

TTCN-3 Charging Communication Test Automation Software

Perform Conformance and Interoperability Testing with Test Suites

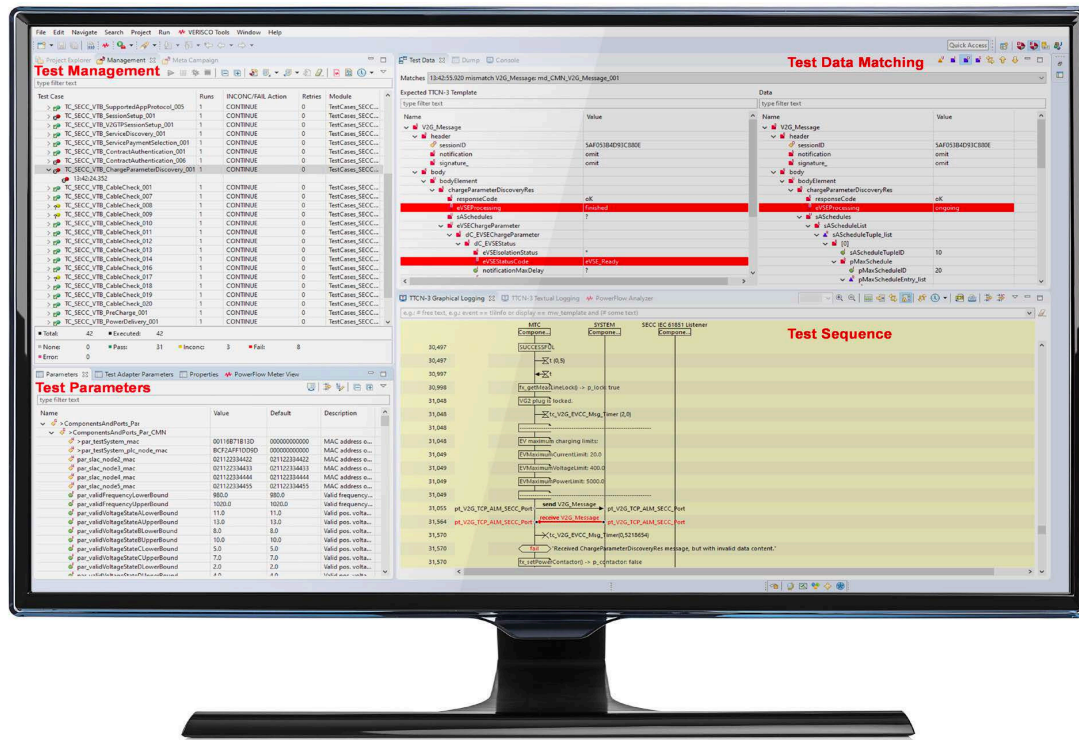


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Perform Conformance and Interoperability Testing with Test Suites

The Keysight TTCN-3 Charging Communication Test Automation Software (CCT) provides test case packages for conformance and interoperability testing based on the test implementation language TTCN-3 (Testing and Test Control Notation).

Learn more about the key features and test scope for each test case package.

Each conformance testing package is based on a national or international standard that specifies a set of concrete test cases, along with detailed descriptions of the test actions and expected behavior.

Each package for interoperability testing covers test cases complementary to conformance test suites that are not publicly available in any test standard. The test cases are derived from field experience, expert groups, and customer feedback to enhance the quality and robustness of Electric Vehicle (EV) and EV Supply Equipment (EVSE) implementation.

Overview of TTCN-3 Charging Communication Test Automation Software (CCT) Options

Test Suites (TS)	EV Test		EVSE Test	
	AC	DC	AC	DC
DIN 70122 Conformance	–	SL1438A	–	SL1449A
DIN 70121 Interop (IOP)	–	SL1439A	–	SL1450A
ISO/IS 15118-4/5 Conformance	SL1440A		SL1451A	
	SL1441A	SL1442A	SL1452A	SL1453A
Option: ISO/IS 15118-4 TLS/PNC	SL1443A Requires ISO 15118 Conformance TS		SL1454A Requires ISO 15118 Conformance TS	
Option: ISO/IS 15118-2/-3 Interop (IOP)	SL2440A		SL2451A	
	SL2441A	SL2442A	SL2452A	SL2453A
Option: ISO/IS 15118-2 Interop (IOP) for TLS/PNC	SL2443A		SL2454A	
ISO/IS 15118-21 Conformance & ISO/PAS 15118-23 Conformance	SL2500A		SL2510A	
		SL2503A		SL2513A
ISO/IS 15118 Value Added Service: VDV 261	–	SL2444A	–	–
ISO/IS 15118 Value Added Service: Battery Data Exchange Protocol	SL2464A		SL2465A	
Core Plugins & Features for TTCN-3 Charging Communication Test Automation Software (CCT)	SL1471A			
TTCN-3 Test Execution Environment (VIAVI TWorkbench™)	SL1430A / SL1431A / SL1433A			

Note 1: The SL1451A option is only available in combination with the SL1452A or SL1453A options.

Note 2: The SL1452A option is only available in combination with the SL1451A option.

Note 3: The SL1453A option is only available in combination with the SL1451A option.

Note 4: The SL1454A option is only available in combination with the SL1451A and SL1452A or SL1451A and SL1453A options.

Note 5: The SL2452A option is only available in combination with the SL2451A option.

Note 6: The SL2453A option is only available in combination with the SL2451A option.

Note 7: The SL2454A option is only available in combination with the SL2451A and SL2452A or SL2451A and SL2453A options.

Note 8: The SL2513A option is only available in combination with the SL2510A option.

Note 9: The SL1440A option is only available in combination with the SL1441A or SL1442A options.

Note 10: The SL1441A option is only available in combination with the SL1440A option.

Note 11: The SL1442A option is only available in combination with the SL1440A option.

Note 12: The SL1443A option is only available in combination with the SL1440A and SL1441A or SL1440A and SL1442A options.

Note 13: The SL2440A option is only available in combination with the SL2441A or SL2442A options.

Note 14: The SL2441A option is only available in combination with the SL2440A option.

Note 15: The SL2442A option is only available in combination with the SL2440A option.

Note 16: The SL2443A option is only available in combination with the SL2440A and SL2441A or SL2440A and SL2442A options.

Note 17: The SL2503A option is only available in combination with the SL2500A option.

Note 17: The SL2464A option is only available in combination with the SL1440A and SL1441A option.

Note 18: The SL2465A option is only available in combination with the SL1451A and SL1452A option.

Note 19: The SL1471A option is only available in combination with the SL1430A, SL1431A, or SL1433A options.

Note 20: SL1430A TTCN-3 Test Execution Environment – VIAVI TTworkbench Express.

Note 21: SL1431A TTCN-3 Test Execution Environment – VIAVI TTworkbench Basic.

Note 22: SL1433A TTCN-3 Log File Analysis – VIAVI TTworkbench Viewer.

Note 23: VIAVI TTworkbench™ is a registered trademark of Viavi Solutions Inc.

Note 24: The software assets may require the latest software release version. Please check the equivalent release notes for the selected software asset.

Option Class Conformance Test Automation Software - CORE

SL1471A TTCN-3 Charging Communication Test Automation Software (CCT) - Core Plugins and Drivers

SL1471A - Core Plugins and Drivers

Key Features

Keysight's Charging Discovery System (CDS) Driver EV and EVSE Test:

- Mandatory software driver to integrate Keysight's CDS in TTCN-3 CCS Conformance Test Automation Framework. This driver enables the execution of conformance/interop test suites (e.g., for DIN 70121/ISO 15118) and provides PLC communication support, as well as control and measurement capabilities for Control Pilot (CP) signaling, required for the System Under Test (SUT) EV/EVSE.

Keysight's DHVE Driver AC and DC:

- Mandatory software driver to integrate Keysight Dynamic High Voltage Emulators (DHVEs) into the TTCN-3 CCS Conformance Test Automation Framework. This driver enables power flow support according to IEC 61851-23 and HV measurement capabilities for TTCN-3 conformance and interoperability test suites (e.g., for DIN 70121/ISO 15118), which are required for SUT EV/EVSE.

CCT Configuration Wizard Plugin:

- The web-based graphical user interface for the configuration of test case attributes and module parameters to parameterize the test execution.

Power Flow Analyzer Plugin:

- Visualization of power flow values and PWM signals within the time domain after test execution.

CCT Reporter Plugin:

- The web-based graphical user interface for the configuration of the test report generation.

Dump View Plugins

In-depth data structure analysis for V2G and SLAC messages

Live Web View Plugin

IEC 61851 Codec Plugin for Ethernet Messaging (PWM)

Test Robot External Functions Plugin

AC/DC Power Flow External Functions Plugins

Logging PcapCapture Plugin

IEC 61851 SUT Adapter for Ethernet Messaging (PWM)

Note: SL1471A must be combined with TTCN-3 Test Execution Environment (Viavi's TTworkbench™). For test execution with hardware, either Express (SL1430A) or Basic (SL1431A) is required. Trace analysis requires the CCT Plugin for TTworkbench™ Viewer (SL1433A).

CCT Configuration Wizard

KEYSIGHT

System Settings

ISO 15118-21

SUT: SECC EVCC

Essential
Control Pilot
Timer
Advanced
Profiles

V2G - PICS

PICS_CMN_ETT

e_AC

>

☐

e_DC

>

☒

e_WPT

>

☐

e_ACDP

>

☐

PICS_CMN_AuthorizationServices

e_EIM

>

☒

e_PNC

>

☐

PICS_CMN_Control_Mode

e_Dynamic

>

☒

e_Scheduled

>

☐

PICS_CMN_BPT

i>

☐

PICS_CMN_Pause

i>

☐

V2G - Test Parameter

par_ett_value

i

e_DC

par_authorizationServices_value

i

eIM

par_bpt_value

i>

☐

par_bptCharging_value

i

e_charging

par_controlMode_value

i

e_Scheduled

par_dcPlugtype_value

i

e_Extended

Update Test Suite Parameters

Figure 1. CCT configuration wizard

4 Test Report Summary

4.1 Test Result Overview for ISO 15118-4/-5 DC EV

Table 8 summarizes the number of test cases executed and the respective test verdicts. A detailed overview of the test results and derived assessments are provided in section 5 - 6.

Table 8 – Tabular Test Case Status and Verdict Overview

Test Case Execution Status	# Test Cases			
UNIQUE EXECUTED	64			
OVERALL EXECUTED	64			
	PASS	FAIL	INCONCLUSIVE	ERROR
	60	4	0	0

4.1.1 Test Case Verdict Distribution for ISO 15118-4/-5 DC EV

Figure 1 shows the test case verdict distribution for the Conformance Test for ISO 15118-4/-5 DC EV based on OVERALL EXECUTED results.

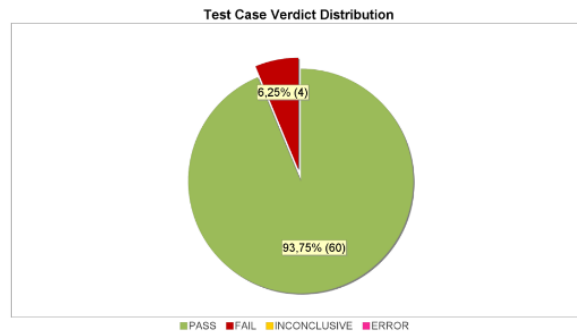


Figure 1 - Distribution of Test Case Verdicts

Table 9 summarizes all test cases with a conformance verdict equals to fail or inconclusive based on OVERALL EXECUTED results.

Table 9 - Test Case Overview for Conformance Verdict FAIL and INCONCLUSIVE

No.	Test Case ID	Conformance Verdict	Test Result Description
1	TC_EVCC_CMN_VTB_AttenuationCharacterization_002	fail	The repetition limit is reached. The Matching process is considered as FAILED.

Figure 2. Keysight test report (excerpt)

Option Class EVSE Test Cases

SL1449A EVSE Conformance Test Package – CCS – DIN 70122

SL1449A – Executable Test Suite with Codecs and Adapters

Key Features

DIN 70121:2014 Codec plugin for Signal Level Attenuation Characterization (SLAC) messaging over Ethernet
DIN 70121:2014 Codec plugin for vehicle-to-grid transport protocol (V2GTP) messaging
DIN 70121:2014 Codec plugin for SECC Discovery Protocol (SDP) over user datagram protocol (UDP) messaging
DIN 70121:2014 Codec plugin for V2G over transmission control protocol (TCP) messaging
DIN 70121:2014 System under test (SUT) adapter for Ethernet Messaging (SLAC)
DIN 70121:2014 SUT adapter for UDP messaging (V2GTP/SDP)
DIN 70121:2014 SUT adapter for TCP messaging (V2GTP/V2G)
DIN 70121:2014 External functions plugin
Includes all test cases according to DIN 70122:2018
Includes all test cases according to CharIN test cases for DIN SPEC 70121:2014 Implementation Guide (Version 1.1.3 March 2022)
Includes all test cases according to CharIN Umbrella Document for Charging System Basic DC EVSE (Version 1.0 December 2025)

Test Scope

DC charging only; conformance test of protocol
Test of SLAC and matching process according to DIN 70121:2014.
Test of “SECC Discovery Protocol” and TCP/Ipv6 binding process according to DIN 70121:2014.
Test of “V2GTP” message encapsulation according to DIN 70121:2014.
Test of “Supported Application Protocol Handshake” process and messaging according to DIN 70121:2014.
Test of all V2G messages according to DIN 70121:2014 for charging setup, charging loop, and termination of the charging process.
Good case and error case test run through all SLAC messages according to DIN 70121:2014.
Good case and error case test run through all V2G messages according to DIN 70121:2014.
Test of concurrent handling of PLC communication based on DIN 70121:2014.
The test scope focuses on communication/signaling. Power flow support is available depending on the selected hardware/driver option.

Note 1. SL1449A is delivered as TTCN-3 project and set of Plugins for Viavi's TWorkbench™. TWorkbench™ is a full-featured integrated test development and execution environment (IDE). This powerful, user-friendly tool allows you to test software products and services regardless of technology, operating system, or implementation domain. Based on the standardized testing language TTCN-3, it enables test automation as well as unlimited extensibility.

Note 2. Number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL1450A EVSE Keysight Interop (IOP) Test Package – CCS – DIN 70121

SL1450A – Executable Test Suite Complementary to Conformance Tests Suite

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependence.
Practical valid/invalid scenario tests.

Test Scope

IOP test suite covers 8 groups of test cases:

All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.

Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/environments (e.g. protocol versions).

Interface Testing (IT): Testing of customer interaction (HMI testing).

Negative Testing (NT): Testing of brought range of unexpected input values or conditions (e.g. wrong data, timeouts).

Performance Testing (PT): Testing of responsiveness, stability, and application performance.

Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period (e.g. long charging sessions).

Stress Testing (ST): Testing of reliability and stability under a heavy workload.

System Testing (SYST): Integration testing of various system components (e.g. EV/EVSE with power flow).

Note 1. SL1450A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL1451A EVSE Conformance Test Package – CCS – ISO 15118-4/-5 (COMMON Test Cases)

SL1451A – Executable Test Suite with Codecs and Adapters

Required

SL1452A or SL1453A

Key Features

ISO 15118-2:2014 Codec plugin for SLAC messaging over Ethernet

ISO 15118-2:2014 Codec plugin for V2GTP messaging

ISO 15118-2:2014 Codec plugin for SDP over UDP messaging

ISO 15118-2:2014 Codec plugin for V2G over TCP messaging

ISO 15118-2:2014 SUT adapter for Ethernet messaging (SLAC)

ISO 15118-2:2014 SUT adapter for UDP messaging (V2GTP/SDP)

ISO 15118-2:2014 SUT adapter for TCP messaging (V2GTP/V2G)

ISO 15118-2:2014 External functions plugin

Includes all common test cases for AC/DC EVSE according to ISO/DIS 15118-4:2025 and ISO/IS 15118-5:2018

Includes all common test cases for DC EVSE according to CharIN Umbrella Document for Charging System

Extended DC EVSE (Version 1.0 December 2025)

Test Scope

Common for AC/DC charging; conformance test of protocol

Test of SLAC and TCP/IPv6 binding process according to ISO 15118-3:2015.

Test of “SDP” and TCP/IPv6 binding process according to ISO 15118-2:2014.

Test of “V2GTP” message encapsulation according to ISO 15118-2:2014.

Test of “Supported Application Protocol Handshake” process and messaging according to ISO 15118-2:2014.

Test of all common V2G messages according to ISO 15118-2:2014 for charging setup and termination of charging process.

Good case and error case test run through all SLAC messages according to ISO 15118-3:2015.

Good case and error case test run through all common V2G messages according to ISO 15118-2:2014.

Test of concurrent handling of PLC communication based on ISO 15118-2:2014 and ISO 15118-3:2015.

Note 1. SL1451A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. Software maintenance options are available on request.

SL1452A EVSE Conformance Test Package – CCS – ISO 15118-4/-5 (AC-specific Test Cases)

SL1452A – Executable Test Suite with Codecs and Adapters

Required

SL1451A

Key Features

Includes all test cases for AC EVSE according to ISO/DIS 15118-4:2025 and ISO/IS 15118-5:2018.

Test Scope

AC charging only; conformance test of protocol

Test of all AC V2G messages according to ISO 15118-2:2014 for charging loop and termination of charging process.

Good case and error case test run through all AC V2G messages according to ISO 15118-2:2014.

Test of concurrent handling of PLC communication based on ISO 15118-2:2014 and ISO 15118-3:2015.

Test of concurrent handling of power flow scope focuses on communication/signaling only. Power flow support is available depending on the selected hardware/driver option.

Note 1: SL1452A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2: The number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3: Software maintenance options are available on request.

SL1453A EVSE Conformance Test Package - CCS - ISO 15118-4/-5 (DC-specific Test Cases)

SL1453A - Executable Test Suite with Codecs and Adapters

Required

SL1451A

Key Features

Includes all test cases for DC EVSE according to ISO/DIS 15118-4:2025 and ISO/IS 15118-5:2018.

Includes all DC test cases for DC EVSE according to CharIN Umbrella Document for Charging System Extended DC EVSE (Version 1.0 December 2025)

Test Scope

DC charging only; conformance test of protocol

Test of all DC V2G messages according to ISO 15118-2:2014 for the charging loop and termination of the charging process.

Good case and error case test run through all DC V2G messages according to ISO 15118-2:2014.

Test of concurrent handling of PLC communication based on ISO 15118-2:2014 and ISO 15118-3:2015.

Test scope is focusing on communication/signaling only. Power flow support is available depending on the selected hardware/driver option.

Note 1: SL1453A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2: The number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3: Software maintenance options are available on request.

SL1454A EVSE Conformance Test Package - CCS - ISO 15118-4 (TLS/PNC-specific Test Cases)

SL1454A - Executable Test Suite with Codecs and Adapters

Required

SL1451A and SL1452A or SL1451A and SL1453A

Test Scope

AC and DC charging; conformance test of protocol
3 Test PKIs with different setups according to ISO 15118-2:2014 and with valid and invalid certificates.
Good case test run through PnC charging process with all V2G Messages according to ISO 15118-2:2014.
Error case test run through PnC charging process with all V2G Messages according to ISO 15118-2:2014.
Good case test run through certificate update and installation process according to ISO 15118-2:2014.
Error case test run through certificate update and Installation according to ISO 15118-2:2014.
Signature validation as part of all test runs and in-depth analysis tools for fault identification.

Note 1. SL1454A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. The number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL2451A EVSE Keysight Interop (IOP) Test Package - CCS - ISO 15118-2/-3 (COMMON Test Cases)

SL2451A - Executable Test Suite Complementary to Conformance Tests Suite

Required

SL2452A or SL2453A

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependence.
Practical valid/invalid scenario tests.

Test Scope

IOP Test Suite covers 4 groups of test cases:
All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.
Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/environments (e.g. protocol versions).
Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period (e.g. long charging sessions).
Stress Testing (ST): Testing of reliability and stability under a heavy workload.

Note 1. SL2451A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL2452A EVSE Keysight Interop (IOP) Test Package - CCS - ISO 15118-2/-3 (AC-specific Test Cases)

SL2452A - Executable Test Suite Complementary to Conformance Tests Suite

Required

SL2451A

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependence. Practical valid/invalid scenario tests.

Test Scope

IOP Test Suite covers 4 groups of test cases:

All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.

Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/environments (e.g. protocol versions).

Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period (e.g. long charging sessions).

Stress Testing (ST): Testing of reliability and stability under a heavy workload.

Note 1. SL2452A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL2453A EVSE Keysight Interop (IOP) Test Package - CCS - ISO 15118-2/-3 (DC-specific Test Cases)

SL2453A - Executable Test Suite Complementary to Conformance Tests Suite

Required

SL2451A

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependence. Practical valid/invalid scenario tests.

Test Scope

IOP Test Suite covers 4 groups of test cases:

All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.

Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/environments (e.g. protocol versions).

Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period (e.g. long charging sessions).

Stress Testing (ST): Testing of reliability and stability under a heavy workload.

Note 1. SL2453A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL2454A EVSE Keysight Interop (IOP) Test Package - CCS - ISO 15118-2 (TLS/PnC-specific Test Cases)

SL2454A - Executable Test Suite with Codecs and Adapters

Required

SL2451A and SL2453A or SL2451A and SL2452A

Test Scope

IOP Test Suite covers 1 group of TLS/PnC-specific test cases:

Security Testing (SEC): Testing security functions according to Plug and Charge (PnC) (e.g. invalid certificates, signatures etc.)

Note 1. SL2454A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL2465A EVSE Conformance Test Package – CCS – Value Added Service for Battery Data Exchange Protocol

SL2465A – Executable Test Suite with Codecs and Adapters

Key Features

Codec plugin for BDEP messaging

SUT adapter for additional TCP connection (VAS)

Template matching for TCP header information

Includes all AC EVSE test cases according to Test Items for Battery Data Exchange Protocol for Smart Control Charge (September 2025)

Test Scope

AC charging based on ISO 15118-2 only

Test of BDEP (VAS) selection according to ISO 15118-2, Technical Standard of Battery Data Exchange Protocol for Smart Control Charger (May 2025).

Test of AC connection coordination.

Test of interaction between BC and HLC-C.

Test of charging control & shutdown behavior based on BDEP messaging & HMI.

End-to-end test of AC charging process with enabled VAS service.

Note 1. SL2465A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. Software maintenance options are available on request.

SL2510A EVSE Conformance Test Package – CCS – ISO 15118-21 (COMMON Test Cases)

SL2510A – Executable Test Suite with Codecs and Adapters

Key Features

ISO 15118-20:2020 Codec plugin for V2GTP messaging
ISO 15118-20:2020 Codec plugin for V2G over TLS messaging
ISO 15118-20:2020 SUT adapter for TLS messaging (V2GTP/V2G)
ISO 15118-20:2020 External functions plugin
Includes all common test cases for AC & DC EVSE EIM according to ISO/IS 15118-21:2025

Test Scope

Common for AC & DC EIM charging; conformance test of protocol
Test of “SDP” and TLS 1.3/Ipv6 binding process according to ISO 15118-20:2020.
Test of “V2GTP” message encapsulation according to ISO 15118-20:2020.
Test of “Supported Application Protocol Handshake” process and messaging according to ISO 15118-20:2020.
Test of all common V2G messages according to ISO 15118-20:2020 for charging setup and termination of charging process.
Good case and error case test run through all common V2G messages according to ISO 15118-20:2020.
Functional test of dynamic or scheduled mode, pause, standby, service renegotiation and schedule renegotiation.

Note 1. SL2510A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. Software maintenance options are available on request.

SL2513A EVSE Conformance Test Package - CCS - ISO 15118-23 (DC-specific Test Cases)

SL2513A - Executable Test Suite with Codecs and Adapters

Required

SL2510A

Key Features

Includes all test cases for DC EVSE EIM according to ISO/DPAS 15118-23:2026.

Test Scope

DC charging only; conformance test of protocol
Test of all DC V2G messages according to ISO 15118-23:2020 for the charging loop and termination of the charging process.
Good case and error case test run through all DC V2G messages according to ISO 15118-20:2020.
Test of DC charging with/without BPT for dynamic or scheduled mode.
Test scope focuses on communication/signaling only. Power flow support is available depending on the selected hardware/driver option.

Note 1. SL2513A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

Option Class EV Test Cases

SL1438A EV Conformance Test Package - CCS - DIN 70122

SL1438A - Executable Test Suite with Codecs and Adapters

Key Features

DIN 70121:2014 Codec plugin for SLAC messaging over Ethernet
DIN 70121:2014 Codec plugin for V2GTP messaging
DIN 70121:2014 Codec plugin for SDP over UDP messaging
DIN 70121:2014 Codec plugin for V2G over TCP messaging
DIN 70121:2014 SUT adapter for Ethernet messaging (SLAC)
DIN 70121:2014 SUT adapter for UDP messaging (V2GTP/SDP)
DIN 70121:2014 SUT adapter for TCP messaging (V2GTP/V2G)
DIN 70121:2014 External functions plugin
Includes all test cases according to DIN 70122:2018
Includes all test cases according to CharIN test cases for DIN SPEC 70121:2014 Implementation Guide (Version 1.1.3 January 2022)
Includes all Basic test cases according to CharIN Umbrella Document for Charging System Basic and Extended DC EV (Version 1.0 December 2025)
Includes all Basic test cases according to CharIN Test Case Modification Guide (Version 1.0 November 2025)

Test Scope

DC charging only; conformance test of protocol
Test of SLAC and matching process according to DIN 70121:2014.
Test of "SDP" and TCP/IPv6 binding process according to DIN 70121:2014.
Test of "V2GTP" message encapsulation according to DIN 70121:2014.
Test of "Supported Application Protocol Handshake" process and messaging according to DIN 70121:2014.
Test of all V2G messages according to DIN 70121:2014 for charging setup, charging loop, and termination of the charging process.
Good case test run through all V2G messages according to DIN 70121:2014.
Error case test runs through all V2G messages according to DIN 70121:2014.
Test of concurrent handling of DIN 70121:2014.
Test scope focuses on charging communication and signaling. Power flow support is available depending on the selected hardware adapter.

Note 1. SL1438A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL1439A EV Keysight Interop (IOP) Test Package - CCS - DIN 70121

SL1439A - Executable Test Suite Complementary to Conformance Tests Suite

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependencies.

Practical valid/invalid scenario tests.

Test Scope

IOP Test Suite covers 9 groups of test cases:

All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.

Boundary Value Testing (BVT): Testing of valid and invalid boundary values.

Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/ environments (e.g. protocol versions).

Interface Testing (IT): Testing of customer interaction (HMI testing).

Negative Testing (NT): Testing brought range of unexpected input values or conditions (e.g. wrong data, timeouts).

Performance Testing (PT): Testing of responsiveness, stability, and application performance.

Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period of time (e.g. long charging sessions).

Stress Testing (ST): Testing of reliability and stability under a heavy workload.

System Testing (SYST): Integration testing of various system components (e.g. EV/EVSE with power flow).

Note 1. SL1439A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL1440A EV Conformance Test Package - CCS - ISO 15118-4/-5 (COMMON Test Cases)

SL1440A - Executable Test Suite with Codecs and Adapters

Required

SL1441A or SL1442A

Key Features

ISO 15118-2:2014 Codec Plugin for SLAC messaging over Ethernet

ISO 15118-2:2014 Codec Plugin for V2GTP messaging

ISO 15118-2:2014 Codec Plugin for SDP over UDP messaging

ISO 15118-2:2014 Codec Plugin for V2G over TCP messaging

ISO 15118-2:2014 SUT Adapter for Ethernet messaging (SLAC)

ISO 15118-2:2014 SUT Adapter for UDP messaging (V2GTP/SDP)

ISO 15118-2:2014 SUT Adapter for TCP messaging (V2GTP/V2G)

ISO 15118-2:2014 External Functions Plugin

Includes all common test cases for AC/DC EV according to ISO/DIS 15118-4:2025 and ISO/IS 15118-5:2018

Includes all common Extended test cases according to CharIN Umbrella Document for Charging System Basic and Extended DC EV (Version 1.0 December 2025)

Includes all common Extended test cases for DC EV according to CharIN Test Case Modification Guide (Version 1.0 November 2025)

Test Scope

Common for AC/DC charging; conformance test of protocol

Test of SLAC and TCP/IPv6 binding process according to ISO 15118-3:2015.

Test of "SDP" and TCP/IPv6 binding process according to ISO 15118-2:2014.

Test of "V2GTP" message encapsulation according to ISO 15118-2:2014.

Test of "Supported Application Protocol Handshake" process and messaging according to ISO 15118-2:2014.

Test of all common V2G messaging according to ISO 15118-2:2014 for charging setup and termination of charging process.

Good case and error case test run through all SLAC messaging according to ISO 15118-3:2015.

Good case and error case test run through all common V2G messaging according to ISO 15118-2:2014.

Test of concurrent handling of PLC communication based on ISO 15118-2:2014 and ISO 15118-3:2015.

Note 1. SL1440A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. Software maintenance options are available on request.

SL1441A EV Conformance Test Package - CCS - ISO 15118-4/-5 (AC-specific Test Cases)

SL1441A - Executable Test Suite with Codecs and Adapters

Required

SL1440A

Key Features

Includes all test cases for AC EV according to ISO/DIS 15118-4:2025 and ISO/IS 15118-5:2018.

Test Scope

AC charging only; conformance test of protocol

Test of all AC V2G messages according to ISO 15118-2:2014 for charging loop and termination of the charging process.

Good case and error case test run through all AC V2G messages according to ISO 15118-2:2014.

Test of concurrent handling of PLC communication based on ISO 15118-2:2014 and ISO 15118-3:2015.

Test scope is focusing on communication/signaling. Power flow support is available depending on the selected hardware/driver option.

Note 1. SL1441A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL1442A EV Conformance Test Package - CCS - ISO 15118-4/-5 (DC-specific Test Cases)

SL1442A - Executable Test Suite with Codecs and Adapters

Required

SL1440A

Key Features

Includes all test cases for DC EV according to ISO/DIS 15118-4:2025 and ISO/IS 15118-5:2018.

Includes all DC Extended test cases according to CharIN Umbrella Document for Charging System Basic and Extended DC EV (Version 1.0 December 2025)

Includes all DC Extended test cases for DC EV according to CharIN Test Case Modification Guide (Version 1.0 November 2025)

Test Scope

DC charging only; conformance test of protocol

Test of all DC V2G messages according to ISO 15118-2:2014 for charging loop and termination of the charging process.

Good case and error case test run through all DC V2G messages according to ISO 15118-2:2014.

Test of concurrent handling of PLC communication based on ISO 15118-2:2014 and ISO 15118-3:2015.

Test scope is focusing on communication/signaling. Power flow support is available depending on the selected hardware/driver.

Note 1. SL1442A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The Number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL1443A EV Conformance Test Package - CCS - ISO 15118-4 (TLS/PNC-specific Test Cases)

SL1443A - Executable Test Suite with Codecs and Adapters

Required

SL1440A and SL1441A or SL1440A or SL1442A

Test Scope

AC and DC charging; conformance test of protocol

3 Test PKIs with different setups according to ISO 15118-2:2014 and with valid and invalid certificates.

Good case test run through PnC charging process with all V2G messages according to ISO 15118-2:2014.

Error case test run through PnC charging process with all V2G messages according to ISO 15118-2:2014.

Good case test run through Certificate Update and Installation process according to ISO 15118-2:2014.

Error case test run through Certificate Update and Installation according to ISO 15118-2:2014.

Signature Validation as part of all test runs and in-depth analysis tools for fault identification.

Note 1. SL1443A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The Number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL2440A EV Keysight Interop (IOP) Test Package - CCS - ISO 15118-2/-3 (COMMON Test Cases)

SL2440A - Executable Test Suite Complementary to Conformance Tests Suite

Required

SL2441A or SL2442A

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependencies.

Practical valid/invalid scenario tests.

Test Scope

IOP Test Suite covers 7 groups of test cases:

All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.

Boundary Value Testing (BVT): Testing of valid and invalid boundary values.

Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/ environments (e.g. protocol versions).

Negative Testing (NT): Testing of brought range of unexpected input values or conditions (e.g. wrong data, timeouts).

Performance Testing (PT): Testing of responsiveness, stability, and application performance.

Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period of time (e.g. long charging sessions).

Stress Testing (ST): Testing of reliability and stability under a heavy workload.

Note 1. SL2440A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL2441A EV Keysight Interop (IOP) Test Package - CCS - ISO 15118-2/-3 (AC-specific Test Cases)

SL2441A - Executable Test Suite Complementary to Conformance Tests Suite

Required

SL2440A

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependencies.

Practical valid/invalid scenario tests.

Test Scope

IOP Test Suite covers 9 groups of test cases:

All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.

Boundary Value Testing (BVT): Testing of valid and invalid boundary values.

Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/ environments (e.g. protocol versions).

Interface Testing (IT): Testing of customer interaction (HMI testing).

Negative Testing (NT): Testing brought range of unexpected input values or conditions (e.g. wrong data, timeouts).

Performance Testing (PT): Testing of responsiveness, stability, and application performance.

Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period of time (e.g. long charging sessions).

Stress Testing (ST): Testing of reliability and stability under a heavy workload.

System Testing (SYST): Integration testing of various system components (e.g. EV/EVSE with power flow).

Note 1. SL2441A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL2442A EV Keysight Interop (IOP) Test Package - CCS - ISO 15118-2/-3 (DC-specific Test Cases)

SL2442A - Executable Test Suite Complementary to Conformance Tests Suite

Required

SL2440A

Key Features

Complementary test cases to enhance the scope of conformance tests with respect to standards interdependencies.

Practical valid/invalid scenario tests.

Test Scope

IOP Test Suite covers 8 groups of test cases:

All Pairs Testing (APT): Testing of possible discrete combinations of values/enumerations.

Compatibility Testing (CT): Testing of application compatibility for different use case scenarios/ environments (e.g. protocol versions).

Interface Testing (IT): Testing of customer interaction (HMI testing).

Negative Testing (NT): Testing brought range of unexpected input values or conditions (e.g. wrong data, timeouts).

Performance Testing (PT): Testing of responsiveness, stability, and application performance.

Reliability Testing (RT): Testing software reliability in given environmental conditions and for a specified period of time (e.g. long charging sessions).

Stress Testing (ST): Testing of reliability and stability under a heavy workload.

System Testing (SYST): Integration testing of various system components (e.g. EV/EVSE with power flow).

Note 1. SL2442A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. This test suite is continuously enhanced with new test cases based on customer feedback and field experience (see support and maintenance contract).

Note 3. The number of executable test cases strongly depends on the capabilities and configurability of the SUT.

Note 4. Software maintenance options are available on request.

SL2443A EV Keysight Interop (IOP) Test Package - CCS - ISO 15118-2 (TLS/PnC-specific Test Cases)

SL2443A - Executable Test Suite with Codecs and Adapters

Required

SL2440A and SL2442A or SL2440A and SL2441A

Test Scope

IOP Test Suite covers 1 group of TLS/PnC-specific test cases:

Security Testing (SEC): Testing security functions according to Plug and Charge (PnC) (e.g. invalid certificates, signatures etc.)

Note 1. SL2443A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

SL2444A Keysight Interop (IOP) Test Package – CCS – VDV 261 Value Added Service for ISO 15118

SL2444A – Executable Test Suite with Codecs and Adapters

Key Features

Codec plugin for JSON messaging

SUT adapter for TLS messaging (HTTP)

VDV 261 External functions plugin

Includes test cases for DC EV according to VDV 261:2020 Ed.1 & VDV 261:2023 Ed.2

Test Scope

DC charging based on ISO 15118-2 only

Test of VAS selection in charging protocol according to ISO 15118-2, VDV 261:2020 Ed.1 & VDV 261:2023 Ed.2.

Test of HTTP authentication according to VDV 261:2020 Ed.1 & VDV 261:2023 Ed.2.

Test of HTTP header information according to VDV 261:2020 Ed.1 & VDV 261:2023 Ed.2.

Test of pre-defined VDV 261 use cases (e.g. preconditioning of heating).

End-to-end test of charging process with enabled VAS service according to ISO 15118-2, VDV 261:2020 Ed.1. & VDV 261:2023 Ed.2.

Good case and error case test run through V2ICP messages according to VDV 261:2020 Ed.1 & VDV 261:2023 Ed.2.

Note 1. Only IPv6 link-local addresses are supported for the VAS communication.

Note 2. VDV 261 Value Added Service for ISO 15118 is currently only supported for ISO 15118-2.

Note 3. SL2500A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 4. Software maintenance options are available on request.

SL2464A EV Conformance Test Package – CCS – Value Added Service for Battery Data Exchange Protocol

SL2464A – Executable Test Suite with Codecs and Adapters

Key Features

Codec plugin for BDEP messaging
SUT adapter for additional TCP connection (VAS)
Template matching for TCP header information
Includes all AC EV test cases according to Test Items for Battery Data Exchange Protocol for Smart Control Charge (September 2025)

Test Scope

AC charging based on ISO 15118-2 only
Test of BDEP (VAS) selection according to ISO 15118-2, Technical Standard of Battery Data Exchange Protocol for Smart Control Charger (May 2025).
Test of AC connection coordination.
Test of interaction between BC and HLC-C.
Test of charging control & shutdown behavior based on BDEP messaging & HMI.
End-to-end test of AC charging process with enabled VAS service.
Conformance Testing of BDEP messaging according to Technical Standard of Battery Data Exchange Protocol for Smart Control Charger (May 2025).

Note 1. SL2464A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. Software maintenance options are available on request.

SL2500A EV Conformance Test Package – CCS – ISO 15118-21 (COMMON Test Cases)

SL2500A – Executable Test Suite with Codecs and Adapters

Key Features

ISO 15118-20:2020 Codec plugin for V2GTP messaging
ISO 15118-20:2020 Codec plugin for V2G over TLS messaging
ISO 15118-20:2020 SUT adapter for TLS messaging (V2GTP/V2G)
ISO 15118-20:2020 External functions plugin
Includes all common test cases for AC & DC EV EIM according to ISO/IS 15118-21:2025

Test Scope

Common for AC & DC EIM charging; conformance test of protocol
Test of "SDP" and TLS 1.3/IPv6 binding process according to ISO 15118-20:2020.
Test of "V2GTP" message encapsulation according to ISO 15118-20:2020.
Test of "Supported Application Protocol Handshake" process and messaging according to ISO 15118-20:2020.
Test of all common V2G messages according to ISO 15118-20:2020 for charging setup and termination of charging process.
Good case and error case test run through all common V2G messages according to ISO 15118-20:2020.
Test of dynamic or scheduled mode and service renegotiation.

Note 1. SL2500A is delivered as TTCN-3 project and set of plugins for Viavi's TTworkbench™.

Note 2. Software maintenance options are available on request.

SL2503A EV Conformance Test Package - CCS - ISO 15118-23 (DC-specific Test Cases)

SL2503A - Executable Test Suite with Codecs and Adapters

Required

SL2500A

Key Features

Includes all test cases for DC EV EIM according to ISO/DPAS 15118-23:2026

Test Scope

DC charging only; conformance test of protocol

Test of all DC V2G messages according to ISO 15118-23:2020 for the charging loop and termination of the charging process.

Good case and error case test run through all DC V2G messages according to ISO 15118-20:2020.

Test of DC charging with/without BPT for dynamic or scheduled mode.

Test scope focuses on communication/signaling only. Power flow support is available depending on the selected hardware/driver option.

Note 1. SL2503A is delivered as TTCN-3 project and set of Plugins for Viavi's TTworkbench™.

Note 2. The number of test cases strongly depends on the capabilities and configurability of the SUT.

Note 3. Software maintenance options are available on request.

Flexible software licenses and KeysightCare Software Support Subscriptions

Keysight offers a range of flexible licensing options tailored to your needs and budget. Choose your license term and license type.

License Terms

Perpetual – Perpetual licenses are valid indefinitely.

Subscription – Subscription licenses are valid only for the license term (3, 6, 12, 24, or 36 months).

License Types

Node-locked – License can be used on one specified instrument/computer.

Floating – Networked instruments/computers can access a license from a server one at a time. Multiple licenses can be purchased for concurrent usage.

- Single Site: Valid within a 1-mile (1.6 km) radius from the server
- Single Region: Valid in a single region; Americas, Europe, Asia/Japan
- Worldwide: Valid anywhere in the world

USB Portable – A USB Portable license is bound to a physical USB dongle and can be used on one PC or instrument at a time, enabling easy license transfer by moving the USB key between systems without requiring a network connection.

KeysightCare Software Support Subscriptions

Perpetual licenses are sold with a 12- to 60-month software support subscription, with a user-selected start and end date. Support subscriptions can be renewed for a fee after that. Subscription licenses include a software support subscription for 3 to 36 months, with a user-selected start date.

Option Class TTCN-3 Test Execution Environment

The following items are required to configure and execute TTCN-3 based test cases. For more information, please refer to the official [Viavi data sheet](#).

SL1430A TTCN-3 Test Execution Environment – VIAVI TTworkbench Express

SL1430A

Key Features

- TTCN-3-based test development and execution environment
- Technology-independent test automation platform
- Reusable and extensible test framework
- Project-based test campaign management
- Advanced logging, analysis, and statistics
- Multi-format report generation (HTML, PDF, Excel, Word)
- XSD-to-TTCN-3 schema mapping
- XML codec runtime and code generation support

Note 1. Software maintenance options are available on request. An active software maintenance agreement is required for technical support and access to software updates.

SL1431A TTCN-3 Test Execution Environment – VIAVI TTworkbench Basic

SL1431A

Includes All Express License Key Features, Plus:

- User-friendly text-based test case definition (including T3Doc)
- Platform-independent TTCN-3 compilation
- Automatic generation of TTCN-3 test scripts from traces

Note 1. Software maintenance options are available on request. An active software maintenance agreement is required for technical support and access to software updates.

SL1433A TTCN-3 Log File Analysis – VIAVI TTworkbench Viewer

SL1433A

Key Features

- Visual analysis of TTCN-3 test logs and execution traces
- Textual and graphical result exploration
- Efficient root-cause analysis and test result debugging
- Traceability from test results to TTCN-3 source code
- Statistical evaluation and result reporting
- Export of analysis results in HTML, PDF, Excel, and Word formats

Note 1. Software maintenance options are available on request. An active software maintenance agreement is required for technical support and access to software updates.

TTCN-3 Test Execution Environment licensing and KeysightCare Software Support Subscriptions

Viavi's TTworkbench™ licenses are available only as perpetual worldwide floating licenses. The floating license can be hosted on an external license server, a Windows Ethernet adapter, or a portable USB-to-Ethernet dongle. Software maintenance is available for terms of 12, 24, or 36 months only.

Extend the Capabilities of Your Test Solution

Meet the Charging Discovery System family of Solutions

Accelerate Your Charging Interface Testing and Validate Charging Behavior Across EV And EVSE

Keysight's Charging Discovery System Series (CDS) supports the latest adapters and protocols used with EVs and EVSE. As use cases, standards, and protocols evolve, our modular, upgradeable portfolio will help you ensure conformance and interoperability today and tomorrow.



Figure 3. From left to right: SL1040A EMC CDS, SL1047A High-Power CDS, SL1040A Portable CDS, and SL2600A Megawatt CDS with EV and EVSE test

- Configure the CDS to your specific needs and replace multiple real EV/EVSE with one test solution.
- Address R&D and type-approval applications with automated functional, conformance, interoperability, safety, and quality testing.
- Automate and accelerate conformance testing with pre-programmed test cases.
- Get a holistic view of current and voltage measurements as well as charging communication.

Find out more about SL1040A CDS Series [here](#).

Find out more about SL1047A CDS – High-Power Series [here](#).

Find out more about the SL2600A Megawatt CDS [here](#).

Meet the SL1550A EV - EVSE Charging Communication Interface Tester

Perform component-level testing for EV/EVSE communication controllers

The Keysight EV - EVSE Charging Communication Interface Tester (Com Tester) is a fully integrated test adapter for EVCC or SECC allowing equipment emulation or test case execution to test charging communication and protocols.



Figure 4. SL1550A EV - EVSE Charging Communication Interface Tester

With the Com Tester, you can perform component-level testing for development tests, type approval tests, manufacturing tests (end-of-line), and hardware-in-the-loop tests.

Find out more about the SL1550A Com Tester [here](#).