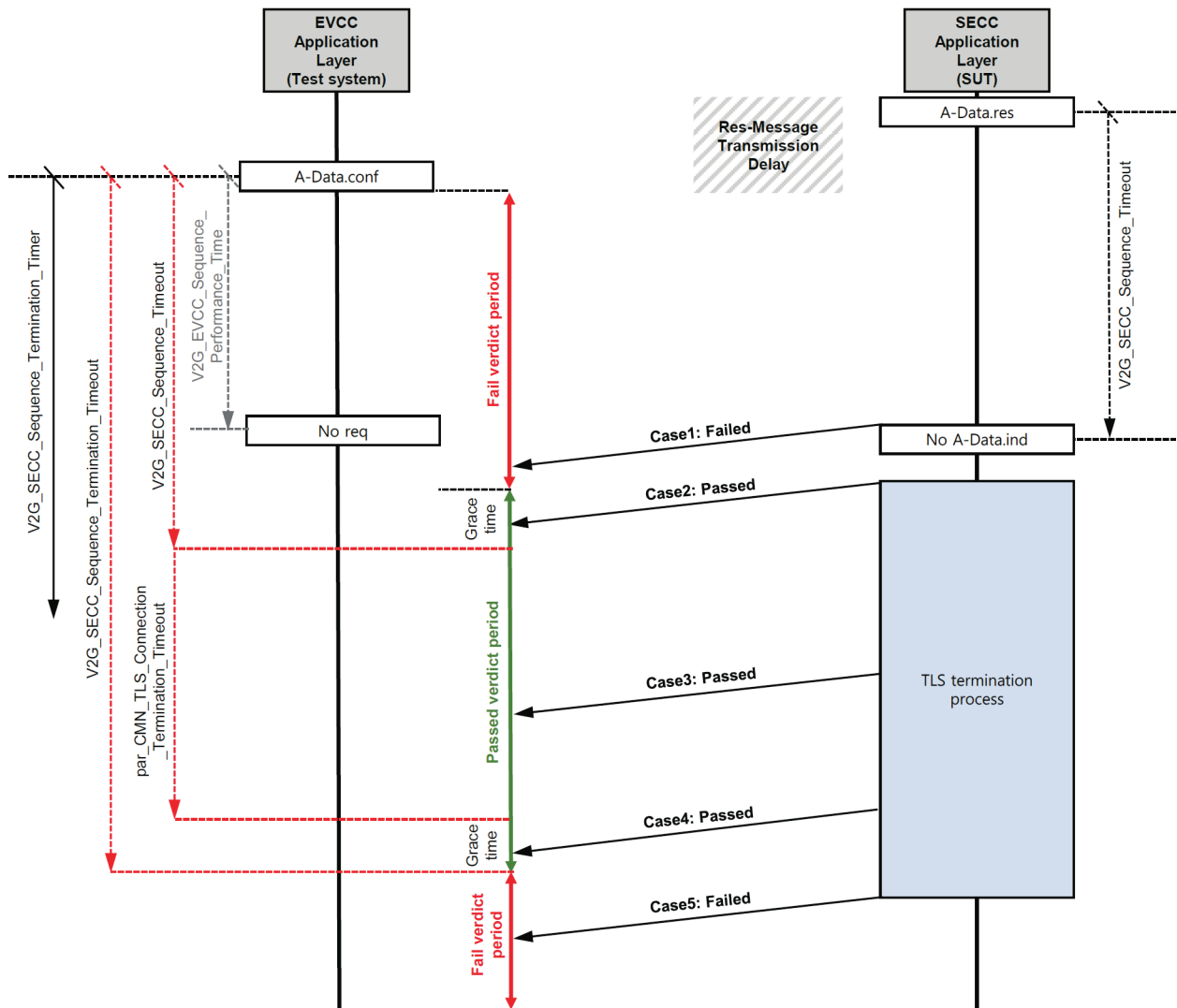


Figure 4 — Test system timer handling for SECC sequence timeout scenarios (triggered by SECC timeout)

6.5.3 Test system timer scenarios for SUT EVCC

This clause specifies relevant timer handling scenarios for test system for SUT EVCC with reference to the test system timers and timeouts specified in 6.5.1.

Figure 5 shows the TS timer handling for SECC sequence timeout scenarios for SUT EVCC.

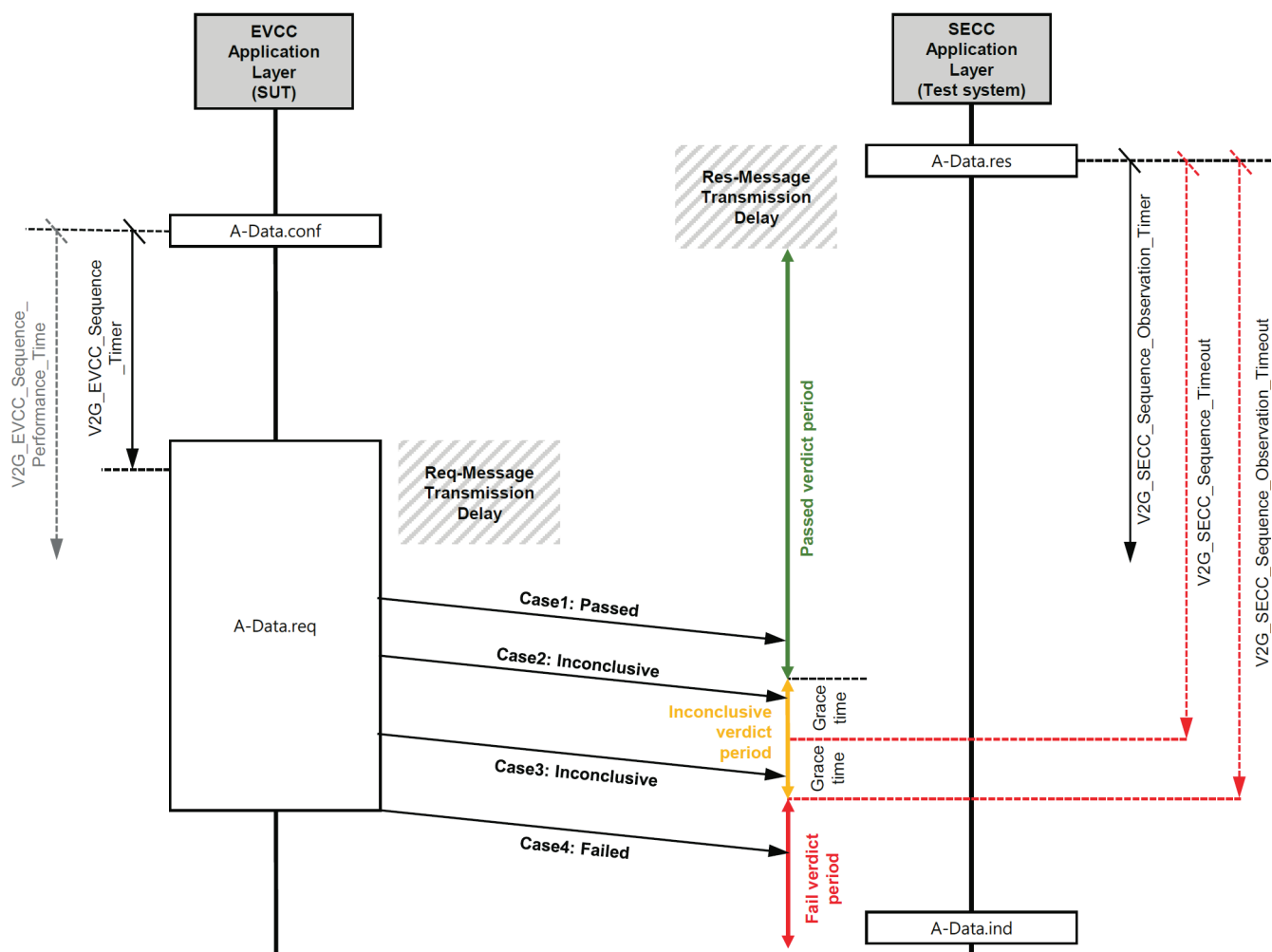


Figure 5 — Test system timer handling for SECC sequence timeout scenarios for SUT EVCC

Figure 6 shows the TS timer handling for EVCC message timeout scenarios triggered by the SUT (EVCC).

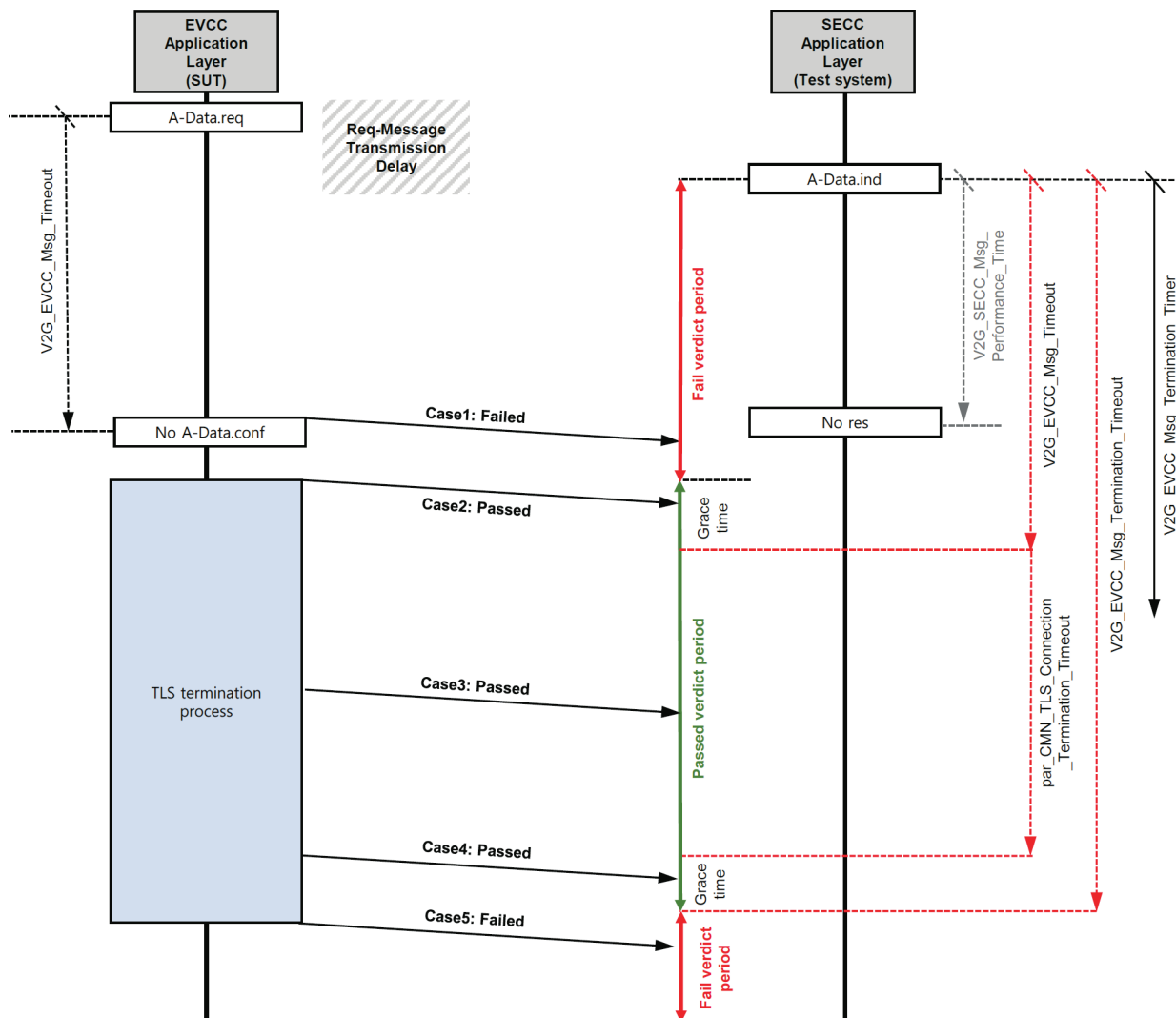


Figure 6 — Test system timer handling for EVCC message timeout scenarios (triggered by EVCC timeout)

Figure 7 shows the TS timer handling for EVCC termination scenarios triggered by a test system stimulus.

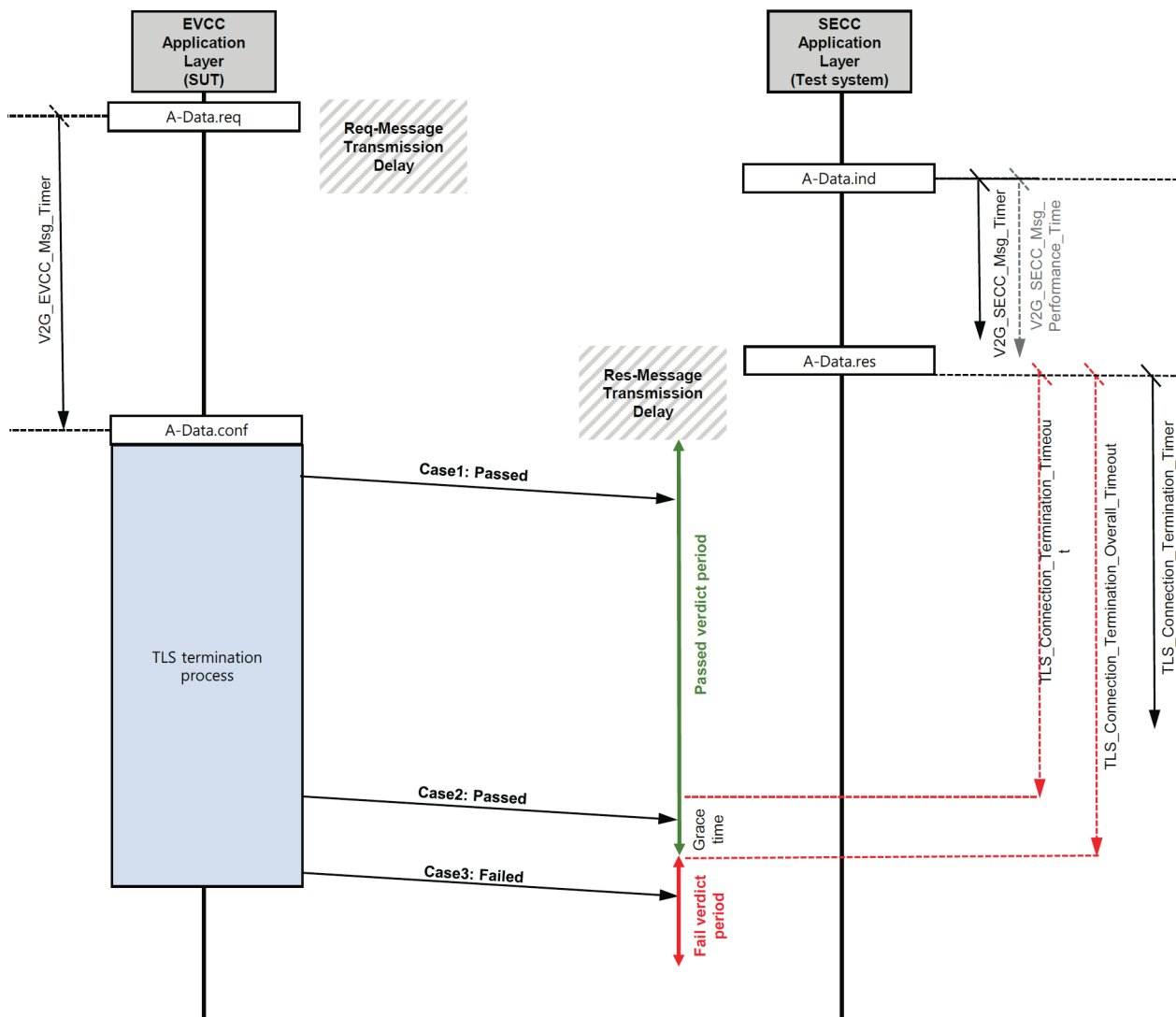


Figure 7 — Test system timer handling for EVCC termination scenarios (triggered by test system stimulus)

7 Test suite conventions

7.1 General information

This clause specifies all conventions that are relevant for conformance tests of SUTs implementing ISO 15118-20.

7.2 Test suite structure (TSS)

An abstract test suite is a complete set of abstract test cases, possibly combined into groups or modules, that are necessary to perform conformance testing for a given SUT.

Each abstract test case specifies how the SUT is stimulated with specific inputs and furthermore specifies expected reaction(s) for verdict assignment. Depending on the test purpose different pre-conditions and post-conditions are considered for the formulation of the test behaviour. The pre-conditions, post-conditions as well as test behaviours are encapsulated into individual functions and stored within separate modules. Thus, an abstract test case is composed by the actual test behaviour enveloped by pre- and post-conditions.

The corresponding grouping of functions can therefore be assigned to the lowest abstract hierarchical level (see Figure 8). The abstract test cases are assigned to the second level.

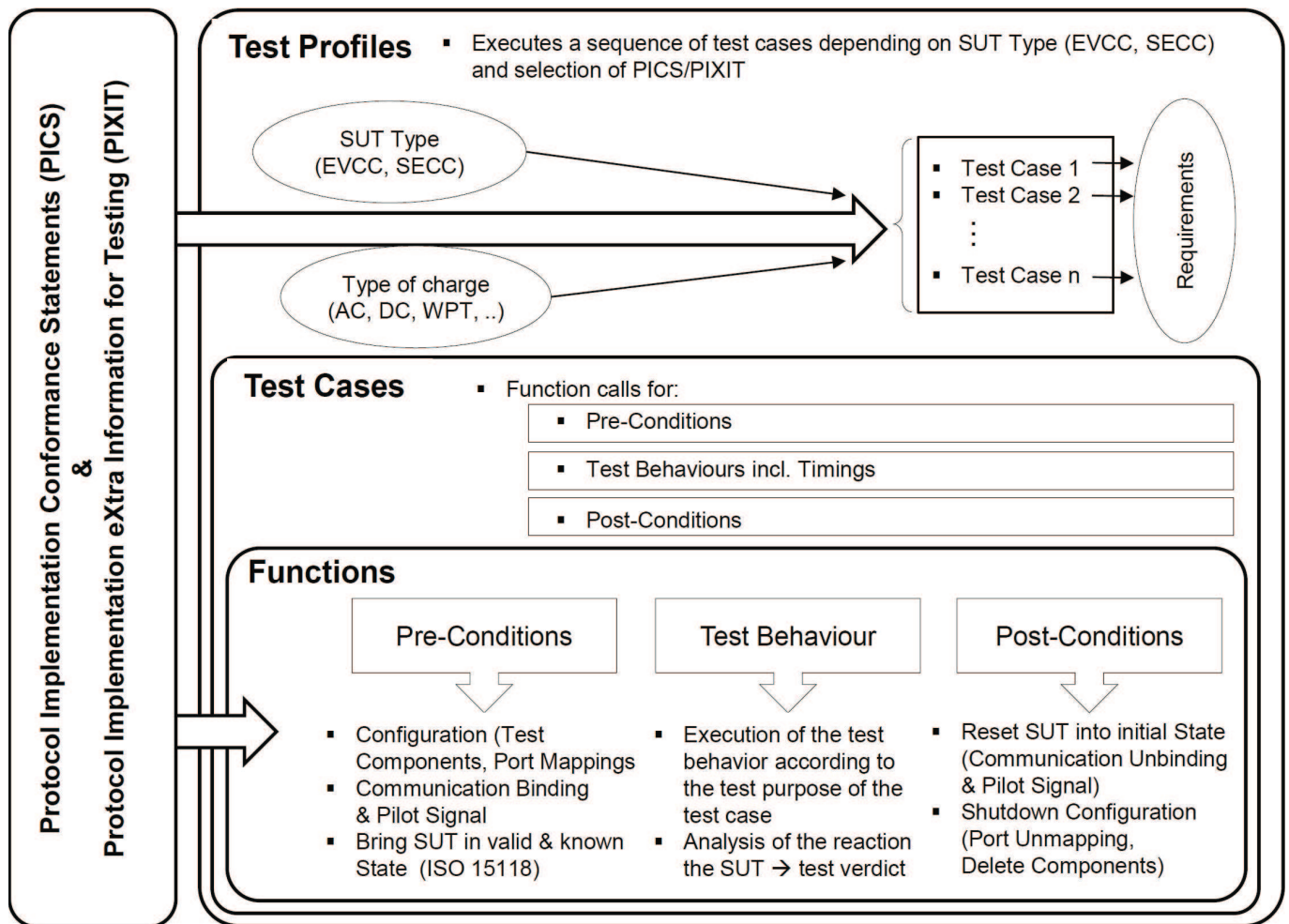


Figure 8 — General overview of the test suite structure (TSS)

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 abstract test suite structure (TSS) is segmented into subgroups for conformance testing according to the use cases specified in ISO 15118-1. Table 3 shows these subgroups, which are used for the organization of the abstract test case specifications as well as for the test suite identifiers (see 7.3 for details).

Table 3 — Identifiers within the test suite structure (TSS)

Identifiers	Values	Description
<sut>		System under test
	EVCC	Electric vehicle communication controller
	SECC	Supply equipment communication controller
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)

7.3 Test profiles

7.3.1 General information

This sub clause specifies test profiles for conformance with ISO 15118-20. 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 specified. 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.

7.3.2 Test configurations

The test configuration reflects various ISO 15118 scenarios. The main entities for the system under test (SUT) are:

- electric vehicle communication controller (EVCC),
- supply equipment communication controller (SECC).

The combination of entities and additionally used test components are grouped by test configuration IDs (CF_Part_ID). Table 4 shows the test configurations for this document.

Table 4 — Test configurations

CF_Part_ID	SUT	Tester	PTCs
CF_21_001	SECC including HPGP PLC interface	EVCC with ISO 15118-20 SUT adapter	61851-1 CP PWM PTC
CF_21_002	EVCC including HPGP PLC interface	SECC with ISO 15118-20 SUT adapter	61851-1 CP PWM PTC
CF_21_003	SECC including wireless LAN interface	EVCC with ISO 15118-20 SUT adapter	61851-1 CP PWM PTC
CF_21_004	EVCC including wireless LAN interface	SECC with ISO 15118-20 SUT adapter	61851-1 CP PWM PTC
CF_21_005	SECC including wireless LAN interface (AP / APUT)	EVCC with ISO 15118-20 SUT adapter	None
CF_21_006	EVCC including wireless LAN interface (STA / STAUT)	SECC with ISO 15118-20 SUT adapter	None

7.3.3 Components and ports

In correspondence to the identified set of relevant test configurations this sub clause specifies test components which reflect the main entities needed for stimulation of the SUT with respect to ISO 15118-20 and IEC 61851-1. Ports are used to connect these components with each other and the SUT. The components are specified in the configuration module and are summarized in Table 5. Port types specify which kind of messages can be sent or received by this port. The corresponding port type definitions are summarized in Table 6.

The parallel test component (PTC) for IEC 61851-1 signaling continuously observes the protocol specific parameters positive voltage (state), frequency, duty cycle and the proximity resistor value in accordance with the specified valid range of values (as specified in IEC 61851-1:2017, Annex A), during the entire test case execution.

Table 5 — 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 6) 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 6) are assigned to this component type.
HAL_61851_Listener (PTC)	The HAL_61851_Listener is responsible for watching the correct IEC 61851 behaviour and is used in the form of a parallel test component (PTC). This component uses the HAL_61851_Port (see Table 6) to communicate with an IEC 61851-1 SUT Adapter and the HAL_61851_Internal_Port (see Table 6) to communicate with the MTC.

Table 6 — Port type definitions

Port Type	Description
V2G_TCP_TLS_ALM_SECC_Port	This port is used to send and receive V2G- Application Layer Messages (ALM) or supportedAppProtocol messages via TCP/TLS specified in ISO 15118-20 to/from an SECC. This port is also used to send and receive internal TCP/TLS port control messages.
V2G_TCP_TLS_ALM_EVCC_Port	This port is used to send and receive V2G- Application Layer Messages (ALM) or supportedAppProtocol messages via TCP/TLS specified in ISO 15118-20 to/from an EVCC. This port is also used to send and receive internal TCP/TLS port control messages.
V2G_UDP_SDP_Port	This port is used to send and receive SDP messages via UDP specified in ISO 15118-20 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 comprise relevant test configurations for this document. Whether the type EVCC_Tester or SECC_Tester is to be used as MTC depends on the type of the SUT.

[V2G21-018] If the SUT is an EVCC, the MTC shall use the type EVCC_Tester.

[V2G21-019] If the SUT is an SECC, the MTC shall use the type SECC_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.

A test configuration also consists of respective test system interfaces (TSI). An abstract 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 9. The type of the V2G components and ports (EVCC or SECC) depends on the SUT type.

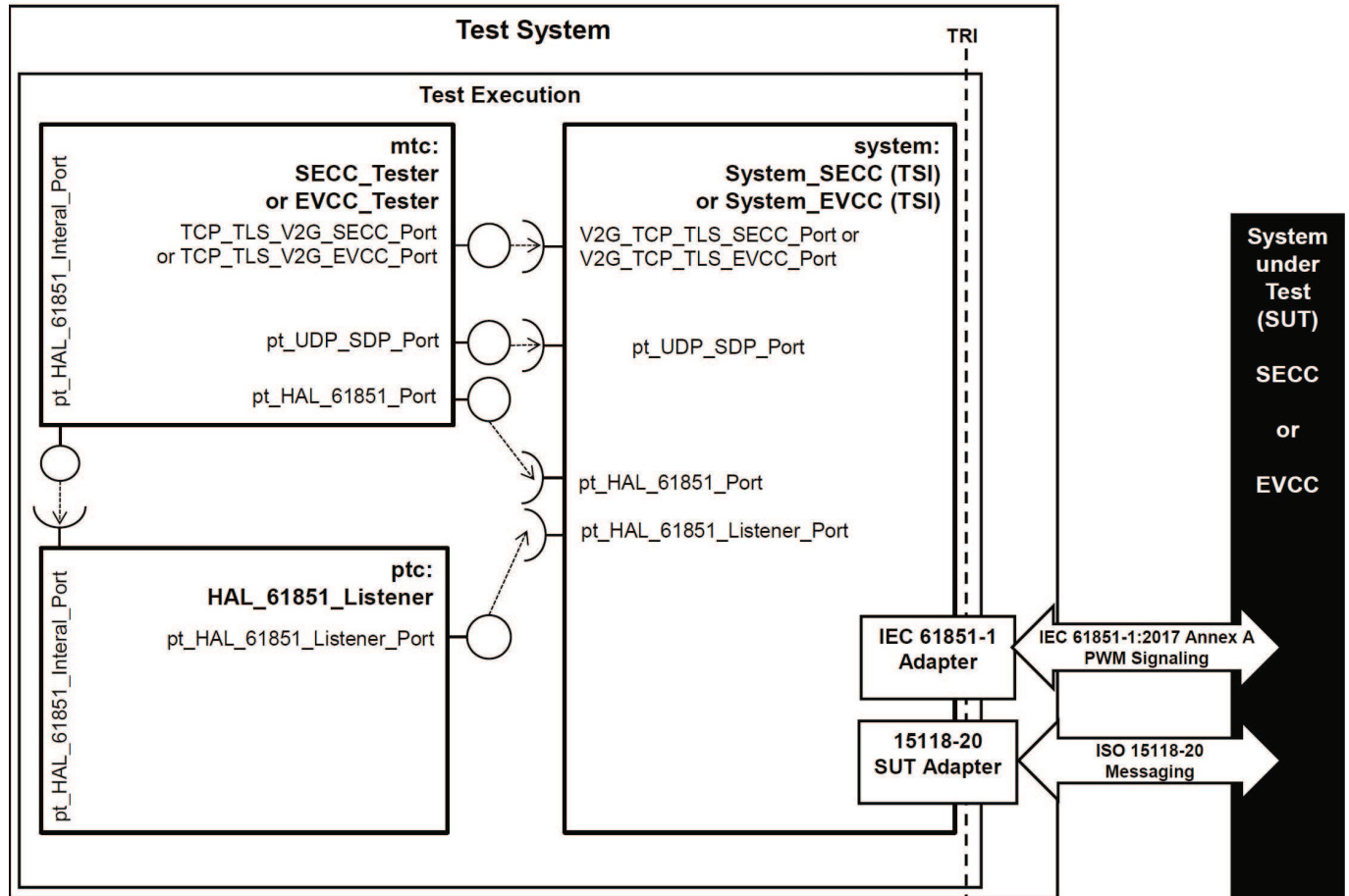


Figure 9 — Overview of test system components and ports in this document

As shown in Figure 9 the port mappings are specified 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.

7.3.4 Protocol implementation conformance statement (PICS) definition

To evaluate the conformance of a particular SUT, it is necessary to have implementation conformance statements (ICS) 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,

**E DIN EN ISO 15118-21:2024-07
ISO/DIS 15118-21:2024(en)**

and against those requirements only. Such a statement is called a protocol implementation conformance statement (PICS), compare to ITU-T X.290.

All PICS specified in the ATS are summarized in Table 7 to Table 9.

Table 7 — PICS for test system configurations CF_21_001 and CF_21_002 (SUT either SECC or EVCC)

PICS	Capability description	Test parameter
PICS_CMN_ETT	Specifies the list of all supported energy transfer types (ETT) by the SUT. Possible values contained in that list are: <ul style="list-style-type: none"> — AC — DC — WPT — ACDP Any combination of these values is allowed.	Test parameter PICS_CMN_ETT_value indicates which energy transfer type is being tested. One of the following values can be assigned to ett_value: <ul style="list-style-type: none"> — AC — DC — WPT — ACDP
PICS_CMN_ControlMode	Specifies the list of all supported Control Modes by the SUT. Possible values contained in that list are: <ul style="list-style-type: none"> — Dynamic — Scheduled Any combination of these values is allowed.	Parameter controlMode_value indicates which control mode is being tested. One of the following values can be assigned to controlmode_value: <ul style="list-style-type: none"> — Dynamic — Scheduled
PICS_CMN_AuthorizationServices	Specifies the list of all supported Authorization Services supported by the SUT. Possible values contained in that list are: <ul style="list-style-type: none"> — EIM — PNC Any combination of these values is allowed.	Parameter authorizationServices_value indicates which authorization service is being tested. One of the following values can be assigned to authorizationServices_value: <ul style="list-style-type: none"> — EIM — PNC
PICS_CMN_CertificateInstallationService	Specifies whether Certification Installation Service is supported by the SUT. Possible values to choose from are: <ul style="list-style-type: none"> — True — False 	Parameter certificationInstallationService_value indicates if the certificate installation service is being tested. One of the following values can be assigned to certificationInstallationService_value: <ul style="list-style-type: none"> — True — False
PICS_CMN_Pause	Specifies whether Charging Pause is supported by the SUT. Possible values to choose from are: <ul style="list-style-type: none"> — True — False 	Parameter pause_value indicates if a paused session is being tested. One of the following values can be assigned to pause_value: <ul style="list-style-type: none"> — True — False
PICS_CMN_ACPlugType	Specifies the list of all supported AC Plug Types supported by the SUT. Possible values contained in that list are: <ul style="list-style-type: none"> — SinglePhase — ThreePhase Any combination of these values is allowed.	Parameter acPlugtype_value indicates which AC Plug Type is being tested. One of the following values can be assigned to acPlugtype_value: <ul style="list-style-type: none"> — SinglePhase — ThreePhase
PICS_CMN_BPT	Specifies whether BPT is supported by the SUT. Possible values to choose from are: <ul style="list-style-type: none"> — True or False — True — False 	Parameter bpt_value indicates if a BPT is being tested. One of the following values can be assigned to bpt_value: <ul style="list-style-type: none"> — True — False
PICS_CMN_MeteringConfirmationRequested	Specifies whether a MeteringConfirmation is triggered by the SUT using EVSENotification set to 'MeteringConfirmation'. Possible values to choose from are: <ul style="list-style-type: none"> — True — False 	Parameter meteringConfirmationRequested_value indicates if a MeteringConfirmation message sequence is being tested. One of the following values can be assigned to meteringConfirmationRequested_value: <ul style="list-style-type: none"> — True — False

Table 7 (continued)

PICS	Capability description	Test parameter
PICS_CMN_Internet	Specifies whether the value-added service 'Internet' is supported by the SUT. Possible values to choose from are: <ul style="list-style-type: none"> — True or False — True — False 	Parameter <code>internet_value</code> indicates if the 'Internet' service is selected in <code>ServiceSelectionReq</code> message. One of the following values can be assigned to <code>internet_value</code> : <ul style="list-style-type: none"> — True — False
PICS_CMN_ParkingStatus	Specifies whether the value-added service 'ParkingStatus' is supported by the SUT. Possible values to choose from are: <ul style="list-style-type: none"> — True or False — True — False 	Parameter <code>parkingStatus_value</code> indicates if the 'ParkingStatus' service is selected in <code>ServiceSelectionReq</code> message for testing. One of the following values can be assigned to <code>parkingStatus_value</code> : <ul style="list-style-type: none"> — True — False
PICS_CMN_MobilityNeedsMode	Specifies who provides mobility needs information. Possible values to choose from are: <ul style="list-style-type: none"> — 1: Mobility needs provided by EVCC — 2: Mobility needs provided by SECC allowed 	Parameter <code>mobilityNeedsMode_value</code> indicates which <code>MobilityNeedsMode</code> is selected for testing. One of the following values can be assigned to <code>mobilityNeedsMode_value</code> : <ul style="list-style-type: none"> — 1: Mobility needs provided by EVCC — 2: Mobility needs provided by SECC allowed

Table 8 — PICS for test system configuration CF_21_001 (SUT equals SECC)

PICS	Capability description	Test parameter
PICS_SECC_VAS	Specifies whether any VAS is provided by the SUT. Possible values to choose from are: <ul style="list-style-type: none"> — True — False 	Parameter <code>vas_value</code> indicates if any VAS is included in <code>ServiceDiscoveryRes</code> message. One of the following values can be assigned to <code>vas_value</code> : <ul style="list-style-type: none"> — True — False

Table 9 — PICS for test system configuration CF_21_002 (SUT equals EVCC)

PICS	Capability description	Test parameter
PICS_EVCC_PrioritizedEmaids	Specifies whether prioritized EMAIDs are supported by the SUT. Possible values to choose from are: <ul style="list-style-type: none"> — True or False — True — False 	Parameter <code>prioritizedEmaids_value</code> indicates if the <code>PrioritizedEMAIDs</code> is included in <code>CertificateInstallationReq</code> message. One of the following values can be assigned to <code>prioritizedEmaids_value</code> : <ul style="list-style-type: none"> — True — False

7.3.5 Protocol implementation extra information for testing (PIXIT) definition

In addition to the ICS, further statements (IXIT) made by a supplier or implementer may be required related to the SUT and its testing environment to enable the test laboratory to run the test suite against the SUT. With reference to ISO 15118-20 protocol conformance, the following set of PIXIT is specified in addition to the PICS in this document.

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

All PIXIT specified in the ATS are summarized in Table 10 to Table 12.

Table 10 — PIXIT for test system configurations CF_21_001 and CF_21_002

PIXIT	Description
PIXIT_CMN_MinPowerRating	Max(Test System MinPosPowerRating, SUT MinPosPowerRating)
PIXIT_CMN_MaxPowerRating	Min(Test System MaxPowerPosRating, SUT MaxPosPowerRating)
PIXIT_CMN_MultipleContracts	Specifies whether multiple contract certificates are available or requested. Possible values to choose from are: <ul style="list-style-type: none">— True— False

Table 11 — PIXIT for test system configuration CF_21_001 (SUT SECC)

PIXIT	Description
PIXIT_SECC_UnknownEMAID	Specifies whether the provided EMAID is registered at SA. Possible values to choose from are: <ul style="list-style-type: none">— True— False
PIXIT_SECC_UnknownPCID	Specifies whether a contract is registered at SA for the provided PCID. Possible values to choose from are: <ul style="list-style-type: none">— True— False
PIXIT_SECC_CommunicationToSA	Specifies whether the connection to the SA is established. Possible values to choose from are: <ul style="list-style-type: none">— True— False
PIXIT_SECC_AuthorizationInitiated	Specifies whether the EIM authorization is executed. Possible values to choose from are: <ul style="list-style-type: none">— True— False
PIXIT_SECC_ChargingParameterAvailable	Specifies whether the charging parameter are available. Possible values to choose from are: <ul style="list-style-type: none">— True— False

Table 12 — PIXIT for test system configuration CF_21_002 (SUT EVCC)

PIXIT	Description
PIXIT_EVCC_EVCCID	Electric vehicle communication controller ID according to the format specified in [V2G20-2597].

7.3.6 Test control

For test control the following requirements or recommendations apply for this document:

- [V2G21-020] Test control shall execute all applicable test cases listed in 4.2 for SUT SECC and 8.4 for SUT EVCC.
- [V2G21-021] Test control should execute test cases in the order as they appear in Table 17 for each SUT.
- [V2G21-022] Test control shall implement the PICS and PIXIT parameters as specified in 3.6 and 3.7 and assign them as specified in each test case definition for SUT SECC (4.2) and for SUT EVCC (4.3).

7.3.7 Test system template messages

Test system template messages are specified in order to provide common parameterization values for all message elements used by the TS in send operations during test case execution.

- [V2G21-023] A TS for SUT type EVCC shall use the template messages as specified in Annex B for default parametrization of the send operation during test case execution.
- [V2G21-024] A TS for SUT type SECC shall use the template messages as specified in Annex C for default parametrization of the send operation during for test case execution.
- [V2G21-025] The test case specification may override the parametrization values from the template messages. In such a case, the TS shall use the parameterization from the test case specification.
- [V2G21-026] With reference to the template messages specified in Annex B and Annex C, the TS for SUT type EVCC and SUT type SECC shall implement all functions listed in Annex D to determine any dynamic data elements during test case execution.

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 specified.

7.4.1 Test case identifiers

The test case identifier for test cases specified in this document is specified as follows:

TC21_<sut>_<ctx>_<nnn>

The segments of this identifier are described in Table 13.

Table 13 — ISO 15118 test suite naming convention for test case identifiers

Identifier	Values	Description
<prefix>	TC21	Prefix for test cases in this document
<sut>		System under test
	EVCC	Electric vehicle communication controller
	SECC	Supply equipment communication controller
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)
<nnn>	{xxx}	Sequential number from 001 to 999

An example for test case identifier is:

TC21_SECC_SupportedAppProtocolRes_001

7.4.2 PICS/PIXIT identifiers

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

<pic>_<sut>_<ctx>

The segments of this identifier are described in Table 14. An example for PICS/PIXIT identifier is:

PICS_CMN_ETT

Table 14 — 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
<ctx>	{fullname}	Context (e.g. name of message pattern signal name according to standard)

7.4.3 Verdict types

In this subclause the conventions for test verdicts are specified. The test verdicts specified in this document are listed in Table 15.

Table 15 — 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. See ITU-T X.290.	If in review of a requirement the SUT has a correct behaviour, 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 test purpose from being accomplished. See ITU-T X.290.	Means that neither pass nor fail can be reliably assigned.
FAIL	A verdict given when the observed outcome is syntactically invalid or inopportune with respect to the relevant requirements or the PICS/PIXIT. See ITU-T X.290.	If in review of a requirement the SUT has a wrong behaviour, then this verdict type shall be used.

7.5 Test case specification

The abstract test case specification in this document is described according to the template shown in Table 16.

Table 16 — Abstract test case specification template

TC Id	The TC Id is a unique identifier for a test case. It is specified according to the TC Id naming convention specified in 3.3.1.
Test purpose	Short description of test purpose according to the requirements from the base standard (ISO 15118-20).
Pre-condition	Description of steps needed to bring the SUT and TS into the state before the actual test behaviour of the test cases is entered.
Test behaviour	Description of the steps needed execute the test behaviour and to derive a test verdict. The steps in the test behaviour typically involve to send one or more stimuli from the TS to the SUT and to match the SUT's expected behaviour with its actual response to the stimuli.
Document reference	The document reference indicates the subclauses of the reference standard specifications in which the conformance requirement(s) is/are expressed. The references are provided according to the following format: Document: ISO 15118-X:20XX:(IS FDIS) Section(s): x.x.x.x.x, y.y.y.y, ...
Referenced requirement(s)	The referenced requirement(s) refers to the subclauses of the referenced standard specification requirement(s). The requirements are referenced according to the format specified in ISO 15118-20: [V2G20-YXX-ZZZ], ...
Config Id	The Config Id references the ISO 15118-20 configuration selected for this test case according to 3.4. EXAMPLE 2 CF_21_001, ...
PICS selection	The PICS selection references the PICS statement(s) for this test case in accordance with 3.6. EXAMPLE 3 PICS_CMN_ETT
PIXIT selection	The PIXIT selection references the PIXIT statement(s) for this test case in accordance with 3.7. EXAMPLE 4 PIXIT_CMN_MultipleContracts

8 Test case specification for common ISO 15118-20 requirements

8.1 General information

Subclause 4.2 covers all test cases for SECC according to ISO 15118-20 while subclause 4.3 covers all test cases for EVCC according to ISO 15118-20, respectively.

8.2 Test cases for SUT SECC

8.2.1 SECC SDP test case specifications

TC Id	TC21_SECC_SDP_001
Test purpose	This TC observes whether the SUT sends an SDP response message in time after receiving an SDP request message from the test system.
Pre-condition	The SUT and TS are initialized to a state, where the data link is successfully established.
Test behaviour	<p>The test system starts the SDP_Msg_Observation_Timer when sending an SDP request message with all elements and values from default parameter set according to Annex C.</p> <p>For verdict 'pass' the test system then checks whether an SDP response message is received within SDP_Msg_Timeout according to the test system timer handling as specified in clause 6.5 with the following format:</p> <pre>SDP response := { SECC IP address := ? SECC port := ? Security := '00'H Transport protocol := '00'H }</pre> <p>If no SDP response message is received within SDP_Msg_Timeout, the test system restarts the SDP_Msg_Observation_Timer and sends another SDP request message. This message sequence is repeated until receipt of SDP response message or the maximum number of 50 SDP request messages is reached.</p>
Document reference	ISO 15118-20:2022, 7.4, ISO 15118-20:2022, 7.10.1.3, ISO 15118-20:2022, 7.10.1.6
Referenced requirement(s)	[V2G20-027], [V2G20-123], [V2G20-624], [V2G20-144], [V2G20-150], [V2G20-154]
Config Id	CF_21_001
PICS	PICS_CMN_ETT contains (ett_value = AC DC)
PIXIT	-

8.2.2 SECC V2GTP test case specifications

TC Id	TC21_SECC_V2GTPSDP_001
Test purpose	This TC observes whether the SUT sends an SDP response message with V2GTP header information ProtocolVersion equals to '01'H, InvProtocolVersion equals to 'FE'H and PayloadType equals to '9001'H after receiving an SDP request message from the test system.
Pre-condition	The SUT and TS are initialized to a state, where the data link is successfully established.
Test behaviour	<p>The test system starts the SDP_Msg_Observation_Timer when sending an SDP request message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C.</p> <p>For verdict 'pass' the test system then checks whether an SDP response message with V2GTP header information is received within SDP_Msg_Timeout according to the test system timer handling as specified in clause 6.5 with the following format:</p> <pre> V2GTP := { Header := { ProtocolVersion := '01'H InvProtocolVersion := 'FE'H PayloadType := '9001'H PayloadLength := ? } Payload := SDP response := ? } </pre> <p>If no SDP response message is received within SDP_Msg_Timeout, the test system restarts the SDP_Msg_Observation_Timer and sends another SDP request message. This message sequence is repeated until receipt of SDP response message or the maximum number of 50 SDP request messages is reached.</p>
Document reference	ISO 15118-20:2022, 7.8.3.1, ISO 15118-20:2022, 7.10.1.6
Referenced requirement(s)	[V2G20-2307], [V2G20-1255]
Config Id	CF_21_001
PICS	PICS_CMN_ETT contains (ett_value = AC DC)
PIXIT	-

**E DIN EN ISO 15118-21:2024-07
ISO/DIS 15118-21:2024(en)**

TC Id	TC21_SECC_V2GTPSDP_002
Test purpose	This TC observes whether the SUT ignores an SDP request message with invalid V2GTP header information ProtocolVersion equals to 'FF'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link is successfully established.
Test behaviour	<p>The test system starts the SDP_Msg_Observation_Timer when sending an SDP request message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment:</p> <p>ProtocolVersion := 'FF'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to an SDP request message with invalid V2GTP header within SDP_Msg_Timeout according to the test system timer handling as specified in clause 6.5. This process is repeated for the maximum number of 50 invalid SDP request messages.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001
PICS	PICS_CMN_ETT contains (ett_value = AC DC)
PIXIT	-

TC Id	TC21_SECC_V2GTPSDP_003
Test purpose	This TC observes whether the SUT ignores an SDP request message with invalid V2GTP header information InvProtocolVersion equals to 'FF'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link is successfully established.
Test behaviour	<p>The test system starts the SDP_Msg_Observation_Timer when sending an SDP request message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment:</p> <p>InvProtocolVersion := 'FF'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to an SDP request message with invalid V2GTP header within SDP_Msg_Timeout according to the test system timer handling as specified in clause 6.5. This process is repeated for the maximum number of 50 invalid SDP request messages.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001
PICS	PICS_CMN_ETT contains (ett_value = AC DC)
PIXIT	-

TC Id	TC21_SECC_V2GTPSDP_004
Test purpose	This TC observes whether the SUT ignores an SDP request message with invalid V2GTP header information PayloadType equals to '7001'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link is successfully established.
Test behaviour	<p>The test system starts the SDP_Msg_Observation_Timer when sending an SDP request message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment: PayloadType := '7001'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to an SDP request message with invalid V2GTP header within SDP_Msg_Timeout according to the test system timer handling as specified in clause 6.5. This process is repeated for the maximum number of 50 invalid SDP request messages.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001
PICS	PICS_CMN_ETT contains (ett_value = AC DC)
PIXIT	-

TC Id	TC21_SECC_V2GTPSDP_005
Test purpose	This TC observes whether the SUT ignores an SDP request message with invalid V2GTP header information PayloadLength equals to '00000000'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link is successfully established.
Test behaviour	<p>The test system starts the SDP_Msg_Observation_Timer when sending an SDP request message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment: PayloadLength := '00000000'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to an SDP request message with invalid V2GTP header within SDP_Msg_Timeout according to the test system timer handling as specified in clause 6.5. This process is repeated for the maximum number of 50 invalid SDP request messages.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001
PICS	PICS_CMN_ETT contains (ett_value = AC DC)
PIXIT	-

**E DIN EN ISO 15118-21:2024-07
ISO/DIS 15118-21:2024(en)**

TC Id	TC21_SECC_V2GTPSupportedAppProtocol_001
Test purpose	This TC observes whether the SUT sends a SupportedAppProtocolRes message with V2GTP header information ProtocolVersion equals to '01'H, InvProtocolVersion equals to 'FE'H and PayloadType equals to '8001'H after receiving a SupportedAppProtocolReq message from the test system.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SupportedAppProtocolReq message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C.</p> <p>For verdict 'pass' the test system then checks whether a SupportedAppProtocolRes message with V2GTP header information is received within V2G_EVCC_Msg_Time-out according to Table 215 in ISO 15118-20:2022 and the test system timer handling as specified in clause 6.5 with the following format:</p> <pre> V2GTP := { Header := { ProtocolVersion := '01'H InvProtocolVersion := 'FE'H PayloadType := '8001'H PayloadLength := ? } Payload := SupportedAppProtocolRes := ? } </pre>
Document reference	ISO 15118-20:2022, 7.8.3.1
Referenced requirement(s)	[V2G20-2307]
Config Id	CF_21_001, CF_21_003, CF_21_005
PICS	PICS_CMN_ETT contains (ett_value = AC DC WPT ACDP)
PIXIT	-

TC Id	TC21_SECC_V2GTPSupportedAppProtocol_002
Test purpose	This TC observes whether the SUT sends a SupportedAppProtocolRes message whose TCP destination port number is in range of V2G_DST_TCP_DATA after receiving a SupportedAppProtocolReq message from the test system.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SupportedAppProtocolReq message with all elements and values from default parameter set according to Annex C.</p> <p>For verdict 'pass' the test system then checks whether the used TCP destination port number of SupportedAppProtocolRes message is in the range of Dynamic Ports (49152-65535).</p>
Document reference	ISO 15118-20:2022, 7.8.2
Referenced requirement(s)	[V2G20-078], [V2G20-080]

**E DIN EN ISO 15118-21:2024-07
ISO/DIS 15118-21:2024(en)**

Config Id	CF_21_001, CF_21_003, CF_21_005
PICS	PICS_CMN_ETT contains (ett_value = AC DC WPT ACDP)
PIXIT	-

TC Id	TC21_SECC_V2GTPSupportedAppProtocol_003
Test purpose	This TC observes whether the SUT ignores a SupportedAppProtocolReq message with invalid V2GTP header information ProtocolVersion equals to 'FF'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SupportedAppProtocolReq message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment:</p> <p>ProtocolVersion := 'FF'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to a SupportedAppProtocolReq message with invalid V2GTP header within V2G_EVCC_Msg_Timeout according to Table 215 in ISO 15118-20:2022 and the test system timer handling as specified in clause 6.5.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001, CF_21_003, CF_21_005
PICS	PICS_CMN_ETT contains (ett_value = AC DC WPT ACDP)
PIXIT	-

TC Id	TC21_SECC_V2GTPSupportedAppProtocol_004
Test purpose	This TC observes whether the SUT ignores a SupportedAppProtocolReq message with invalid V2GTP header information InvProtocolVersion equals to 'FF'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SupportedAppProtocolReq message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment:</p> <p>InvProtocolVersion := 'FF'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to a SupportedAppProtocolReq message with invalid V2GTP header within V2G_EVCC_Msg_Timeout according to Table 215 in ISO 15118-20:2022 and the test system timer handling as specified in clause 6.5.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001, CF_21_003, CF_21_005
PICS	PICS_CMN_ETT contains (ett_value = AC DC WPT ACDP)
PIXIT	-

TC Id	TC21_SECC_V2GTPSupportedAppProtocol_005
Test purpose	This TC observes whether the SUT ignores a SupportedAppProtocolReq message with invalid V2GTP header information PayloadType equals to '7001'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SupportedAppProtocolReq message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment: PayloadType := '7001'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to a SupportedAppProtocolReq message with invalid V2GTP header within V2G_EVCC_Msg_Timeout according to Table 215 in ISO 15118-20:2022 and the test system timer handling as specified in clause 6.5.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001, CF_21_003, CF_21_005
PICS	PICS_CMN_ETT contains (ett_value = AC DC WPT ACDP)
PIXIT	-

TC Id	TC21_SECC_V2GTPSupportedAppProtocol_006
Test purpose	This TC observes whether the SUT ignores a SupportedAppProtocolReq message with invalid V2GTP header information PayloadLength equals to '00000000'H.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SupportedAppProtocolReq message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C with consideration of the following parameter adjustment: PayloadLength := '00000000'H</p> <p>For verdict 'pass' the test system then checks whether the SUT does not respond to a SupportedAppProtocolReq message with invalid V2GTP header within V2G_EVCC_Msg_Timeout according to Table 215 in ISO 15118-20:2022 and the test system timer handling as specified in clause 6.5.</p>
Document reference	ISO 15118-20:2022, 8.6.4.6.3.1
Referenced requirement(s)	[V2G20-800]
Config Id	CF_21_001, CF_21_003, CF_21_005
PICS	PICS_CMN_ETT contains (ett_value = AC DC WPT ACDP)
PIXIT	-

**E DIN EN ISO 15118-21:2024-07
ISO/DIS 15118-21:2024(en)**

TC Id	TC21_SECC_V2GTPCommonMessages_001
Test purpose	This TC observes whether the SUT sends a SessionSetupRes message with V2GTP header information ProtocolVersion equals to '01'H, InvProtocolVersion equals to 'FE'H and PayloadType equals to '8002'H after receiving a SessionSetupReq message from the test system.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established and V2G message sequence is succeeded until SupportedAppProtocolRes message.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SessionSetupReq message and the corresponding V2GTP header with all elements and values from default parameter set according to Annex C.</p> <p>For verdict 'pass' the test system then checks whether a SessionSetupRes message with V2GTP header is received within V2G_EVCC_Msg_Timeout according to Table 215 in ISO 15118-20:2022 and the test system timer handling as specified in clause 6.5 with the following format:</p> <pre> V2GTP := { Header := { ProtocolVersion := '01'H InvProtocolVersion := 'FE'H PayloadType := '8002'H PayloadLength := ? } Payload := SessionSetupRes := ? } </pre>
Document reference	ISO 15118-20:2022, 7.8.3.1
Referenced requirement(s)	[V2G20-2307]
Config Id	CF_21_001, CF_21_003, CF_21_005
PICS	-
PIXIT	-

TC Id	TC21_SECC_V2GTPCommonMessages_002
Test purpose	This TC observes whether the SUT sends a SessionSetupRes message whose TCP destination port number is in range of V2G_DST_TCP_DATA after receiving a SessionSetupReq message from the test system.
Pre-condition	The SUT and TS are initialized to a state, where the data link and TLS connection are successfully established and V2G message sequence is succeeded until SupportedAppProtocolRes message.
Test behaviour	<p>The test system starts the V2G_EVCC_Msg_Observation_Timer when sending a SessionSetupReq message with all elements and values from default parameter set according to Annex C.</p> <p>For verdict 'pass' the test system then checks whether the used TCP destination port number of SessionSetupRes message is in the range of Dynamic Ports (49152-65535).</p>
Document reference	ISO 15118-20:2022, 7.8.2