SL1550A EV - EVSE Charging Communication Interface Tester

Perform component-level testing for EV and EVSE communication controllers

KEYSIGHT

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 electric vehicle communication controllers (EVCC) or supply equipment communication controllers (SECC) according to the Combined Charging System (CCS). The Com Tester supports the following modes depending on the chosen software options:

- AC Mode 3 with or without digital communication via Homeplug GreenPHY PLC (ISO 15118) or
- DC Mode 4 with digital communication via Homeplug GreenPHY PLC (DIN 70121 or ISO 15118)

The Com Tester is tailored towards charging communication and protocol testing purposes enabling EVCC and SECC emulation or test case execution for good case or error case test campaigns (e.g. conformance tests). It provides a Homeplug GreenPHY MAC/PHY according to DIN SPEC 70121:2014 and ISO/IS 15118-3:2015 as well as control pilot (CP) circuitry according to IEC 61851-1:2017 Ed 3. Accordingly, it provides physical interfaces to connect to a system under test (SUT) via control pilot (CP) lines, proximity pilot (PP) lines, and protective earth (PE).

Use Cases

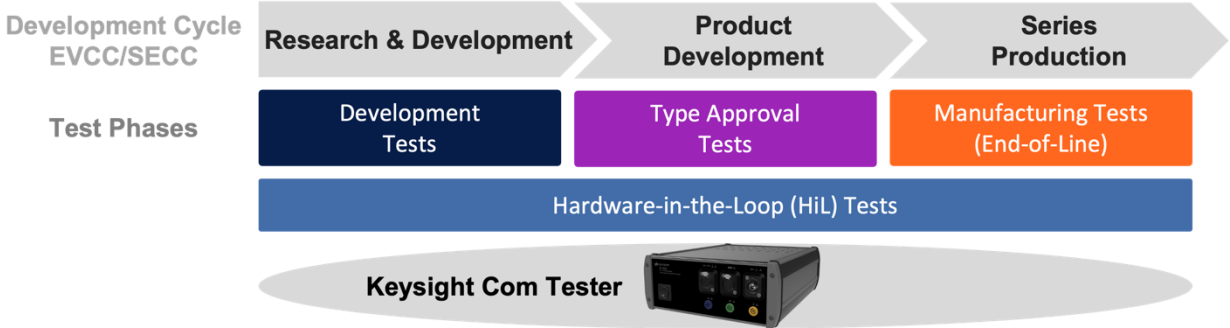Perform the following four main use cases covered by the Keysight Com Tester:

Figure 1. The development cycle of EVCC and SECC and the corresponding test phases

Use case 1: Development testing for EVCC or SECC

Emulate an SECC and run tests against a SUT of type EVCC with the Com Tester.

In combination with the Smart Charging Emulation Software (SCE), the test scope is tailored towards individual and configurable test sequences tailored towards the development stage. In many cases, the focus is on functional tests where a good case emulation run of an SECC / EVCC is required to stimulate the EVCC / SECC under test for development-driven validation purposes.

Figure 2. Development tests of EVCC with Com Tester and Smart Charging Emulation Software (SCE)

Figure 3. Development tests of SECC with Com Tester and SCE

Use case 2: Type approval testing for EVCC or SECC

Perform type approval tests of the EVCC or SECC with the Com Tester. In this particular use case, the EVCC or SECC under test is validated against the complete set of test cases with reference to the corresponding conformance test case specifications (e.g. DIN 70122, ISO 15118-4/-5, etc.). This setup is applicable for vendors preparing type approval tests for their customers or for certification bodies.
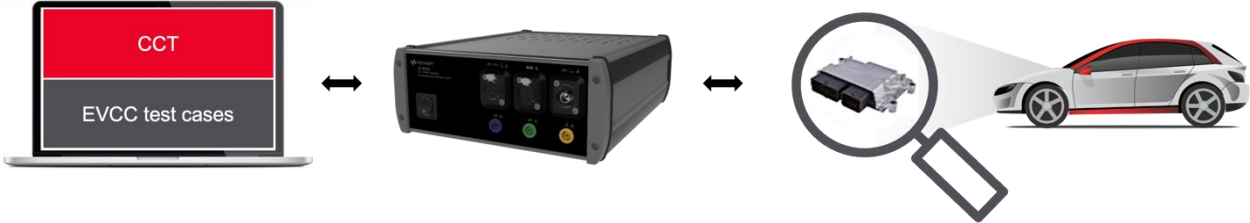

Figure 4. Type approval tests of EVCC with Com Tester and Charging Communication Conformance Test Software (CCT)

Figure 5. Type approval tests of SECC with Com Tester and CCT

Use case 3: Manufacturing testing for EVCC or SECC

Perform manufacturing tests of an EVCC / SECC component with the Com Tester. In this test stage, particular scenario-driven tests for End-of-Line (EoL) tests are performed to validate whether the component satisfies the specifications and characteristics according to the type approval sheet. This use case is most relevant for manufacturing companies of an EVCC or SECC for validating signaling and the general functionality of the EVCC / SECC under test.

Figure 6. End-of-Line tests of EVCC with Com Tester and SCE

Figure 7. EoL tests of SECC with Com Tester and SCE

Use case 4: Hardware-in-the-Loop (HiL) testing

An advanced testing scenario is HiL testing, where the Com Tester is embedded into a larger test environment composed of the EVCC / SECC under test in combination with other test components that either automate the charging test environment through an external test control interface or stimulate the SUT to enlarge the scope of the component test towards integration tests in a fully automated test environment.
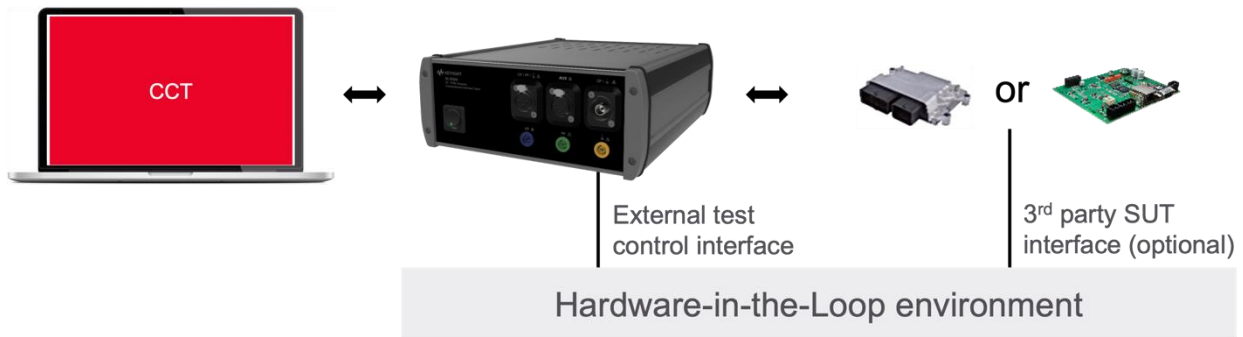

Figure 8. HiL tests of EVCC or SECC with Com Tester and CCT
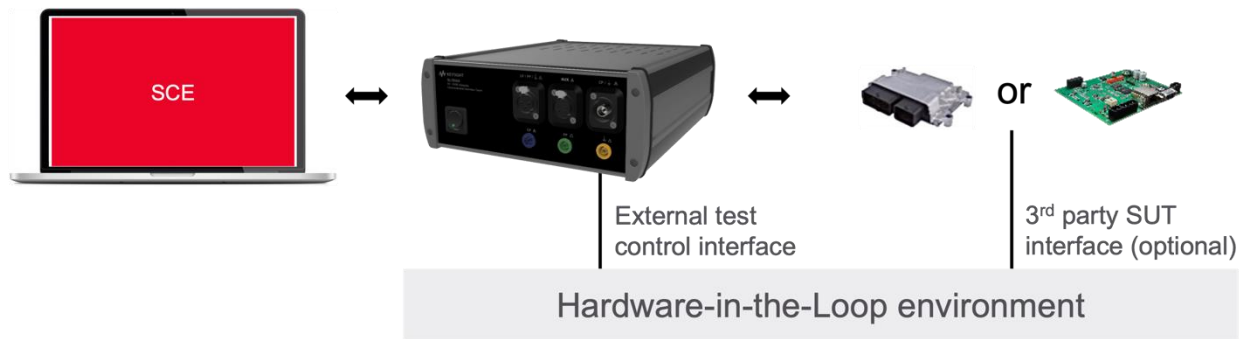

Figure 9. HiL tests of EVCC or SECC with Com Tester and SCE

Feature Overview

- CP and PP according to IEC 61851-1:2017 Ed. 3
  - Optimized for testing purposes
    - Autoplug feature: (Dis-)Connect CP/PP without physical (dis-)connect
    - Supports parameterization of CP state / frequency / duty cycle / voltage with valid and invalid ranges (fault injection)
    - Supports parameterization of PP with valid and invalid ranges (fault injection)
    - Supports parameterization of capacitance for PLC frontend, EV/EVSE-CP circuitry, and cable capacitance
    - Supports parameterization of the diode in CP-path for EV-mode (e.g. short circuit, change of voltage drop)
- Validate charging communication
  - Homeplug GreenPHY 1.1.1 PLC modem based on QCA 7005
    - Keysight custom design
    - Calibrated PSD for HomePlug GreenPHY PLC signal at CP output
    - Aligned with MAC/PHY specification of
      - DIN SPEC 70121:2014
      - ISO/IS 15118-3:2015
  - Supported charging modes according to IEC 61851-1:2017 Ed. 3
    - For emulation of charging communication (see software options)
      - AC Mode 3 without digital communication (basic charging)
      - AC Mode 3 with digital communication (ISO 15118-3/-2/-20)
      - DC Mode 4 without digital communication (DIN 70121)
      - DC Mode 4 with digital communication (ISO 15118-3/-2-20)
    - For conformance testing charging communication (see software options)
      - AC Mode 3 with digital communication (ISO 15118-5/-4)
      - DC Mode 4 with digital communication (DIN 70122 and CharIN test cases for DIN 70121)
      - DC Mode 4 with digital communication (ISO 15118-5/-4)
- Compatible with Keysight SL156XA EV - EVSE Charging Test Robot Series
  - Automate RFID swiping and push button interaction (physical buttons or touch-based UI)
  - Up to five actuators are supported
- Operating modes (depends on software options)
  - External mode (remote control via host PC)
  - Standalone mode
- Robust metal casing with rubber feet
- Firmware/software update via a web interface

Front/rear panel and interfaces

The Com Tester supports multiple connectors to connect a SUT. The front panel provides three 4 mm female banana-plugs for CP, PP, and PE besides a BNC plug for additional measurement of the CP signal. In addition, an XLR based 3-pin plug combines all signal connections into one cable. Furthermore, the interface of SL156XA EV - EVSE Charging Test Robot Series can be used to connect automatic (RFID) card swipers or automatic push button actuators.

Figure 10. SL1550A Com Tester front panel

Figure 11. SL1550A Com Tester back panel

The rear panel hosts the 12 V DC power input socket, next to the Ethernet and USB interfaces, as well as a 17-pin socket with multiple predefined I/Os and auxiliary I/Os. The Ethernet connection is used to connect a host PC. The USB interface is reserved for future purposes.

Technical data SL1550A

System characteristics

System designation	EV - EVSE Charging Communication Interface Tester
Model number	SL1550A
Dimension (H x W x D)	100 x 251 x 305 mm
Weight	approx. 3.3 kg
Central mains supply	
Power supply	90 to 264 V AC to 12 V DC, 5 A, 60 Watt
Power socket	3-Pin XLR-male socket connector
Interfaces	
SUT interfaces	• 4 mm female banana-plugs for CP, PP, and PE • 3-Pin XLR-female connector for CP/PP/PE • BNC socket (CP, PE) • May be used as a SUT interface or for measurement instruments like digital oscilloscopes
Interface to workstation	1000 Mbps Ethernet, RJ45

Peripheral interfaces	• 5-Pin XLR-female EV – EVSE Charging Test Robot Series connector
	Concatenate up to 5 robotic actuators:
	  ◦ EV – EVSE Charging Test Robot – HMI Actuator
	  ◦ EVSE Charging Test Robot – CARD Swiper
	• CAN2.0B-Interface
	• Industrial-grade USB 2.0 Type A

I/O interface characteristics	Input • Max. input voltage range 0 V to 12 V • Protected against electrostatic discharge Output • Open-Drain-circuit (switching to GND) • No PullUp-resistor • Current should not exceed 1 A per channel • Protected against electrostatic discharge

Test system interfaces	• Industrial-grade RJ-45 Ethernet socket (100Base-TX)
	  ◦ Ethernet-to-PLC Bridge
	  ◦ Ethernet-to-PWM (Control Pilot)

Compliance	CE compliance according to: • EN 61000-6-1 / 10.2007 • EN 61000-6-3 / 09.2011

Included in the scope of delivery

- Power supply including power cable
- 3 m Ethernet cable (Ethercon to RJ45)
- Operating instructions

Keysight software options

- TTCN-3 Charging Communication Test Automation Software (CCT)
- EV - EVSE Smart Charging Emulation Software (SCE)

Keysight hardware options

Option class	Description
CCS Communication Adapter - Com XLR Cable [SL1550A-001]	3-Pin XLR male to 3-Pin XLR female, 3 m
CCS Communication Adapter - EV Plug Type 1 [SL1550A-201]	3-Pin XLR male to AC Type 1 female EV Plug
CCS Communication Adapter - EV Plug Type 2 [SL1550A-202]	3-Pin XLR male to AC Type 2 female EV Plug
CCS Communication Adapter - EVSE Plug Type 2 [SL1550A-301]	3-Pin XLR male to AC Type 2 male EVSE Plug

Contact us to learn more about how to perform component-level testing for EV and EVSE communication controllers with Keysight's hardware and software solutions.

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