

# INTEROPERABILITY TEST PLAN

Version 2.0



JULY 2025



## Document Overview and Disclaimer

The Testing Task Force of the ChargeX Consortium developed version 2.0 of the EV-EVSE Interoperability Test Plan (EEITP). The task force consisted of researchers from Argonne National Laboratory (ANL), Idaho National Laboratory (INL), and the National Renewable Energy Laboratory (NREL).

The objective of this document was to establish a standardized procedure for testing the interoperability between Electric Vehicles (EVs) and Electric Vehicle Supply Equipment (EVSEs), based on applicable standards such as ISO, SAE, OCPP, and other relevant protocols.

This plan was the result of a collaborative effort informed by the extensive experience of laboratory researchers, industry stakeholders, and continuous input from EV and EVSE original equipment manufacturers (OEMs), testing professionals and consultants.

The EEITP was conceived as a living document, intended to be updated periodically as new field data and practical experience related to EV-EVSE interoperability become available. Future revisions will be carried out through various initiatives and working groups dedicated to globally advancing EV-EVSE interoperability.

It should be noted that the ChargeX Consortium does not assume responsibility for the technical correctness, feasibility, or performance outcomes of the interoperability tests described herein. This plan is intended to serve as a reference framework for test entities and should be used with appropriate engineering discretion. The standards cited in this document provided the foundational basis for the test procedures.

Stakeholders are encouraged to submit feedback, propose changes, and suggest new test cases that may contribute to the evolution of a more comprehensive and robust version of the EEITP. This document will be published as a formal outcome of the ChargeX Consortium's efforts to support standardized EV-EVSE interoperability testing.

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## Test Table Template

<b>Test Case:</b>			
<b>Test Identifier:</b>			
<b>Test Name:</b>			
<b>Test Type:</b>			
<b>Test Category:</b>			
<b>Purpose:</b>			
<b>Observed Metrics:</b>			
<b>Intended MRECs/Errors:</b>			
<b>Possible MRECs/Errors:</b>			
<b>Recorded Test Results:</b>			
<b>Pre-Test Conditions:</b>	<b>Pre-condition #1</b>		
	<b>Pre-condition #2</b>		
	<b>Pre-condition #3</b>		
	<b>Pre-condition #4</b>		
	...		
<b>Steps</b>	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	...		
<b>Pass Criteria:</b> <b>(Check box if met)</b>		<b>Met</b>	
	Start Time:		
	End Time:		
	#... EVSE:	<input type="checkbox"/>	
	#2 EVSE:	<input type="checkbox"/>	
	#1 EVSE:	<input type="checkbox"/>	
	#... EV:	<input type="checkbox"/>	
	#2 EV:	<input type="checkbox"/>	
	#1 EV:	<input type="checkbox"/>	
<b>Comments</b>			

## Test Table Template: Multiple Attempts

<b>Test Case:</b>					
<b>Test Identifier:</b>					
<b>Test Name:</b>					
<b>Test Type:</b>					
<b>Test Category:</b>					
<b>Purpose:</b>					
<b>Observed Metrics:</b>					
<b>Intended MRECs/Errors:</b>					
<b>Possible MRECs/Errors:</b>					
<b>Recorded Test Results:</b>					
<b>Pre-Test Conditions:</b>	Pre-condition #1				
	Pre-condition #2				
	Pre-condition #3				
	Pre-condition #4				
	...				
<b>Steps</b>	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	...				
<b>Pass Criteria:</b> <b>(Check box if met)</b>		Attempt 1	Attempt 2	Attempt 3	Points
	Start Time:				--
	End Time:				--
	#... EVSE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	#2 EVSE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	#1 EVSE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	#... EV:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	#2 EV:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	#1 EV:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Comments</b>					

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<b>Test Name</b>	<b>"FreeVend" or "No authorization/authentication"</b>													
<b>Test Identifier</b>	ITP-01-01-001													
<b>Test Type</b>	Authentication Types, Methods & Timeouts													
<b>Test Category</b>	Baseline Functionality & Safety Tests													
<b>Test Purpose</b>	To ensure "FreeVend" mode allows for charge discovery to begin													
<b>Observed Metrics</b>	Visual confirmation of charge sequence													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Authentication Type/s</b></td> <td>FreeVendMode</td> </tr> <tr> <td><b>Plug or Authenticate first</b></td> <td>Plug</td> </tr> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;75%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> </table>		<b>Authentication Type/s</b>	FreeVendMode	<b>Plug or Authenticate first</b>	Plug	<b>EV Initial SoC</b>	<75%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE
<b>Authentication Type/s</b>	FreeVendMode													
<b>Plug or Authenticate first</b>	Plug													
<b>EV Initial SoC</b>	<75%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to 'Authentication Type'.</li> <li>2. Plug in EV to start charge.</li> <li>3. Observe charge discovery.</li> <li>4. Terminate charge session 30-60 seconds into the power transfer.</li> <li>5. Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated.</li> </ul> <input type="checkbox"/>													
<b>Comments</b>														

<b>Test Name</b>	<b>Authentication after Plug-in [Multiple enumerations]</b>	
<b>Test Identifier</b>	ITP-01-01-002	
<b>Test Type</b>	Authentication Types, Methods & Timeouts	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure "plug-first" option is available, and that alternative methods of authentication are accepted	
<b>Observed Metrics</b>	Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Authentication Type/s</b> CC Insert, CC Tap, RFID, App <b>Plug or Authenticate first</b> Plug <b>EV Initial SoC</b> <75% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20 <b>Involved System/s</b> EV, EVSE	
<b>Steps</b>	1. Set EVSE authentication option to 'Authentication Type'. 2. Plug-in EV. 3. Within 30 seconds, provide 'Authentication Type'. 4. Observe charge discovery into power transfer. 5. Terminate charge session 30-60 seconds into power transfer. 6. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	<b>Authentication before Plug-in [Multiple enumerations]</b>	
<b>Test Identifier</b>	ITP-01-01-003	
<b>Test Type</b>	Authentication Types, Methods & Timeouts	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure "authenticate-first" option is available, and that alternative methods of authentication are accepted	
<b>Observed Metrics</b>	Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Authentication Type/s</b> CC Insert, CC Tap, RFID, App <b>Plug or Authenticate first</b> Authenticate <b>EV Initial SoC</b> <75% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20 <b>Involved System/s</b> EV, EVSE	
<b>Steps</b>	1. Set EVSE authentication option to 'Authentication Type'. 2. Provide 'Authentication Type'. 3. Within 60 seconds, plug-in EV. 4. Observe charge discovery. 5. Terminate charge session 30-60 seconds into power transfer. 5. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

Test Name	Timeout after Plug-in [Multiple enumerations]	
Test Identifier	ITP-01-01-004	
Test Type	Authentication Types, Methods & Timeouts	
Test Category	Baseline Functionality & Safety Tests	
Test Purpose	To test system for timeout time after "plug-first" method	
Observed Metrics	Timeout time, Visual confirmation of charge sequence	
Intended MRECs/Errors	"AuthorizationTimeout"	
Other Possible MRECs	--	
Test Conditions	Authentication Type/s	CC Insert, CC Tap, RFID, App
	Plug or Authenticate first	Plug
	EV Initial SoC	<75%
	EV SoC Charge Limit	100%
	HLC Protocol/s	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	Involved System/s	EV, EVSE
Steps	1. Set EVSE authentication option to any 'Authentication Type' other than FreeVend. 2. Plug-in EV. 3. Do not provide 'Authentication Type', wait 10 minutes or until timeout. 4. Log timeout time, Log EV & EVSE instructions for user after timeout. 5. Unplug EV.	
Pass Criteria (Check box if met)	<ul style="list-style-type: none"> <li>• Timeout occurs after 120 seconds.</li> </ul> <input type="checkbox"/>	
Comments		

Test Name	Timeout after Authentication [Multiple enumerations]	
Test Identifier	ITP-01-01-005	
Test Type	Authentication Types, Methods & Timeouts	
Test Category	Baseline Functionality & Safety Tests	
Test Purpose	To test system for timeout time after "authenticate-first" method	
Observed Metrics	Timeout time, Visual confirmation of charge sequence	
Intended MRECs/Errors	"AuthorizationTimeout"	
Other Possible MRECs	--	
Test Conditions	Authentication Type/s	CC Insert, CC Tap, RFID, App
	Plug or Authenticate first	Authenticate
	EV Initial SoC	<75%
	EV SoC Charge Limit	100%
	HLC Protocol/s	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	Involved System/s	EV
Steps	1. Set EVSE authentication option to any 'Authentication Type' other than FreeVend. 2. Provide 'Authentication Type'. 3. Do not plug-in EV, wait 10 minutes or until timeout. 4. Log timeout time, Log EV & EVSE instructions for user after timeout. 5. Unplug EV.	
Pass Criteria (Check box if met)	<ul style="list-style-type: none"> <li>• Timeout occurs after 120 seconds.</li> </ul> <input type="checkbox"/>	
Comments		

Test Name	Timeout after Plug-in, then Authenticate [Multiple enumerations]		
Test Identifier	ITP-01-01-006		
Test Type	Authentication Types, Methods & Timeouts		
Test Category	Baseline Functionality & Safety Tests		
Test Purpose	To test if system will allow authentication & charge discovery after plug-in timeout occurs		
Observed Metrics	Timeout time, Visual confirmation of charge sequence		
Intended MRECs/Errors	"AuthorizationTimeout"		
Other Possible MRECs	--		
Test Conditions	<b>Authentication Type/s</b> CC Insert, CC Tap, RFID, App <b>Plug or Authenticate first</b> Plug <b>EV Initial SoC</b> <75% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20 <b>Involved System/s</b> EV, EVSE		
Steps			
Pass Criteria (Check box if met)	<ul style="list-style-type: none"> <li>• Timeout occurs, should not enter charge discovery after authentication.</li> </ul> <input type="checkbox"/>		
Comments			

Test Name	Timeout after Authentication, then Plug-in [Multiple enumerations]	
Test Identifier	ITP-01-01-007	
Test Type	Authentication Types, Methods & Timeouts	
Test Category	Baseline Functionality & Safety Tests	
Test Purpose	To test if EVSE will allow plug-in & charge discovery after authentication timeout occurs	
Observed Metrics	Timeout time, Visual confirmation of charge sequence	
Intended MRECs/Errors	"AuthorizationTimeout"	
Other Possible MRECs	--	
Test Conditions	Authentication Type/s	CC Insert, CC Tap, RFID, App
	Plug or Authenticate first	Authenticate
	EV Initial SoC	<75%
	EV SoC Charge Limit	100%
	HLC Protocol/s	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	Involved System/s	EV, EVSE
Steps	1. Set EVSE authentication option to any 'Authentication Type' other than FreeVend. 2. Provide 'Authentication Type' payment. 3. Do not plug-in EV, wait 10 minutes or until timeout. 4. After timeout, plug-in EV. 5. Log EV & EVSE state, Log EV & EVSE instructions for the user. 6. If applicable, Terminate charge session 30-60 seconds into power transfer. 7. Unplug EV.	
Pass Criteria (Check box if met)	<ul style="list-style-type: none"> <li>• Timeout occurs, should not enter charge discovery after plug-in.</li> </ul> <input type="checkbox"/>	
Comments		

<b>Test Name</b>	Plug & Charge (PnC) Charge Start	
<b>Test Identifier</b>	ITP-01-01-008	
<b>Test Type</b>	Authentication Types, Methods & Timeouts	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure basic "Plug & Charge" functionality allows for charge discovery to begin	
<b>Observed Metrics</b>	Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	Invalid certificates, HLC not supported	
<b>Test Conditions</b>	<b>Authentication Type/s</b> Plug or Authenticate first <b>EV Initial SoC</b> <b>EV SoC Charge Limit</b> <b>HLC Protocol/s</b> <b>Involved System/s</b>	PnC Plug <75% 100% ISO 15118-2, ISO 15118-20, J3400-1 EV, EVSE
<b>Steps</b>		1. Set EVSE authentication option to 'Authentication Type'. 2. Plug-in EV to start charge. 3. Observe charge discovery. 4. Terminate charge session 30-60 seconds into power transfer. 5. Unplug EV.
<b>Pass Criteria (Check box if met)</b>		<ul style="list-style-type: none"> <li>Charge discovery is initiated, session enters into power transfer.</li> </ul> <input type="checkbox"/>
<b>Comments</b>		

<b>Test Name</b>	HLC Priority Selection (EV preferring DIN from EVSE) [Multiple enumerations]															
<b>Test Identifier</b>	ITP-01-01-009															
<b>Test Type</b>	Authentication Types, Methods & Timeouts															
<b>Test Category</b>	Baseline Functionality & Safety Tests															
<b>Test Purpose</b>	To ensure HLC priority selection chooses DIN when EV prefers it, with changing EVSE HLC priority															
<b>Observed Metrics</b>	HLC Messages, Visual confirmation of charge sequence															
<b>Intended MRECs/Errors</b>	--															
<b>Other Possible MRECs</b>	HLC Not Supported															
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Plug or Authenticate first</b></td> <td>Plug</td> </tr> <tr> <td><b>EVSE HLC Priority</b></td> <td>Test 1: ISO 15118-2 &gt; DIN SPEC 70121 Test 2: ISO 15118-2 &lt; DIN SPEC 70121</td> </tr> <tr> <td><b>EV HLC Priority</b></td> <td>DIN SPEC 70121 &lt; ISO 15118-2</td> </tr> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;75%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-2</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> </table>		<b>Plug or Authenticate first</b>	Plug	<b>EVSE HLC Priority</b>	Test 1: ISO 15118-2 > DIN SPEC 70121 Test 2: ISO 15118-2 < DIN SPEC 70121	<b>EV HLC Priority</b>	DIN SPEC 70121 < ISO 15118-2	<b>EV Initial SoC</b>	<75%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2	<b>Involved System/s</b>	EV, EVSE
<b>Plug or Authenticate first</b>	Plug															
<b>EVSE HLC Priority</b>	Test 1: ISO 15118-2 > DIN SPEC 70121 Test 2: ISO 15118-2 < DIN SPEC 70121															
<b>EV HLC Priority</b>	DIN SPEC 70121 < ISO 15118-2															
<b>EV Initial SoC</b>	<75%															
<b>EV SoC Charge Limit</b>	100%															
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2															
<b>Involved System/s</b>	EV, EVSE															
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to Any.</li> <li>2. Set EVSE HLC Priority to 'EVSE HLC Priority'.</li> <li>3. Set EV HLC Priority to 'EV HLC Priority'.</li> <li>4. Plug-in EV to start charge.</li> <li>5. Observe charge discovery.</li> <li>6. Terminate charge session 30-60 seconds into power transfer.</li> <li>7. Unplug EV.</li> </ol>															
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated utilizing DIN HLC protocol.</li> </ul> <input type="checkbox"/>															
<b>Comments</b>																

<b>Test Name</b>	HLC Priority Selection (EV preferring ISO-2 from EVSE) [Multiple enumerations]															
<b>Test Identifier</b>	ITP-01-01-010															
<b>Test Type</b>	Authentication Types, Methods & Timeouts															
<b>Test Category</b>	Baseline Functionality & Safety Tests															
<b>Test Purpose</b>	To ensure HLC priority selection chooses ISO when EV prefers it, with changing EVSE HLC priority															
<b>Observed Metrics</b>	HLC Messages, Visual confirmation of charge sequence															
<b>Intended MRECs/Errors</b>	--															
<b>Other Possible MRECs</b>	HLC Not Supported															
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Plug or Authenticate first</b></td> <td>Plug</td> </tr> <tr> <td><b>EVSE HLC Priority</b></td> <td>Test 1: ISO 15118-2 &gt; DIN SPEC 70121 Test 2: ISO 15118-2 &lt; DIN SPEC 70121</td> </tr> <tr> <td><b>EV HLC Priority</b></td> <td>DIN SPEC 70121 &gt; ISO 15118-2</td> </tr> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;75%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-2</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> </table>		<b>Plug or Authenticate first</b>	Plug	<b>EVSE HLC Priority</b>	Test 1: ISO 15118-2 > DIN SPEC 70121 Test 2: ISO 15118-2 < DIN SPEC 70121	<b>EV HLC Priority</b>	DIN SPEC 70121 > ISO 15118-2	<b>EV Initial SoC</b>	<75%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2	<b>Involved System/s</b>	EV, EVSE
<b>Plug or Authenticate first</b>	Plug															
<b>EVSE HLC Priority</b>	Test 1: ISO 15118-2 > DIN SPEC 70121 Test 2: ISO 15118-2 < DIN SPEC 70121															
<b>EV HLC Priority</b>	DIN SPEC 70121 > ISO 15118-2															
<b>EV Initial SoC</b>	<75%															
<b>EV SoC Charge Limit</b>	100%															
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2															
<b>Involved System/s</b>	EV, EVSE															
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to Any.</li> <li>2. Set EVSE HLC Priority to 'EVSE HLC Priority'.</li> <li>3. Set EV HLC Priority to 'EV HLC Priority'.</li> <li>4. Plug-in EV to start charge.</li> <li>5. Observe charge discovery.</li> <li>6. Terminate charge session 30-60 seconds into power transfer.</li> <li>7. Unplug EV.</li> </ol>															
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated utilizing ISO-2 HLC protocol.</li> </ul> <input type="checkbox"/>															
<b>Comments</b>																

<b>Test Name</b>	HLC Priority Selection (EV forcing ISO-2 from EVSE) [Multiple enumerations]															
<b>Test Identifier</b>	ITP-01-01-011															
<b>Test Type</b>	Authentication Types, Methods & Timeouts															
<b>Test Category</b>	Baseline Functionality & Safety Tests															
<b>Test Purpose</b>	To ensure HLC priority selection chooses ISO when EV only offers it, with changing EVSE HLC priority. Should fail if EVSE doesn't offer ISO.															
<b>Observed Metrics</b>	HLC Messages, Visual confirmation of charge sequence															
<b>Intended MRECs/Errors</b>	--															
<b>Other Possible MRECs</b>	HLC Not Supported															
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Plug or Authenticate first</b></td> <td>Plug</td> </tr> <tr> <td><b>EVSE HLC Priority</b></td> <td>Test 1: ISO 15118-2 &gt; DIN SPEC 70121 Test 2: ISO 15118-2 &lt; DIN SPEC 70121</td> </tr> <tr> <td><b>EV HLC Priority</b></td> <td>ISO 15118-2</td> </tr> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;75%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-2</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> </table>		<b>Plug or Authenticate first</b>	Plug	<b>EVSE HLC Priority</b>	Test 1: ISO 15118-2 > DIN SPEC 70121 Test 2: ISO 15118-2 < DIN SPEC 70121	<b>EV HLC Priority</b>	ISO 15118-2	<b>EV Initial SoC</b>	<75%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2	<b>Involved System/s</b>	EV, EVSE
<b>Plug or Authenticate first</b>	Plug															
<b>EVSE HLC Priority</b>	Test 1: ISO 15118-2 > DIN SPEC 70121 Test 2: ISO 15118-2 < DIN SPEC 70121															
<b>EV HLC Priority</b>	ISO 15118-2															
<b>EV Initial SoC</b>	<75%															
<b>EV SoC Charge Limit</b>	100%															
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2															
<b>Involved System/s</b>	EV, EVSE															
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to Any.</li> <li>2. Set EVSE HLC Priority to 'EVSE HLC Priority'.</li> <li>3. Set EV HLC Priority to 'EV HLC Priority'.</li> <li>4. Plug-in EV to start charge.</li> <li>5. Observe charge discovery.</li> <li>6. Terminate charge session 30-60 seconds into power transfer.</li> <li>7. Unplug EV.</li> </ol>															
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated utilizing ISO-2 HLC protocol.</li> </ul> <input type="checkbox"/>															
<b>Comments</b>																

<b>Test Name</b>	HLC Priority Selection (EV forcing ISO-2 from EVSE, EVSE ISO-2 not supported)	
<b>Test Identifier</b>	ITP-01-01-012	
<b>Test Type</b>	Authentication Types, Methods & Timeouts	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure when HLC communication mismatch occurs, system responds accordingly.	
<b>Observed Metrics</b>	HLC Messages, Error Messages, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	HLC Not Supported	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Plug or Authenticate first</b>	Plug
	<b>EVSE HLC Priority</b>	Test 1: DIN SPEC 70121 Test 2: ISO 15118-2
	<b>EV HLC Priority</b>	ISO 15118-2
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Set EVSE HLC Priority to 'EVSE HLC Priority'. 3. Set EV HLC Priority to 'EV HLC Priority'. 4. Plug-in EV to start charge. 5. Observe charge discovery. 6. Terminate charge session 30-60 seconds into power transfer. 7. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is not initiated, protocol is not supported.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	<b>HLC Priority Selection (EV forcing DIN from EVSE, EVSE DIN not supported)</b>	
<b>Test Identifier</b>	ITP-01-01-013	
<b>Test Type</b>	Authentication Types, Methods & Timeouts	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure when HLC communication mismatch occurs, system responds accordingly.	
<b>Observed Metrics</b>	HLC Messages, Error Messages, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	HLC Not Supported	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Plug or Authenticate first</b>	Plug
	<b>EVSE HLC Priority</b>	Test 1: DIN SPEC 70121 Test 2: ISO 15118-2
	<b>EV HLC Priority</b>	DIN SPEC 70121
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Set EVSE HLC Priority to 'EVSE HLC Priority'. 3. Set EV HLC Priority to 'EV HLC Priority'. 4. Plug-in EV to start charge. 5. Observe charge discovery. 6. Terminate charge session 30-60 seconds into power transfer. 7. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	• Charge discovery is not initiated, protocol is not supported. <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	HLC Priority Selection (EV preferring ISO-20 from EVSE) [Multiple enumerations]															
<b>Test Identifier</b>	ITP-01-01-014															
<b>Test Type</b>	Authentication Types, Methods & Timeouts															
<b>Test Category</b>	Baseline Functionality & Safety Tests															
<b>Test Purpose</b>	To ensure HLC priority selection chooses ISO when EV prefers it, with changing EVSE HLC priority															
<b>Observed Metrics</b>	HLC Messages, Visual confirmation of charge sequence															
<b>Intended MRECs/Errors</b>	--															
<b>Other Possible MRECs</b>	HLC Not Supported															
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Plug or Authenticate first</b></td> <td>Plug</td> </tr> <tr> <td><b>EVSE HLC Priority</b></td> <td>Test 1: ISO 15118-20 &gt; DIN SPEC 70121 Test 2: ISO 15118-20 &lt; DIN SPEC 70121</td> </tr> <tr> <td><b>EV HLC Priority</b></td> <td>ISO 15118-20 &gt; DIN SPEC 70121</td> </tr> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;75%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> </table>		<b>Plug or Authenticate first</b>	Plug	<b>EVSE HLC Priority</b>	Test 1: ISO 15118-20 > DIN SPEC 70121 Test 2: ISO 15118-20 < DIN SPEC 70121	<b>EV HLC Priority</b>	ISO 15118-20 > DIN SPEC 70121	<b>EV Initial SoC</b>	<75%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE
<b>Plug or Authenticate first</b>	Plug															
<b>EVSE HLC Priority</b>	Test 1: ISO 15118-20 > DIN SPEC 70121 Test 2: ISO 15118-20 < DIN SPEC 70121															
<b>EV HLC Priority</b>	ISO 15118-20 > DIN SPEC 70121															
<b>EV Initial SoC</b>	<75%															
<b>EV SoC Charge Limit</b>	100%															
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-20															
<b>Involved System/s</b>	EV, EVSE															
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to Any.</li> <li>2. Set EVSE HLC Priority to 'EVSE HLC Priority'.</li> <li>3. Set EV HLC Priority to 'EV HLC Priority'.</li> <li>4. Plug-in EV to start charge.</li> <li>5. Observe charge discovery.</li> <li>6. Terminate charge session 30-60 seconds into power transfer.</li> <li>7. Unplug EV.</li> </ol>															
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated utilizing ISO HLC protocol.</li> </ul> <input type="checkbox"/>															
<b>Comments</b>																

<b>Test Name</b>	HLC Priority Selection (EV forcing ISO-20 from EVSE) [Multiple enumerations]															
<b>Test Identifier</b>	ITP-01-01-015															
<b>Test Type</b>	Authentication Types, Methods & Timeouts															
<b>Test Category</b>	Baseline Functionality & Safety Tests															
<b>Test Purpose</b>	To ensure HLC priority selection chooses ISO when EV only offers it, with changing EVSE HLC priority. Should fail if EVSE doesn't offer ISO.															
<b>Observed Metrics</b>	HLC Messages, Visual confirmation of charge sequence															
<b>Intended MRECs/Errors</b>	--															
<b>Other Possible MRECs</b>	HLC Not Supported															
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Plug or Authenticate first</b></td> <td>Plug</td> </tr> <tr> <td><b>EVSE HLC Priority</b></td> <td>Test 1: ISO 15118-20 &gt; DIN SPEC 70121 Test 2: ISO 15118-20 &lt; DIN SPEC 70121</td> </tr> <tr> <td><b>EV HLC Priority</b></td> <td>ISO 15118-20</td> </tr> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;75%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> </table>		<b>Plug or Authenticate first</b>	Plug	<b>EVSE HLC Priority</b>	Test 1: ISO 15118-20 > DIN SPEC 70121 Test 2: ISO 15118-20 < DIN SPEC 70121	<b>EV HLC Priority</b>	ISO 15118-20	<b>EV Initial SoC</b>	<75%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE
<b>Plug or Authenticate first</b>	Plug															
<b>EVSE HLC Priority</b>	Test 1: ISO 15118-20 > DIN SPEC 70121 Test 2: ISO 15118-20 < DIN SPEC 70121															
<b>EV HLC Priority</b>	ISO 15118-20															
<b>EV Initial SoC</b>	<75%															
<b>EV SoC Charge Limit</b>	100%															
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-20															
<b>Involved System/s</b>	EV, EVSE															
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to Any.</li> <li>2. Set EVSE HLC Priority to 'EVSE HLC Priority'.</li> <li>3. Set EV HLC Priority to 'EV HLC Priority'.</li> <li>4. Plug-in EV to start charge.</li> <li>5. Observe charge discovery.</li> <li>6. Terminate charge session 30-60 seconds into power transfer.</li> <li>7. Unplug EV.</li> </ol>															
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is initiated utilizing ISO HLC protocol.</li> </ul> <input type="checkbox"/>															
<b>Comments</b>																

<b>Test Name</b>	HLC Priority Selection (EV forcing ISO-20 from EVSE, EVSE ISO-20 not supported)	
<b>Test Identifier</b>	ITP-01-01-016	
<b>Test Type</b>	Authentication Types, Methods & Timeouts	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure when HLC communication mismatch occurs, system responds accordingly.	
<b>Observed Metrics</b>	HLC Messages, Error Messages, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	HLC Not Supported	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Plug or Authenticate first</b>	Plug
	<b>EVSE HLC Priority</b>	ISO 15118-2 or DIN SPEC 70121
	<b>EV HLC Priority</b>	ISO 15118-20
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Set EVSE HLC Priority to 'EVSE HLC Priority'. 3. Set EV HLC Priority to 'EV HLC Priority'. 4. Plug-in EV to start charge. 5. Observe charge discovery. 6. Terminate charge session 30-60 seconds into power transfer. 7. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is not initiated, protocol is not supported.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Emulating a cut cable	
<b>Test Identifier</b>	ITP-01-02-001	
<b>Test Type</b>	Idle Error Faults (EVSE Only)	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure "CutCable" MREC is produced in the event of a cut cable.	
<b>Observed Metrics</b>	Error Messages	
<b>Intended MRECs/Errors</b>	"CutCable"	
<b>Other Possible MRECs</b>	"PilotLoss"	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EVSE
<b>Steps</b>	1. Power Off EVSE; perform Zero-Voltage-Verification and Lock-Out-Tag-Out. 2. Disconnect charging cable (+/-) from EVSE dispenser relay (+/-). 3. Disconnect temperature sensors from EVSE dispenser MCU. 4. Disconnect Pilot signal wire from EVSE dispenser MCU. 5. Remove Lock-Out-Tag-Out, Power ON. 6. Observe EVSE UI and/or backend for reported fault.	
<b>Pass Criteria (Check box if met)</b>	• MREC is produced and station does not allow for any charge sessions until remediated.	
<b>Comments</b>		

<b>Test Name</b>	Emulating a lost Pilot signal	
<b>Test Identifier</b>	ITP-01-02-002	
<b>Test Type</b>	Idle Error Faults (EVSE Only)	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure "PilotFault" MREC is produced in the event of a lost pilot signal.	
<b>Observed Metrics</b>	Error Messages	
<b>Intended MRECs/Errors</b>	"PilotFault"	
<b>Other Possible MRECs</b>	"CutCable", "PilotLoss", "PreChargeFailure", "ResistanceFault"	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EVSE
<b>Steps</b>	1. Power Off EVSE; perform Zero-Voltage-Verification and Lock-Out-Tag-Out. 2. Disconnect Pilot signal wire from EVSE dispenser MCU. 3. Remove Lock-Out-Tag-Out, Power ON. 4. Observe EVSE UI and/or backend for reported fault.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• MREC is produced and station does not allow for any charge sessions until remediated.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Emulating a loss of internet	
<b>Test Identifier</b>	ITP-01-02-003	
<b>Test Type</b>	Idle Error Faults (EVSE Only)	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure "NoInternet" fault is produced in the event of a lost internet connection.	
<b>Observed Metrics</b>	Error Messages	
<b>Intended MRECs/Errors</b>	"NoInternet"	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EVSE
<b>Steps</b>	1. Power Off EVSE; perform Zero-Voltage-Verification and Lock-Out-Tag-Out. 2. Disconnect WiFi router. 3. Disconnect Ethernet connection from EVSE dispenser MCU. 4. Remove LTE chip/connection point from EVSE dispenser MCU. 5. Remove Lock-Out-Tag-Out, Power ON. 6. Observe EVSE UI and/or backend for reported fault.	
<b>Pass Criteria (Check box if met)</b>	• MREC is produced and station does not allow for any charge sessions until remediated.	
<b>Comments</b>		

<b>Test Name</b>	Emulating a broken latch	
<b>Test Identifier</b>	ITP-01-02-004	
<b>Test Type</b>	Idle Error Faults (EVSE Only)	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	to ensure "BrokenLatch" MREC is produced in the event of a broken latch present.	
<b>Observed Metrics</b>	Error Messages	
<b>Intended MRECs/Errors</b>	"BrokenLatch"	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EVSE
<b>Steps</b>	1. Power Off EVSE; perform Zero-Voltage-Verification and Lock-Out-Tag-Out. 2. Disconnect/break off Latch. Or remove cable and replace with test cable that has broken Latch. 3. Remove Lock-Out-Tag-Out, Power ON. 4. Observe EVSE UI and/or backend for reported fault.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• MREC is produced and station does not allow for any charge sessions until remediated.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Emulating a complete loss of EVSE power	
<b>Test Identifier</b>	ITP-01-02-005	
<b>Test Type</b>	Idle Error Faults (EVSE Only)	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure "PowerLoss" MREC is produced in the event of a complete loss of power.	
<b>Observed Metrics</b>	Error Messages	
<b>Intended MRECs/Errors</b>	"PowerLoss"	
<b>Other Possible MRECs</b>	Many possible	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EVSE
<b>Steps</b>	1. Simultaneously trip power to all cabinets and dispenser. 2. Observe EVSE backend for reported fault.	
<b>Pass Criteria (Check box if met)</b>	• MREC is produced and station does not allow for any charge sessions until remediated. <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Manual stop methods during SI [Multiple enumerations]	
<b>Test Identifier</b>	ITP-01-03-001	
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure all stop methods are accepted during charge parameter discovery.	
<b>Observed Metrics</b>	Pilot Signal, Error Messages, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	1. -- 2. -- 3. -- 4. -- 5. -- 6. "EmergencyStop" 7. "EmergencyStop" 8. --	
<b>Other Possible MRECs</b>	1. -- 2. -- 3. -- 4. "ConnectorLockFailure" 5. -- 6. "EmergencyStop" 7. "EmergencyStop" 8. --	
<b>Test Conditions</b>	<b>Stop Method/s</b>	1. EVSE UI 2. EV UI 3. EV Inlet Button 4. EVSE Handle S3 switch/button 5. OCPP Remote Stop 6. EVSE Emergency Stop 7. EV Emergency Stop 8. OCPP Hard Reset
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV to start charge. 3. Observe charge discovery. 4. Terminate charge session during each stage of charge discovery using 'Stop Method'. [multiple enumerations for each of possible 8 iterations] 5. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Charge session is ended shortly after stop method is engaged.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	<b>Manual stop during Session Initialization (SI) States [Multiple enumerations]</b>	
<b>Test Identifier</b>	ITP-01-03-002	
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure stop method will end charge session during any stage of charge discovery.	
<b>Observed Metrics</b>	Pilot Signal, Error Messages, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	1. -- 2. -- 3. -- 4. -- 5. -- 6. -- 7. --	
<b>Other Possible MRECs</b>	1. -- 2. -- 3. Payment Failure. 4. -- 5. -- 6. -- 7. --	
<b>Test Conditions</b>	<b>Session Initialization Stop State/s</b>  1. SLAC 2. ServiceDiscovery 3. PaymentDetailRequest 4. ChargeParameterDiscovery 5. CableCheck 6. PreCharge 7. CurrentDemand	<b>EV Initial SoC</b> <75%
	<b>EV SoC Charge Limit</b> 100%	
	<b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1	
	<b>Involved System/s</b> EV, EVSE	
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV to start charge. 3. Observe session initialization. 4. Terminate charge session during 'SI State' using 'Stop Method'. 5. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	• Charge session is ended shortly after stop method is engaged at the desired pilot state.	
<b>Comments</b>		

<b>Test Name</b>	Start charge with different EV modes [Multiple enumerations]	
<b>Test Identifier</b>	ITP-01-03-003	
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure charge discovery is initiated under any EV state.	
<b>Observed Metrics</b>	Pilot Signal, Proximity Signal, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	1. -- 2. -- 3. -- 4. --	
<b>Other Possible MRECs</b>	1.-- 2. "InvalidVehicleMode" 3. "InvalidVehicleMode" 4. "InvalidVehicleMode"	
<b>Test Conditions</b>	<b>EV State/s</b>	1. "PARK" 2. "NEUTRAL" 3. "DRIVE" 4. "REVERSE"
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Set EV to 'EV State'. 3. Plug in EV to start charge. 4. Observe charge discovery. 5. If applicable, terminate charge session 30-60 seconds into power transfer. 6. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery is not initiated under any EV mode, except during "PARK".</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Start charge with partially inserted connector (latch spring engaged)		
<b>Test Identifier</b>	ITP-01-03-004		
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]		
<b>Test Category</b>	Baseline Functionality & Safety Tests		
<b>Test Purpose</b>	To ensure charge discovery does not begin or is halted after recognizing a partially inserted connector.		
<b>Observed Metrics</b>	Pilot Signal, Proximity Signal, Error messages, Visual confirmation of charge sequence		
<b>Intended MRECs/Errors</b>	"ConnectorLockFailure", "PartialInsertion"		
<b>Other Possible MRECs</b>	"BrokenLatch"		
<b>Test Conditions</b>	<b>Plug or Authenticate first</b> Plug <b>EV Initial SoC</b> <75% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20 <b>Involved System/s</b> EV, EVSE		
<b>Steps</b>			
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery does not begin or is halted due to partially inserted connector.</li> </ul> <input type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Start charge with failure to lock	
<b>Test Identifier</b>	ITP-01-03-005	
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure charge discovery does not begin or is halted after recognizing a partially inserted connector.	
<b>Observed Metrics</b>	Pilot Signal, Proximity Signal, Error messages, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	"BrokenLatch"	
<b>Other Possible MRECs</b>	"ConneterLockFailure", "PartialInsertion"	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Power Off EVSE; perform Zero-Voltage-Verification and Lock-Out-Tag-Out. 2. Remove Latch from cable, or replace cable with one where latch is broken. 3. Remove Lock-Out-Tag-Out, Power ON. 4. Observe EVSE UI for fault, if no fault continue. 5. Set EVSE authorization option to Any 6. Plug-in EV (no latch on connector), authorize charge, observe until failure 7. If no failure, Terminate charge session 30-60 seconds into power transfer USING EV or EVSE STOP METHODS, NOT BY REMOVING CABLE 8. Unplug EV	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery does not begin or is halted due to broken latch.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Start charge with disconnected DC+ or DC- cable	
<b>Test Identifier</b>	ITP-01-03-006	
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure SI doesn't move beyond "PreCharge" after recognizes a disconnected DC+ or DC- cable and charge discovery does not begin or is halted.	
<b>Observed Metrics</b>	Pilot Signal, Proximity Signal, Visual confirmation of charge sequence	
<b>Intended MRECs/Errors</b>	"PreChargeFailure"	
<b>Other Possible MRECs</b>	"CableCheckFailure", "CutCable", "PilotLoss", "ResistanceFault"	
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Power Off EVSE; perform Zero-Voltage-Verification and Lock-Out-Tag-Out. 2. Disconnect DC+ charging cable from EVSE dispenser DC+ relay. Secure hanging DC+ cable in safe location. 3. Remove Lock-Out-Tag-Out, Power ON. 4. Observe EVSE UI for fault, if no fault continue. 5. Set EVSE Authorization Type to Any. 6. Plug-in EV, authorize charge, observe until failure. 7. If no failure, Terminate charge session 30-60 seconds into power transfer. 8. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge discovery does not begin or is halted at precharge state due to disconnected DC+ cable.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Press Latch during Session Initialization (SI)	
<b>Test Identifier</b>	ITP-01-03-007	
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To emulate an EV driver pressing connector latch during session initialization. To witness EV and EVSE systems behavior when attempting latch press during SI.	
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response	
<b>Intended MRECs/Errors</b>	"ConnectorLockFailure", "ProximityFailure"	
<b>Other Possible MRECs</b>	"CableCheckFailure", "CutCable", "PilotLoss", "ResistanceFault"	
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE HLC highest priority to Any 'HLC Protocol'. 2. Set EVSE authentication option to Any 'Authentication Type'. 3. Provide 'Authentication Type' Within 30 seconds. 4. Plug-In EV Within 5-10 seconds of plug-in, press connector latch. 5. If session does not fault/end upon latch press, manually terminate charge session during PT. 6. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EVSE Latch cannot be pressed during SI or EVSE visual "Connector Lock" error and session ends.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	<b>Sudden plug disconnection and re-connection during Session Initialization (SI)</b>				
<b>Test Identifier</b>	ITP-01-03-008				
<b>Test Type</b>	Session Initialization (SI) Tests [from Authentication to Power transfer]				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To assess the impact of abrupt plug disconnection and reconnection on the Session Initialization (SI) process.				
<b>Observed Metrics</b>	Error messages				
<b>Intended MRECs/Errors</b>	"ConnetorLockFailure", "BrokenLatch", "PilotFailure"				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE HLC highest priority to Any 'HLC Protocol'. 2. Set EVSE authentication option to Any 'Authentication Type'. 3. Plug in the EV and authorize a charge. 4. Immediately prior to session initialization and plug latching, promptly disconnect and reinsert the plug. 5. Observe the EVSE UI. 6. If charging initiates, stop it after 10 sec.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Need to check <input type="checkbox"/></li> </ul>				
<b>Comments</b>					

<b>Test Name</b>	DRIVE mode during power transfer	
<b>Test Identifier</b>	ITP-01-04-001	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To make sure the power transfer stops when the EV is in the drive mode (D).	
<b>Observed Metrics</b>	Error messages	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	"EmergencyStop"	
<b>Test Conditions</b>	<b>EV State/s</b>	"PARK"
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE HLC highest priority to Any 'HLC Protocol'. 2. Set EVSE authentication option to Any 'Authentication Type'. 3. Plug in the EV and authorize a charge and start power transfer. 4. Try to switch the EV into drive mode (D), release the (hand) brake and then try to start driving. 5. Observe the EV UI and EVSE UI. 6. Terminate the EV charging session.	
<b>Pass Criteria (Check box if met)</b>	• EV cannot move before charging session is stopped and connector is unplugged. <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	DRIVE mode before unplug	
<b>Test Identifier</b>	ITP-01-04-002	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To make sure the EV can't transition to DRIVE mode before charging connector is unplugged.	
<b>Observed Metrics</b>	Error messages	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>EV State/s</b>	"PARK"
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE HLC highest priority to Any 'HLC Protocol'. 2. Set EVSE authentication option to Any 'Authentication Type'. 3. Plug in the EV and authorize a charge and start power transfer. 4. Terminate the EV charging session. 5. Try to switch the EV into drive mode (D), release the (hand) brake and then try to start driving. 6. Observe the EV UI and EVSE UI. 7. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV cannot move before charging session is stopped and connector is unplugged.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	EV in motion during charge session	
<b>Test Identifier</b>	ITP-01-04-003	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To make sure the power transfer stops when the EV is in motion. (Imitate the behavior of EV charging on a slope with brake failure)	
<b>Observed Metrics</b>	Error messages	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	"EmergencyStop"	
<b>Test Conditions</b>	<b>EV State/s</b>	"PARK"
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set the EV on a dynamometer testing rig. 2. Set EVSE HLC highest priority to Any. "HLC Protocol". 3. Set EVSE authentication option to Any 'Authentication Type'. 4. Plug in the EV, authorize a charge and start power transfer. 5. Observe the EV UI and EVSE UI. 6. Terminate the EV charging session if needed.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV charging session is stopped if the EV is in motion.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Automatic Stop Charge during PT [Multiple enumerations]	
<b>Test Identifier</b>	ITP-01-04-004	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure power transfer ends when EV target SoC is reached.	
<b>Observed Metrics</b>	Pilot Signal, Error messages, Battery SoC [%], EV Target SoC [%]	
<b>Intended MRECs/Errors</b>	1. -- 2. --	
<b>Other Possible MRECs</b>	1. -- 2. --	
<b>Test Conditions</b>	<b>Stop Method/s</b>	Target SOC reached
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	1. 100% 2. Initial SOC + 10%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Set EV target SoC to 'EV SoC Charge Limit'. 3. Plug-in EV, authorize charge, observe power transfer. 4. Allow charge session to terminate during power transfer automatically by reaching target SoC. 5. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge session is ended when EV target SoC is reached.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Manual Stop Charge during PT [Multiple enumerations]				
<b>Test Identifier</b>	ITP-01-04-005				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To ensure all stop methods are accepted during power transfer.				
<b>Observed Metrics</b>	Pilot Signal, Error messages				
<b>Intended MRECs/Errors</b>	1. -- 2. -- 3. -- 4. -- 5. -- 6. "EmergencyStop" 7. "EmergencyStop" 8. "EmergencyStop"				
<b>Other Possible MRECs</b>	1. -- 2. -- 3. -- 4. "ConnectorLockFailure" 5. -- 6. "EmergencyStop" 7. "EmergencyStop" 8. "EmergencyStop"				
<b>Test Conditions</b>	<b>Stop Method/s</b>	1. EVSE UI 2. EV UI 3. EV Inlet Button 4. EVSE Handle S3 switch/button 5. OCPP Remote Stop 6. EVSE Emergency Stop 7. EV Emergency Stop 8. OCPP Hard Reset			
	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Terminate charge session 30-60 seconds into power transfer using 'Stop Method'. 4. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Charge session is ended when stop method is engaged.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Start charge with different Temperature soaked EV & EVSE [Multiple enumerations]	
<b>Test Identifier</b>	ITP-01-04-006	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure EV and EVSE charge session can operate under different temperature conditions without extreme power derating.	
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], Battery Temp [°C], Cable Temp [°C], Connector temp [°C]	
<b>Intended MRECs/Errors</b>	1. -- 2. -- 3. --	
<b>Other Possible MRECs</b>	1. -- 2. "HighTemperature" 3. --	
<b>Test Conditions</b>	<b>Temperature</b>	1. "Nominal" (23°C) 2. "Hot" (>40°C) 3. "Cold" (<-7°C)
	<b>EV Initial SoC</b>	<75%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Temperature soak EV and EVSE at 'Temperature' for 4 hours prior to plug-in. 3. Plug-in EV, authorize charge, observe power transfer. 4. Terminate charge session 30-60 seconds into power transfer. 5. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Charge session operates well and without extreme derating under different temperature conditions.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Start charge with different EV State of Charge [Multiple enumerations]	
<b>Test Identifier</b>	ITP-01-04-007	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure charge session operates with EV at different starting SoC. Also to test that charge session does not occur when start SoC = target end SoC.	
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], Battery Temp [°C], Cable Temp [°C], Connector temp [°C]	
<b>Intended MRECs/Errors</b>	1. -- 2. -- 3. --	
<b>Other Possible MRECs</b>	1. -- 2. -- 3. --	
<b>Test Conditions</b>	<b>EV Initial SoC</b>	1. <10% 2. >90% 3. 100%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Charge or discharge EV to 'EV State of Charge'. 3. Plug-in EV, authorize charge, observe power transfer. 4. If applicable, terminate the charge session 30-60 seconds into the power transfer. 5. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV successfully runs charge session at all starting EV SoCs, except when start SoC = target end SoC.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Start charge under nominal EV conditions to naturally achieve full power	
<b>Test Identifier</b>	ITP-01-04-008	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure EVSE can accommodate full power requested by EV under more typical and ideal conditions	
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], Battery Temp [°C], Cable Temp [°C], Connector temp [°C]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Temperature</b>	"Nominal" (23°C)
	<b>Vehicle Conditioning</b>	Predriven
	<b>EV Initial SoC</b>	<10%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Temperature soak EV and EVSE at 'Temperature' for 4 hours before plug-in. 3. Drive EV for 20-40 minutes while GPS targeting a DCFC, then return to EVSE under test. 4. Plug-in EV, authorize charge, observe power transfer. 5. Terminate the charge session 5-10 minutes into the power transfer. 6. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV requests full power, EVSE meets EV power request.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Start charge under nominal EV conditions to naturally achieve full power with all EV auxiliaries ON.	
<b>Test Identifier</b>	ITP-01-04-009	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To observe the impact of EV auxiliaries in operation on maximum charging power.	
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], Battery Temp [°C], Cable Temp [°C], Connector temp [°C]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Temperature</b>	"Nominal" (23°C)
	<b>Vehicle Conditioning</b>	Predriven
	<b>EV Initial SoC</b>	<10%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Temperature soak EV and EVSE at 'Temperature' for 4 hours before plug-in. 3. Drive EV for 20-40 minutes while GPS targeting a DCFC, then return to EVSE under test. 4. Turn ON all the EV auxiliaries. 5. Plug-in EV, authorize charge, observe power transfer. 6. Terminate the charge session 5-10 minutes into the power transfer. 7. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV requests full power, EVSE meets EV power request.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	EV remains plugged-in into the EVSE even after the actual charge transfer ends.		
<b>Test Identifier</b>	ITP-01-04-010		
<b>Test Type</b>	Power Transfer (PT) Tests		
<b>Test Category</b>	Baseline Functionality & Safety Tests		
<b>Test Purpose</b>	To understand the charging behavior to observe EVSE availability or notification to the EV user		
<b>Observed Metrics</b>	--		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Temperature</b> "Nominal" (23°C) <b>EV Initial SoC</b> <90% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE		
<b>Steps</b>			
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The charging session is completed, and S3 is opened.</li> <li>• EVSE still shows unavailable, and a new charge session cannot be started.</li> </ul> <input type="checkbox"/> <input checked="" type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Manually request high current to determine maximum allowed from EV				
<b>Test Identifier</b>	ITP-01-04-011				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To determine maximum current EV can receive from EVSE.				
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]				
<b>Intended MRECs/Errors</b>	"OverCurrentFailure"				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<10%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Ensure EVSE available current exceeds or meets maximum rating of EV. 4. Manually request 90% EV rated max current. 5. Increase EV current request by 1% every 10-30 seconds until session terminates or EVSE no longer meets EV current request. 6. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Maximum current is determined, EVSE is non-limiting.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Manually request low current to determine minimum allowed from EV				
<b>Test Identifier</b>	ITP-01-04-012				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To determine minimum current EV can receive from EVSE before session terminates.				
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	Current too low				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Ensure EVSE available current exceeds or meets maximum rating of EV. 4. Manually request 10% EV rated max current. 5. Decrease EV current request by 1% every 10-30 seconds until session terminates or EVSE no longer meets EV current request. 6. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Minimum current is determined before session termination.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Manually request negative current to determine if allowed from EV				
<b>Test Identifier</b>	ITP-01-04-013				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To ensure negative current request is not accepted.				
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	Negative current request				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Ensure EVSE available current exceeds or meets maximum rating of EV. 4. Manually request -10% EV rated max current. 5. If session does not terminate, manually terminate charge session 1-2 minutes into power transfer. 6. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session is terminated when negative current is requested by EV.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Emulating Loss of Internet during PT				
<b>Test Identifier</b>	ITP-01-04-014				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To ensure system responds accordingly when internet connection is lost during PT.				
<b>Observed Metrics</b>	--				
<b>Intended MRECs/Errors</b>	"NoInternet"				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Disconnect WiFi router. 4. Disconnect Ethernet connection from EVSE dispenser MCU. 5. Remove LTE chip/connection point from EVSE dispenser MCU. 6. If no fault, terminate session in 1-2 minutes. 7. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Session is terminated or continues when internet connection is lost, error is reported.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Emulating a lost Pilot signal during PT				
<b>Test Identifier</b>	ITP-01-04-015				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To ensure system responds accordingly when Pilot signal is lost during PT.				
<b>Observed Metrics</b>	Pilot Signal				
<b>Intended MRECs/Errors</b>	"PilotFault"				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE Authorization Type to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Disconnect Pilot signal wire from EVSE dispenser MCU, and observe for a fault. 4. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Session is terminated when pilot signal is lost, error is reported.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Emulating a complete loss of EVSE power during PT				
<b>Test Identifier</b>	ITP-01-04-016				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To ensure system responds accordingly when EVSE power is lost during PT.				
<b>Observed Metrics</b>	--				
<b>Intended MRECs/Errors</b>	"PowerLoss"				
<b>Other Possible MRECs</b>	Many				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any 2. Plug-in EV, authorize charge, observe power transfer. 3. Simultaneously trip power to all cabinets and the dispenser. 4. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Session is terminated when EVSE power is lost, error is reported.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Emulating a CableOverTemp during PT	
<b>Test Identifier</b>	ITP-01-04-017	
<b>Test Type</b>	Power Transfer (PT) Tests	
<b>Test Category</b>	Baseline Functionality & Safety Tests	
<b>Test Purpose</b>	To ensure system responds accordingly when cable over-temperature limits are reached during PT. To determine what cable over-temperature limits are.	
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], Battery Temp [°C], Cable Temp [°C], Connector temp [°C], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	"CableOverTempDerate", "CableOverTempStop"	
<b>Other Possible MRECs</b>	"CableOverTempDerate", "CableOverTempStop", "HighTemperature"	
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<10%
	<b>EV SoC Charge Limit</b>	100%
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Using a heat blow gun, apply heat directly across the Cable while charging. 4. Monitor connector temperature and EVSE available current for any derating. 5. If the session does not terminate, manually terminate charge session 15-20 minutes into power transfer. 6. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Session terminates when cable over-temperature limit is reached, error is reported.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Emulating a ConnectorOverTemp during PT				
<b>Test Identifier</b>	ITP-01-04-018				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To ensure system responds accordingly when connector over-temperature limits are reached during PT. To determine what connector over-temperature limits are.				
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], Battery Temp [°C], Cable Temp [°C], Connector temp [°C], EVSE Available Current [A(DC)], EV Current Req [A(DC)]				
<b>Intended MRECs/Errors</b>	ConnectorOverTemp				
<b>Other Possible MRECs</b>	"CableOverTempDerate", "CableOverTempStop", "HighTemperature"				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<10%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. Using a heat blow gun, apply heat directly across the Connector while charging. 4. Monitor connector temperature and EVSE available current for any derating. 5. If session does not terminate, manually terminate charge session 15-20 minutes into power transfer. 6. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session terminates when connector over-temperature limit is reached, error is reported.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Emulating an EVSE Contactor fault during PT				
<b>Test Identifier</b>	ITP-01-04-019				
<b>Test Type</b>	Power Transfer (PT) Tests				
<b>Test Category</b>	Baseline Functionality & Safety Tests				
<b>Test Purpose</b>	To ensure system responds accordingly when EVSE contactor fault occurs during PT.				
<b>Observed Metrics</b>	Battery SoC [%], Voltage [V(DC)], Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]				
<b>Intended MRECs/Errors</b>	"EVSEContactorFault"				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV, authorize charge, observe power transfer. 3. While charging, remove low-voltage control connection to relay for either DC+ or DC-. 5. If the session does not terminate, manually terminate charge session 2-3 minutes into power transfer. 6. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session terminates when EVSE contactor fault is engaged, error is reported.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Start charge while other port is charging another EV				
<b>Test Identifier</b>	ITP-02-05-001				
<b>Test Type</b>	Simultaneous Single Dispenser Charging (Multiple EVs required)				
<b>Test Category</b>	Advanced Charging Tests				
<b>Test Purpose</b>	To ensure EVSE can seamlessly start charging and deliver power to a second EV while another EV is already in a charge session. To observe the dynamic power-sharing control strategy by the EVSE.				
<b>Observed Metrics</b>	EVSE UI Behavior, Power split between ports				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	"UnderVoltage", "OverCurrentFailure"				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV1 to port 1 of EVSE, authorize charge, and observe power transfer. 3. Wait for 2 min. 4. Plug-in EV2 to port 2 of EVSE, authorize charge, and observe power transfer. 5. Wait for 2 min and observe EVSE UI. 6. Manually terminate charge session 2-3 minutes into power transfer. 7. Unplug both EVs from respective EVSE ports.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE charges two EVs simultaneously.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Start charge on both ports with two EVs at the same time using different authentication methods. [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-05-002	
<b>Test Type</b>	Simultaneous Single Dispenser Charging (Multiple EVs required)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To test the order of charge authentication when plugging in 2 EVs simultaneously.	
<b>Observed Metrics</b>	EVSE UI Behavior	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Authentication Type/s</b> 1. CC Tap or Insert 2. RFID 3. CPO App 4. PnC	<b>EV Initial SoC</b> <75%
		<b>EV SoC Charge Limit</b> 100%
	<b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b> EV, EVSE	
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug-in EV1 and EV2 simultaneously into port1 and Port2 of EVSE. 3. Observe the EVSE UI and perform necessary actions for authorization of individual port. 4. Authorize Port1 and Port2 charge using 2 different authorization methods and observe the SI steps on the EVSE UI. 5. Wait for 2 min and observe the power transfer 6. Manually terminate charge session 2-3 minutes into power transfer. 7. Unplug both EVs from respective EVSE ports.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EVSE provides clear instructions on the authentication approach when two ports are plugged in simultaneously.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Start charge while other port is charging another EV with different battery voltage topologies.				
<b>Test Identifier</b>	ITP-02-05-003				
<b>Test Type</b>	Simultaneous Single Dispenser Charging (Multiple EVs required)				
<b>Test Category</b>	Advanced Charging Tests				
<b>Test Purpose</b>	To ensure EVSE can seamlessly start charge and deliver power to two EVs with different battery voltage topologies at the same time.				
<b>Observed Metrics</b>	Voltage [V(DC)], EVSE UI Behavior, Power split between ports				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>EV Initial SoC</b>	<75%			
	<b>EV SoC Charge Limit</b>	100%			
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE authentication option to Any. 2. Plug in EV1 with <500V battery topology to port 1 of EVSE, authorize charge, and observe power transfer. 3. Wait for 2 min. 4. Plug in EV2 with >500V battery topology to port 2 of EVSE, authorize charge, and observe power transfer. 5. Wait for 2 min and observe EVSE UI. 6. Manually terminate the charge session 2-3 minutes into power transfer. 7. Unplug both EVs from their respective EVSE ports.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE simultaneously charges two EVs with different battery voltage topologies.</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Start charge with both ports requesting nameplate rated Max available power per port	
<b>Test Identifier</b>	ITP-02-05-004	
<b>Test Type</b>	Simultaneous Single Dispenser Charging (Multiple EVs required)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure EVSE can produce the nameplate rated power when two EVs are requesting the max capable power rated per port.	
<b>Observed Metrics</b>	Voltage [V(DC)], EVSE UI Behavior, Power split between ports	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Authentication Type/s</b>	FreeVendMode
	<b>Plug or Authenticate first</b>	Plug
	<b>EV Initial SoC</b>	<10%
	<b>EV SoC Charge Limit</b>	100%
	<b>Temperature</b>	"Nominal" (23°C)
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authentication option to "Authentication Type". 2. Plug-in EV1 and EV2 simultaneously into port1 and Port2 of EVSE. 3. Observe the EVSE UI and perform necessary actions for authorization of the individual port. 4. Manually request 100% port-rated max current for each port from the EVs. 5. Observe the EVSE UI and power transfer. 6. Manually terminate the charge session 2-3 minutes into power transfer. 7. Unplug both EVs from their respective EVSE ports.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EVSE simultaneously delivers the max rated power per port.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Successful seamless retry using EIM due to injecting pre-HLC faults. [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-06-001	
<b>Test Type</b>	Seamless Retry	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the seamless retry is correctly implemented using EIM authentication.	
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	"AuthorizationTimeout"	
<b>Test Conditions</b>	<b>Authentication Type/s</b> EIM <b>Plug or Authenticate first</b> Authenticate <b>Fault Method/s</b> 1. PLC not found [Sr.No.1] 2. PLC communication errors [Sr.No.2] 3. SLAC Sequence Error [Sr.No.3] 4. Error in SLAC Parameter [Sr.No.4] 5. High Attenuation [Sr.No.5] 6. Abrupt / Unexpected closure of Data link / TCP connection [Sr.No.6] 7. TLS setup error [Sr.No.7] 8. TCP Error [Sr.No.8] 9. SDP Error [Sr.No.9] 10. PLC comms timeouts [Sr.No.10] 11. SLAC Timeouts [Sr.No.11] 12. Timeout during TCP Setup [Sr.No.12] 13. SDP Discovery Timeout [Sr.No.13] <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE <b>Test Reference</b> <a href="#">Link to the published document for seamless retry</a>	
<b>Steps</b>		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session faults, reattempts and successfully enters power transfer.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Successful seamless retry using EIM due to injecting V2G Comms / HLC Errors [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-06-002	
<b>Test Type</b>	Seamless Retry	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the seamless retry is correctly implemented using EIM authentication.	
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	"AuthorizationTimeout"	
<b>Test Conditions</b>	<b>Authentication Type/s</b> EIM <b>Plug or Authenticate first</b> Authenticate <b>Fault Method/s</b> 1. Loss of High-Level Communication [Sr.No.14] 2. EXI encode/ decode error [Sr.No.15] 3. Error in V2G Parameter [Sr.No.16] 4. V2GTP error [Sr.No.17] 5. Wrong / Unexpected Response Msg detected by EVCC [Sr.No.18] 6. Wrong / Unexpected Request Msg detected by SECC [Sr.No.19] 7. FAILED_SequenceError Response Code received by EVCC [Sr.No.20] 8. Unprocessable response message by EVCC [Sr.No.21] 9. Unprocessable response message by SECC [Sr.No.22] <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE <b>Test Reference</b> <a href="#">Link to the published document for seamless retry</a>	
<b>Steps</b>		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session faults, reattempts and successfully enters power transfer.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Successful seamless retry using EIM due to injecting an error during handshake [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-06-003	
<b>Test Type</b>	Seamless Retry	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the seamless retry is correctly implemented using EIM authentication.	
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	"AuthorizationTimeout"	
<b>Test Conditions</b>	<b>Authentication Type/s</b> EIM <b>Plug or Authenticate first</b> Authenticate <b>Fault Method/s</b> 1. SupportedAppProtocol failure [Sr.No.23] 2. No charge service selected [Sr.No.24] 3. Invalid selection [Sr.No.25] 4. Failed authentication / authorization [Sr.No.26] 5. Certificate error [Sr.No.27] 6. Contract Certificate error [Sr.No.28] 7. Compatibility check failed during CPD [Sr.No.29] 8. EVCC detects "FAILED" ResponseCode during CPD [Sr.No.30] <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE <b>Test Reference</b> <a href="#">Link to the published document for seamless retry</a>	
<b>Steps</b>	1. Set EVSE authentication option to "Authentication Type". 2. Set TT_SR_session timer to "TT_SR_session Timer Duration". 3. Plug-in EV. 4. Within 30 seconds, provide "Authentication Type". 5. Inject 'Fault Method' during HLC. 6. Observe EVSE for Pilot/HLC state transition after fault and retry attempt. 7. Remove 'Fault Method' within TT_SR_session timer duration to allow for a charge session to start successfully. 8. If the charge session starts, terminate it 30-60 seconds into the power transfer. 9. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session faults, reattempts and successfully enters power transfer.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Successful seamless retry using EIM due to injecting an error during miscellaneous timeouts [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-06-004	
<b>Test Type</b>	Seamless Retry	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the seamless retry is correctly implemented using EIM authentication.	
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	"AuthorizationTimeout"	
<b>Test Conditions</b>	<b>Authentication Type/s</b> EIM <b>Plug or Authenticate first</b> Authenticate <b>Fault Method/s</b> 1. AuthorizationTimeout [Sr.No.31] 2. Certificate install / update timeout [Sr.No.32] 3. CommunicationSetup Timeout [Sr.No.33] 4. ReadyToCharge Timeout [Sr.No.34] 5. Message Timeout [Sr.No.35] 6. Sequence Timeout [Sr.No.36] 7. Ongoing Timeout [Sr.No.37] 8. Ongoing Performance Timeout [Sr.No.38] 9. CableCheck Timeout [Sr.No.39] 10. PreChargeFailure [Sr.No.40] <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE <b>Test Reference</b> <a href="#">Link to the published document for seamless retry</a>	
<b>Steps</b>	1. Set EVSE authentication option to "Authentication Type". 2. Set TT_SR_session timer to suitable value. 3. Plug-in EV. 4. Within 30 seconds, provide "Authentication Type". 5. Inject 'Fault Method' during HLC. 6. Observe EVSE for Pilot/HLC state transition after fault and retry attempt. 7. Remove 'Fault Method' within TT_SR_session timer duration to allow for a charge session to start successfully. 8. If the charge session starts, terminate it 30-60 seconds into the power transfer. 9. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session faults, reattempts and successfully enters power transfer.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Unsuccessful seamless retry due to retry attempts duration exceeding the specified TT_SR_session timer duration [Multiple enumerations]		
<b>Test Identifier</b>	ITP-02-06-005		
<b>Test Type</b>	Seamless Retry		
<b>Test Category</b>	Advanced Charging Tests		
<b>Test Purpose</b>	To ensure the seamless retry will not function after a defined TT_SR_session timer duration.		
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration		
<b>Intended MRECs/Errors</b>	"AuthorizationTimeout"		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Authentication Type/s</b> EIM <b>Plug or Authenticate first</b> Authenticate <b>Fault Method/s</b> AuthorizationTimeout [Sr.No.31] <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE <b>Test Reference</b> <a href="#">Link to the published document for seamless retry</a>		
<b>Steps</b>			
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session terminates as seamless retry time exceeds TT_SR_session Timer Duration.</li> </ul> <input type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Unattempted seamless retry using EIM due to injecting a proximity pilot related fault													
<b>Test Identifier</b>	ITP-02-06-006													
<b>Test Type</b>	Seamless Retry													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To ensure the seamless retry will not function in case of a proximity pilot related fault.													
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration													
<b>Intended MRECs/Errors</b>	"AuthorizationTimeout"													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Authentication Type/s</b></td> <td>EIM</td> </tr> <tr> <td><b>Plug or Authenticate first</b></td> <td>Authenticate</td> </tr> <tr> <td><b>Fault Method/s</b></td> <td>Loss of continuity on Prox / Invalid prox circuit voltage [Sr.No.42]</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>Test Reference</b></td> <td><a href="#">Link to the published document for seamless retry</a></td> </tr> </table>		<b>Authentication Type/s</b>	EIM	<b>Plug or Authenticate first</b>	Authenticate	<b>Fault Method/s</b>	Loss of continuity on Prox / Invalid prox circuit voltage [Sr.No.42]	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1	<b>Involved System/s</b>	EV, EVSE	<b>Test Reference</b>	<a href="#">Link to the published document for seamless retry</a>
<b>Authentication Type/s</b>	EIM													
<b>Plug or Authenticate first</b>	Authenticate													
<b>Fault Method/s</b>	Loss of continuity on Prox / Invalid prox circuit voltage [Sr.No.42]													
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1													
<b>Involved System/s</b>	EV, EVSE													
<b>Test Reference</b>	<a href="#">Link to the published document for seamless retry</a>													
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to "Authentication Type".</li> <li>2. Set TT_SR_session timer to suitable value.</li> <li>3. Plug-in EV.</li> <li>4. Within 30 seconds, provide "Authentication Type".</li> <li>5. Inject 'Fault Method'.</li> <li>6. Observe EVSE for Pilot/HLC state transition after fault and retry attempt.</li> <li>7. Remove 'Fault Method' within TT_SR_session timer duration to allow for a charge session to start successfully.</li> <li>8. If the charge session starts, terminate it 30-60 seconds into the power transfer.</li> <li>9. Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Session terminates as seamless retry is not possible for pilot related fault.</li> </ul> <input type="checkbox"/>													
<b>Comments</b>														

<b>Test Name</b>	Unattempted seamless retry using EIM due to injecting protective earth related faults [Multiple enumerations]													
<b>Test Identifier</b>	ITP-02-06-007													
<b>Test Type</b>	Seamless Retry													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To ensure the seamless retry will not function in case of a protective earth related fault.													
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration													
<b>Intended MRECs/Errors</b>	"AuthorizationTimeout"													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Authentication Type/s</b></td> <td>EIM</td> </tr> <tr> <td><b>Plug or Authenticate first</b></td> <td>Authenticate</td> </tr> <tr> <td><b>Fault Method/s</b></td> <td>1. Loss of continuity on PE during energy transfer [Sr.No.43] 2. Loss of PE during other stages [Sr.No.44]</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>Test Reference</b></td> <td><a href="#">Link to the published document for seamless retry</a></td> </tr> </table>		<b>Authentication Type/s</b>	EIM	<b>Plug or Authenticate first</b>	Authenticate	<b>Fault Method/s</b>	1. Loss of continuity on PE during energy transfer [Sr.No.43] 2. Loss of PE during other stages [Sr.No.44]	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1	<b>Involved System/s</b>	EV, EVSE	<b>Test Reference</b>	<a href="#">Link to the published document for seamless retry</a>
<b>Authentication Type/s</b>	EIM													
<b>Plug or Authenticate first</b>	Authenticate													
<b>Fault Method/s</b>	1. Loss of continuity on PE during energy transfer [Sr.No.43] 2. Loss of PE during other stages [Sr.No.44]													
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1													
<b>Involved System/s</b>	EV, EVSE													
<b>Test Reference</b>	<a href="#">Link to the published document for seamless retry</a>													
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to "Authentication Type".</li> <li>2. Set TT_SR_session timer to suitable value.</li> <li>3. Plug-in EV.</li> <li>4. Within 30 seconds, provide "Authentication Type".</li> <li>5. Inject 'Fault Method'.</li> <li>6. Observe EVSE for Pilot/HLC state transition after fault and retry attempt.</li> <li>7. Remove 'Fault Method' within TT_SR_session timer duration to allow for a charge session to start successfully.</li> <li>8. If the charge session starts, terminate it 30-60 seconds into the power transfer.</li> <li>9. Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Session terminates as seamless retry is not possible for protective earth related faults.</li> </ul> <input type="checkbox"/>													
<b>Comments</b>														

<b>Test Name</b>	Unattempted seamless retry using EIM due to injecting control pilot related faults [Multiple enumerations]													
<b>Test Identifier</b>	ITP-02-06-008													
<b>Test Type</b>	Seamless Retry													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To ensure the seamless retry will not function in case of a control pilot related fault.													
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration													
<b>Intended MRECs/Errors</b>	"AuthorizationTimeout"													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>Authentication Type/s</b></td> <td>EIM</td> </tr> <tr> <td><b>Plug or Authenticate first</b></td> <td>Authenticate</td> </tr> <tr> <td><b>Fault Method/s</b></td> <td>1. Unexpected CP State A detected by SECC [Sr.No.45] 2. CP State E/F detected by EVCC [Sr.No.46] 3. Loss of continuity on CP [Sr.No.50]</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>Test Reference</b></td> <td><a href="#">Link to the published document for seamless retry</a></td> </tr> </table>		<b>Authentication Type/s</b>	EIM	<b>Plug or Authenticate first</b>	Authenticate	<b>Fault Method/s</b>	1. Unexpected CP State A detected by SECC [Sr.No.45] 2. CP State E/F detected by EVCC [Sr.No.46] 3. Loss of continuity on CP [Sr.No.50]	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1	<b>Involved System/s</b>	EV, EVSE	<b>Test Reference</b>	<a href="#">Link to the published document for seamless retry</a>
<b>Authentication Type/s</b>	EIM													
<b>Plug or Authenticate first</b>	Authenticate													
<b>Fault Method/s</b>	1. Unexpected CP State A detected by SECC [Sr.No.45] 2. CP State E/F detected by EVCC [Sr.No.46] 3. Loss of continuity on CP [Sr.No.50]													
<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1													
<b>Involved System/s</b>	EV, EVSE													
<b>Test Reference</b>	<a href="#">Link to the published document for seamless retry</a>													
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE authentication option to "Authentication Type".</li> <li>2. Set TT_SR_session timer to suitable value.</li> <li>3. Plug-in EV.</li> <li>4. Within 30 seconds, provide "Authentication Type".</li> <li>5. Inject 'Fault Method'.</li> <li>6. Observe EVSE for Pilot/HLC state transition after fault and retry attempt.</li> <li>7. Remove 'Fault Method' within TT_SR_session timer duration to allow for a charge session to start successfully.</li> <li>8. If the charge session starts, terminate it 30-60 seconds into the power transfer.</li> <li>9. Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• Session terminates as seamless retry is not possible for control pilot related faults.</li> </ul> <input type="checkbox"/>													
<b>Comments</b>														

<b>Test Name</b>	Successful seamless retry using EIM due to injecting control pilot related faults [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-06-009	
<b>Test Type</b>	Seamless Retry	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the seamless retry is correctly implemented using EIM authentication.	
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	"AuthorizationTimeout"	
<b>Test Conditions</b>	<b>Authentication Type/s</b> EIM <b>Plug or Authenticate first</b> Authenticate <b>Fault Method/s</b> 1. CP State E/F detected by SECC [Sr.No.47] 2. SECC times out while waiting for CP State C [Sr.No.48] 3. SECC times out while waiting for CP State B [Sr.No.49] 4. SECC times out while waiting for CP State C [Sr.No.48] 5. Incorrect CP duty cycle detected by EVCC [Sr.No.51] 6. Unintended CP transition from CP State C to B/A [Sr.No.52] 7. Unexpected CP state B detected by SECC [Sr.No.53] 8. Unsupported CP State detected [Sr.No.54] <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE <b>Test Reference</b> <a href="#">Link to the published document for seamless retry</a>	
<b>Steps</b>	1. Set EVSE authentication option to "Authentication Type". 2. Set TT_SR_session timer to suitable value. 3. Plug-in EV. 4. Within 30 seconds, provide "Authentication Type". 5. Inject 'Fault Method'. 6. Observe EVSE for Pilot/HLC state transition after fault and retry attempt. 7. Remove 'Fault Method' within TT_SR_session timer duration to allow for a charge session to start successfully. 8. If the charge session starts, terminate it 30-60 seconds into the power transfer. 9. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session faults, reattempts and successfully enters power transfer.</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Unattempted seamless retry using EIM due to injecting electrical safety related faults and errors [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-06-010	
<b>Test Type</b>	Seamless Retry	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the seamless retry will not function in case of an electrical safety related fault.	
<b>Observed Metrics</b>	HLC messages, Pilot states, # retries, Session duration	
<b>Intended MRECs/Errors</b>	"AuthorizationTimeout"	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Authentication Type/s</b>	EIM
	<b>Plug or Authenticate first</b>	Authenticate
	<b>Fault Method/s</b>	1. Current leakage [Sr.No.55] 2. Connector Overtemp [Sr.No.56] 3. LowTemperature [Sr.No.57] 4. ConnectorLockFailure [Sr.No.58] 5. Overcurrent device protection [Sr.No.59] 6. Overcurrent detected by EVCC/SECC [Sr.No.60] 7. ConnectorVoltageHigh [Sr.No.61] 8. Overvoltage during energy transfer [Sr.No.62] 9. Overvoltage at any stage [Sr.No.63] 10. InvalidVehicleMode [Sr.No.65] 11. Short circuit before energy transfer [Sr.No.66] 12. Isolation Check / Cable Check failed [Sr.No.67] 13. Insulation monitoring failed during energy transfer [Sr.No.68] 14. Loss of High Voltage Isolation [Sr.No.69] 15. Loss of Power [Sr.No.70] 16. Welded / Unresponsive EV contactor [Sr.No.71] 17. Welded / Unresponsive EVSE contactor [Sr.No.72] 18. EVSE Malfunction [Sr.No.73] 19. RESS Malfunction [Sr.No.74]
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
	<b>Test Reference</b>	<a href="#">Link to the published document for seamless retry</a>
<b>Steps</b>	1. Set EVSE authentication option to "Authentication Type". 2. Set TT_SR_session timer to suitable value. 3. Plug-in EV. 4. Within 30 seconds, provide "Authentication Type". 5. Inject 'Fault Method'. 6. Observe EVSE for Pilot/HLC state transition after fault and retry attempt. 7. Remove 'Fault Method' within TT_SR_session timer duration to allow for a charge session to start successfully. 8. If the charge session starts, terminate it 30-60 seconds into the power transfer. 9. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>Session terminates as seamless retry is not possible for electrical safety-related faults and errors .</li> </ul> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	<b>"Emulated" Pause&amp;Resume by manually curtailing EVSE current to 0A during PT</b>	
<b>Test Identifier</b>	ITP-02-07-001	
<b>Test Type</b>	Pause and Resume	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	- To emulate a workaround approach to Pause&Resume by EVSE limiting to zero current. - To test if EV will allow for extremely low current without ending charge session (i.e. performance check)	
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response, SMS/EVSE curtailment, command	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	EV Performance Check Failure @ low current	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to "Any". 3. Plug in EV and provide 'Authentication Type'. 4. Observe the session initialization transitioning into the power transfer. 5. After 30 seconds of power transfer, curtail EVSE current to 0A for 60 sec via "EVSE available current". 6. Remove EVSE curtailment and allow the charge session to return to full power. 7. After 30 seconds, terminate the charge session. 8. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	• EV allows for 0 Amp curtailment to be commanded for a full 60 sec, then returns to full power. <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	EV commanded pause via SessionStopReq "Pause" during PT, then end of session	
<b>Test Identifier</b>	ITP-02-07-002	
<b>Test Type</b>	Pause and Resume	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To test if a pause can be initiated through an EV during a charge session	
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response, HLC messages	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Authentication Type/s</b>	EIM or Plug&Charge
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to "Any". 3. Plug in EV and provide 'Authentication Type'. 4. Observe the session initialization transitioning into the power transfer. 5. After 30 seconds of power transfer, pause the power transfer from EV by sending "SessionStopReq : Pause" message. 6. After 60 seconds, terminate the charge session. 7. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	• EVSE pauses the power transfer after receiving the "SessionStopRequest: Pause" and charging current goes down to 0A. <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	EV commanded pause via SessionStopReq "Pause" during PT then command SessionSetupReq to resume using same SessionID [Multiple enumerations]				
<b>Test Identifier</b>	ITP-02-07-003				
<b>Test Type</b>	Pause and Resume				
<b>Test Category</b>	Advanced Charging Tests				
<b>Test Purpose</b>	- To test if a pause can be initiated during a charge session - To check if a paused charge session can be resumed				
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response, HLC messages				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>Authentication Type/s</b>	EIM or Plug&Charge			
	<b>HLC Protocol/s</b>	1. ISO 15118-2 2. ISO 15118-20			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to "Any". 3. Plug in EV and provide 'Authentication Type'. 4. Observe the session initialization transitioning into the power transfer. 5. After 30 seconds of power transfer, pause the power transfer from EV by sending "SessionStopReq : Pause" message. 6. After a 60-second pause, send a SessionSetupReq message from the EV to the EVSE using the same [1] SessionID or [2] V2G session credentials. 7. Verify the session resumes PT. 8. After another 60 seconds, terminate the charge session. 9. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EVCC sends prior sessionID resulting in "OK_OldSessionJoined" response message</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Pause: EV commanded pause via SessionStopReq "Pause" during PT then manually command SessionSetupReq to resume using new SessionID [Multiple enumerations]				
<b>Test Identifier</b>	ITP-02-07-004				
<b>Test Type</b>	Pause and Resume				
<b>Test Category</b>	Advanced Charging Tests				
<b>Test Purpose</b>	- To test if a pause can be initiated during a charge session - To check if a paused charge session can be ended and resumed as a new charge session				
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response, HLC messages				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	--				
<b>Test Conditions</b>	<b>Authentication Type/s</b>	EIM or Plug&Charge			
	<b>HLC Protocol/s</b>	1. ISO 15118-2 2. ISO 15118-20			
	<b>Involved System/s</b>	EV, EVSE			
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to "Any". 3. Plug in EV and provide 'Authentication Type'. 4. Observe the session initialization transitioning into the power transfer. 5. After 30 seconds of power transfer, pause the power transfer from EV by sending "SessionStopReq : Pause" message. 6. After a 60-second pause, send a SessionSetupReq message from the EV to the EVSE with a new [1] SessionID or [2] V2G session credentials. 7. Observe the EVSE UI. If needed, provide "Authentication Type" once again. 8. Verify the session resumes PT. 9. After another 60 seconds, terminate the charge session. 10. Unplug EV.				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVCC sends new sessionID resulting in "OK_NewSessionEstablished" response message</li> </ul> <input type="checkbox"/>				
<b>Comments</b>					

<b>Test Name</b>	Pilot Wake & Resume: Wake after a demand response (DR) event [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-08-001	
<b>Test Type</b>	Pilot Wake	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the pilot wake mechanism works when the EV enters sleep mode following a demand response (DR) event.	
<b>Observed Metrics</b>	Pilot Signal, Error Messages, HLC Messages, EV UI Behavior, EVSE UI Behavior	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>Authentication Type/s</b>	FreeVendMode
	<b>Plug or Authenticate first</b>	Plug
	<b>EV Initial SoC</b>	<75%
	<b>State Transition</b>	1. B1 to B2 2. B1 to E transition (4 sec), back to B1 (4 sec), then B2 3. B1 to F (4 sec), back to B1 (4 sec), then B2 4. B1 to B2 with 50%, 900 Hz frequency (4 sec), then B2, 50%, 1kHz 5. B1 to B2 with 5%, 1 kHz (4 sec), then B2, 50%, 1kHz
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE
<b>Steps</b>	1. Set EVSE authorization option to Any. 2. Plug-in EV, authorize charge, and observe power transfer. 3. Transition Pilot C2>C1 and C1>B1 via 'Transition Method' 4. Wait until EV enters sleep mode, then wait an additional 30 sec. 5. Attempt the 'State Transition' to wake the EV. 6. Observe EV behavior to see if the EV transitions out of sleep mode. 7. If the charge session restarts, wait for 1 min. 8. Terminate the charge session and unplug the EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV goes into sleep mode during a DR event.</li> <li>• The pilot wake mechanism works at the end of the DR event and EVSE successfully transitions into B2 state.</li> <li>• Charge session restarts.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	<b>Pilot Wake &amp; Resume: Wake after a power outage event [Multiple enumerations]</b>	
<b>Test Identifier</b>	ITP-02-08-002	
<b>Test Type</b>	Pilot Wake	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the pilot wake mechanism works when the EV enters sleep mode following a power outage event.	
<b>Observed Metrics</b>	Pilot Signal, Error Messages, HLC Messages, EV UI Behavior, EVSE UI Behavior	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	PowerLoss, PilotLoss, Pilotfault	
<b>Test Conditions</b>	<b>Authentication Type/s</b> FreeVendMode <b>Plug or Authenticate first</b> Plug <b>EV Initial SoC</b> <75% <b>State Transition</b> 1. E to B2 2. E to B1 transition (4 sec), back to E (4 sec), then B2 3. E to F (4 sec), back to B1 (4 sec), then B2 4. E to B2 with 50%, 900 Hz frequency (4 sec), then B2, 50%, 1kHz 5. E to B2 with 5%, 1 kHz (4 sec), then B2, 50%, 1kHz <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE	
<b>Steps</b>		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV goes into sleep mode during a power outage event.</li> <li>• The pilot wake mechanism works at the end of a the power outage event and EVSE successfully transitions into B2 state.</li> <li>• Charge session restarts.</li> </ul> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
<b>Comments</b>		

<b>Test Name</b>	Pilot Wake & Resume: Wake after a failure event [Multiple enumerations]	
<b>Test Identifier</b>	ITP-02-08-003	
<b>Test Type</b>	Pilot Wake	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure the pilot wake mechanism works when the EV enters sleep mode following a failure event.	
<b>Observed Metrics</b>	Pilot Signal, Error Messages, HLC Messages, EV UI Behavior, EVSE UI Behavior	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	PowerLoss, PilotLoss, Pilotfault	
<b>Test Conditions</b>	<b>Authentication Type/s</b> FreeVendMode <b>Plug or Authenticate first</b> Plug <b>EV Initial SoC</b> <75% <b>State Transition</b> 1. F to B2 transition 2. F to E transition (4 sec), back to F (4 sec), then B2 3. F to E (4 sec), back to B1 (4 sec), then B2 4. F to B2 with 50%, 900 Hz frequency (4 sec), then B2, 50%, 1kHz 5. F to B2 with 5%, 1kKHz (4 sec), then B2, 50%, 1kHz5. <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE	
<b>Steps</b>		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV goes into sleep mode during a failure event.</li> <li>• The pilot wake mechanism works once the fault is cleared and EVSE successfully transitions into B2 state.</li> <li>• Charge session restarts.</li> </ul>	<input type="checkbox"/>  <input checked="" type="checkbox"/>  <input checked="" type="checkbox"/>
<b>Comments</b>		

<b>Test Name</b>	Scheduled 5-minute, 1kW power curtailment event before plug-in, start charge 2 min prior to curtailment event.	
<b>Test Identifier</b>	ITP-02-09-001	
<b>Test Type</b>	OCPP Smart Charge Profile (SCP)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure curtailment functionality works with smart charge profile, start/end times are accurate, and commanded power level is accurate.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>OCPP Protocol/s</b>	OCPP1.6J, OCPP 2.0.1, OCPP 2.1
	<b>OCPP Curtailment Command</b>	"SetChargingProfile.req" --> (OCPP 1.6J) "SetChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) stacklevel: 0, chargingProfilePurpose: TxDefaultProfile, duration: 300, startSchedule: 120sec_after_plug-in, chargingRateUnit: W chargingSchedulePeriod: (startPeriod: 0, limit: 1000)
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE, CSMS
<b>Steps</b>	1. Make sure the EVSE and CSMS support OCPP Protocol/s. 2. Establish a connection between EVSE and CSMS. 3. Set EVSE authorization option to Any. 4. Schedule EVSE curtailment by sending 'OCPP SetChargingProfile.req' and confirm message reception/acceptance by EVSE. 5. Plug-in EV and authorize charge session 2 min before curtailment event begins and observe power transfer. 6. Observe the curtailment start time, end time and power level during the curtailment period. 7. Terminate the charge session and unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The charging power is limited to 1kW during the curtailment event.</li> <li>• The curtailment occurs for the defined duration of the event.</li> <li>• EVSE &amp; EV will both return to full power after curtailment end.</li> <li>• The system exhibits low start and end latency, with rapid response to curtailment requests.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	Scheduled 5-minute, 1kW power curtailment event before plug-in, start charge during curtailment event.	
<b>Test Identifier</b>	ITP-02-09-002	
<b>Test Type</b>	OCPP Smart Charge Profile (SCP)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure curtailment functionality works when charge start occurs during curtailment window.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>OCPP Protocol/s</b>	OCPP1.6J, OCPP 2.0.1, OCPP 2.1
	<b>OCPP Curtailment Command</b>	"SetChargingProfile.req" --> (OCPP 1.6J) "SetChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) stacklevel: 0, chargingProfilePurpose: TxDefaultProfile, duration: 300, startSchedule: 120sec_before_plug-in, chargingRateUnit: W chargingSchedulePeriod: (startPeriod: 0, limit: 1000)
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE, CSMS
<b>Steps</b>	1. Make sure the EVSE and CSMS support OCPP Protocols. 2. Establish a connection between EVSE and CSMS. 3. Set EVSE authorization option to Any. 4. Schedule EVSE curtailment by sending 'OCPP Curtailment Command' and confirm message reception/acceptance by EVSE. 5. Plug in EV and authorize a charge session during the curtailment event and observe power transfer. 6. Observe the curtailment start time, end time and power level during the curtailment period. 7. Terminate the charge session and unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The charging power is limited to 1kW during the curtailment event.</li> <li>• Power curtailment begins at the moment the EV is plugged in and continues for the defined duration of the curtailment event.</li> <li>• EVSE &amp; EV will both return to full power after curtailment end.</li> <li>• Latency for start/end is low.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	<b>Scheduled 5-minute, 1kW power curtailment event before plug-in, cancel curtailment event during curtailment period.</b>	
<b>Test Identifier</b>	ITP-02-09-003	
<b>Test Type</b>	OCPP Smart Charge Profile (SCP)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure curtailment window can be cancelled and latency is low.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>OCPP Protocol/s</b> <b>OCPP Curtailment Command</b> "SetChargingProfile.req" --> (OCPP 1.6J) "SetChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) {stacklevel: 0, chargingProfilePurpose: TxDefaultProfile, duration: 300, startSchedule: 120sec_before_plug-in, chargingRateUnit: W chargingSchedulePeriod: (startPeriod: 0, limit: 1000)} "ClearChargingProfile.req" --> (OCPP 1.6J) "ClearChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) {stacklevel: 0, chargingProfilePurpose: TxProfile,} <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE, CSMS	OCPP1.6J, OCPP 2.0.1, OCPP 2.1
<b>Steps</b>	1. Make sure the EVSE and CSMS support OCPP Protocols. 2. Establish a connection between EVSE and CSMS. 3. Set EVSE authorization option to Any. 4. Schedule EVSE curtailment by sending 'OCPP Curtailment Command' and confirm message reception/acceptance by EVSE 5. Plug-in EV and authorize charge session during curtailment event and observe power transfer. 6. Observe the curtailment start time, end time and power level during the curtailment period. 7. Via OCPP, cancel curtailment event 2-min into curtailment event using ClearChargingProfile command. 8. Terminate charge session and unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The charging power is limited to 20 kW during the curtailment event.</li> <li>• The curtailment occurs for the defined duration of the event.</li> <li>• EVSE &amp; EV will both return to full power after curtailment end.</li> <li>• The system exhibits low start and end latency, with rapid response to curtailment requests.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	Scheduled 5-minute, 0kW power curtailment event before plug-in, start charge 2-min prior to curtailment event.	
<b>Test Identifier</b>	ITP-02-09-004	
<b>Test Type</b>	OCPP Smart Charge Profile (SCP)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure 0kW power curtailment does not cause charge session to end.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>OCPP Protocol/s</b> <b>OCPP Curtailment Command</b> "SetChargingProfile.req" --> (OCPP 1.6J) "SetChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) stacklevel: 0, chargingProfilePurpose: TxDefaultProfile, duration: 300, startSchedule: 120sec_after_plug-in, chargingRateUnit: W chargingSchedulePeriod: (startPeriod: 0, limit: 0)	OCPP1.6J, OCPP 2.0.1, OCPP 2.1
	<b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1	
	<b>Involved System/s</b> EV, EVSE, CSMS	
<b>Steps</b>	1. Make sure the EVSE and CSMS support OCPP Protocols. 2. Establish a connection between EVSE and CSMS. 3. Set EVSE authorization option to Any. 4. Schedule EVSE curtailment by sending 'OCPP Curtailment Command' and confirm message reception/acceptance by EVSE 5. Plug-in EV and authorize charge session 2-min before curtailment event begins and observe power transfer. 6. Observe the curtailment start time, end time and power level during the curtailment period. 7. Terminate charge session and unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• No power transfer occurs during the curtailment event.</li> <li>• The curtailment occurs for the defined duration of the event.</li> <li>• EVSE &amp; EV will both return to full power after the curtailment ends.</li> <li>• The system exhibits low start and end latency, with rapid response to curtailment requests.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	Schedule (x3) 2-minute 1kW curtailment events before plug-in (1 min apart each), start charge 2-min prior to first curtailment event.	
<b>Test Identifier</b>	ITP-02-09-005	
<b>Test Type</b>	OCPP Smart Charge Profile (SCP)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure multiple curtailment events can be scheduled at once.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>OCPP Protocol/s</b> <b>OCPP Curtailment Command</b> "SetChargingProfile.req" --> (OCPP 1.6J) "SetChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) stacklevel: 0, chargingProfilePurpose: TxDefaultProfile, duration: 600, startSchedule: 120sec_after_plug-in, chargingRateUnit: W chargingSchedulePeriod: {(startPeriod: 0, limit: 1000), (startPeriod: 120, limit: ChargePointRatedPower), (startPeriod: 180, limit: 1000), (startPeriod: 300, limit: ChargePointRatedPower), (startPeriod: 360, limit: 1000), (startPeriod: 480, limit: ChargePointRatedPower) }	OCPP1.6J, OCPP 2.0.1, OCPP 2.1
	<b>HLC Protocol/s</b>	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	<b>Involved System/s</b>	EV, EVSE, CSMS
<b>Steps</b>	1. Make sure the EVSE and CSMS support OCPP Protocols. 2. Establish a connection between EVSE and CSMS. 3. Set EVSE authorization option to Any. 4. Schedule EVSE curtailments by sending 'OCPP Curtailment Command' and confirm message reception/acceptance by EVSE. 5. Plug-in EV and authorize charge session 2-min before curtailment event begins and observe power transfer. 6. Observe the curtailment start time, end time and power level during the curtailment period. 7. Terminate charge session and unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• No power transfer occurs during the curtailment events.</li> <li>• Curtailment is executed according to the defined time-series curtailment schedule.</li> <li>• EVSE &amp; EV will both return to full power after each curtailment period ends.</li> <li>• The system exhibits low start and end latency, with rapid response to curtailment requests.</li> </ul>	
<b>Comments</b>		



Test Name		Schedule (x2) 2-minute power curtailment events before plug-in during the same time at different power levels, start charge 2 min prior to curtailment events.
Test Identifier	ITP-02-09-006	
Test Type	OCPP Smart Charge Profile (SCP)	
Test Category	Advanced Charging Tests	
Test Purpose	To test the combined charging profile when multiple charging profiles are present.	
Observed Metrics	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
Intended MRECs/Errors	--	
Other Possible MRECs	--	
Test Conditions	OCPP Protocol/s	OCPP1.6J, OCPP 2.0.1, OCPP 2.1
	OCPP Curtailment Command	"SetChargingProfile.req" --> (OCPP 1.6J) "SetChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) stacklevel: 0, chargingProfilePurpose: TxDefaultProfile, duration: 600, startSchedule: 120sec_after_plug-in, chargingRateUnit: W chargingSchedulePeriod: {(startPeriod: 0, limit: 1000), (startPeriod: 120, limit: ChargePointRatedPower), (startPeriod: 180, limit: 1000), (startPeriod: 120, limit: ChargePointRatedPower),
	HLC Protocol/s	DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1
	Involved System/s	EV, EVSE, CSMS
Steps	1. Make sure the EVSE and CSMS support OCPP Protocols. 2. Establish a connection between EVSE and CSMS. 3. Set EVSE authorization option to Any. 4. Schedule EVSE curtailments by sending 'OCPP Curtailment Command' and confirm message reception/acceptance by EVSE. 5. Plug-in EV and authorize charge session 2-min before curtailment event begins and observe power transfer. 6. Observe the curtailment start time, end time and power level during the curtailment period. 7. Terminate charge session and unplug EV.	
Pass Criteria (Check box if met)	<ul style="list-style-type: none"> <li>The charging power is limited to X kW during the curtailment event.</li> <li>The curtailment occurs for the defined duration of the event.</li> <li>EVSE &amp; EV will both return to full power after curtailment end.</li> <li>The system exhibits low start and end latency, with rapid response to curtailment requests.</li> </ul>	
Comments		

<b>Test Name</b>	Emergency 5-minute, 1kW power curtailment event during power transfer	
<b>Test Identifier</b>	ITP-02-09-007	
<b>Test Type</b>	OCPP Smart Charge Profile (SCP)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure curtailment functionality works with smart charge profile when sent during an active charge session. To test the response latency of OCPP curtailment command.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>OCPP Protocol/s</b> <b>OCPP Curtailment Command</b> "SetChargingProfile.req" --> (OCPP 1.6J) "SetChargingProfileRequest"--> (OCPP 2.0.1, OCPP 2.1) stacklevel: 0, chargingProfilePurpose: TxProfile, duration: 300, startSchedule: 120sec_after_plug-in, chargingRateUnit: W chargingSchedulePeriod: (startPeriod: 0, limit: 1000) <b>HLC Protocol/s</b> DIN SPEC 70121, ISO 15118-2, ISO 15118-20, J3400-1 <b>Involved System/s</b> EV, EVSE, CSMS	OCPP1.6J, OCPP 2.0.1, OCPP 2.1
<b>Steps</b>	1. Make sure the EVSE and CSMS support OCPP Protocol/s. 2. Establish a connection between EVSE and CSMS. 3. Set EVSE authorization option to Any. 4. Plug-in EV, authorize charge session and observe the charge session. 5. Schedule EVSE curtailment 2 min after the start of charge session by sending 'OCPP SetChargingProfile.req' and confirm message reception/acceptance by EVSE. 6. Observe the curtailment start time, end time and power level during the curtailment period. 7. Terminate the charge session and unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The charging power is limited to 1kW during the curtailment event.</li> <li>• The curtailment occurs for the defined duration of the event.</li> <li>• EVSE &amp; EV will both return to full power after the end of curtailment period.</li> <li>• The system exhibits low start and end latency, with rapid response to curtailment requests.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	Short DepartureTime duration input from EV user for CDP											
<b>Test Identifier</b>	ITP-02-10-001											
<b>Test Type</b>	Charge Discovery Protocol (CDP)											
<b>Test Category</b>	Advanced Charging Tests											
<b>Test Purpose</b>	To check the effect of a very short DepartureTime duration provided by an EV user during the charge discovery protocol.											
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]											
<b>Intended MRECs/Errors</b>	--											
<b>Other Possible MRECs</b>	--											
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;15%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 10 kWh, DepartureTime: 60 (1 min)</td> </tr> </table>		<b>EV Initial SoC</b>	<15%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 10 kWh, DepartureTime: 60 (1 min)
<b>EV Initial SoC</b>	<15%											
<b>EV SoC Charge Limit</b>	100%											
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20											
<b>Involved System/s</b>	EV, EVSE											
<b>EV HMI charge scheduling values</b>	EAmount: 10 kWh, DepartureTime: 60 (1 min)											
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>2. Set EVSE authentication option to 'Authentication Type'.</li> <li>3. Set 'EV HMI charging schedule' values.</li> <li>4. Set 'EVSE charge availability' values.</li> <li>5. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>6. Provide 'Authentication Type'.</li> <li>7. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>8. Wait until the charge session terminates automatically.</li> <li>9. Unplug EV.</li> </ol>											
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse.</li> <li>• The charging session starts and automatically terminates at the DepartureTime specified in the charge parameters.</li> <li>• The charge session terminates after a very short DepartureTime duration.</li> </ul> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>											
<b>Comments</b>												

<b>Test Name</b>	Small EAmount value input from EV user for CDP											
<b>Test Identifier</b>	ITP-02-10-002											
<b>Test Type</b>	Charge Discovery Protocol (CDP)											
<b>Test Category</b>	Advanced Charging Tests											
<b>Test Purpose</b>	To check the effect of a very small EAmount value provided by the EV user during the charge discovery protocol.											
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]											
<b>Intended MRECs/Errors</b>	--											
<b>Other Possible MRECs</b>	--											
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;15%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 1 kWh, DepartureTime: 36000 (10 hr)</td> </tr> </table>		<b>EV Initial SoC</b>	<15%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 1 kWh, DepartureTime: 36000 (10 hr)
<b>EV Initial SoC</b>	<15%											
<b>EV SoC Charge Limit</b>	100%											
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20											
<b>Involved System/s</b>	EV, EVSE											
<b>EV HMI charge scheduling values</b>	EAmount: 1 kWh, DepartureTime: 36000 (10 hr)											
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>2. Set EVSE authentication option to 'Authentication Type'.</li> <li>3. Set 'EV HMI charging schedule values'.</li> <li>4. Set 'EVSE charge availability' values.</li> <li>5. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>6. Provide 'Authentication Type'.</li> <li>7. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>8. Wait until the charge session terminates automatically.</li> <li>9. Unplug EV.</li> </ol>											
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse.</li> <li>• The charging session starts and automatically terminates once the EV user-specified energy amount (EAmount) has been delivered to the EV.</li> </ul>											
<b>Comments</b>												

<b>Test Name</b>	Infinite DepartureTime duration input from EV user for CDP											
<b>Test Identifier</b>	ITP-02-10-003											
<b>Test Type</b>	Charge Discovery Protocol (CDP)											
<b>Test Category</b>	Advanced Charging Tests											
<b>Test Purpose</b>	To check the effect of infinite DepartureTime duration provided by the EV user during the charge discovery protocol.											
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]											
<b>Intended MRECs/Errors</b>	--											
<b>Other Possible MRECs</b>	--											
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;15%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 10 kWh, DepartureTime: 1000000000 (~Infinite duration)</td> </tr> </table>		<b>EV Initial SoC</b>	<15%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 10 kWh, DepartureTime: 1000000000 (~Infinite duration)
<b>EV Initial SoC</b>	<15%											
<b>EV SoC Charge Limit</b>	100%											
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20											
<b>Involved System/s</b>	EV, EVSE											
<b>EV HMI charge scheduling values</b>	EAmount: 10 kWh, DepartureTime: 1000000000 (~Infinite duration)											
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>2. Set EVSE authentication option to 'Authentication Type'.</li> <li>3. Set 'EV HMI charging schedule values'.</li> <li>4. Set 'EVSE charge availability' values.</li> <li>5. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>6. Provide 'Authentication Type'.</li> <li>7. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>8. Wait for 30 min or until the charge session terminates automatically (Whichever is shorter).</li> <li>9. Unplug EV.</li> </ol>											
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse.</li>   <li>• EVSE creates the PMaxSchedule with a suitable DepartureTime and neglects the infinite value.</li> </ul>											
<b>Comments</b>												

<b>Test Name</b>	Infinite EAmount value input from EV user for CDP											
<b>Test Identifier</b>	ITP-02-10-004											
<b>Test Type</b>	Charge Discovery Protocol (CDP)											
<b>Test Category</b>	Advanced Charging Tests											
<b>Test Purpose</b>	To check the effect of a very high EAmount value provided by the EV user during the charge discovery protocol.											
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]											
<b>Intended MRECs/Errors</b>	--											
<b>Other Possible MRECs</b>	--											
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;15%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 100000 kWh, DepartureTime: 3600 (1 min)</td> </tr> </table>		<b>EV Initial SoC</b>	<15%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 100000 kWh, DepartureTime: 3600 (1 min)
<b>EV Initial SoC</b>	<15%											
<b>EV SoC Charge Limit</b>	100%											
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20											
<b>Involved System/s</b>	EV, EVSE											
<b>EV HMI charge scheduling values</b>	EAmount: 100000 kWh, DepartureTime: 3600 (1 min)											
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>2. Set EVSE authentication option to 'Authentication Type'.</li> <li>3. Set 'EV HMI charging schedule values'.</li> <li>4. Set 'EVSE charge availability' values.</li> <li>5. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>6. Provide 'Authentication Type'.</li> <li>7. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>8. Wait for 30 min or until the charge session terminates automatically (Whichever is shorter).</li> <li>9. Unplug EV.</li> </ol>											
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse.</li> <li>• EVSE creates the PMaxSchedule with an infinite EAmount input.</li> <li>• The charging session stops when the EV reaches the EV SoC Charge Limit.</li> </ul>											
<b>Comments</b>												

<b>Test Name</b>	<b>Multi-Step Smart Charge Scheduling with non-zero power values</b>	
<b>Test Identifier</b>	ITP-02-11-001	
<b>Test Type</b>	Smart Charge Scheduling (SCS)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure EV and EVSE can perform a charging session with Smart Charge Scheduling.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>EV Initial SoC</b> <50% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> ISO 15118-2, ISO 15118-20 <b>Involved System/s</b> EV, EVSE <b>EV HMI charge scheduling values</b> EAmount: 10kWh, DepartureTime: 3600 (1 hour) <b>EVSE charge scheduling values</b> PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: "nonzero" W [2] start: 90, Pmax: "nonzero" W [3] start: 110, Pmax: "nonzero" W	
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to 'Authentication Type'. 3. Set 'EV HMI charging schedule' values. 4. Set 'EVSE charge availability' values. 5. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs. 6. Provide 'Authentication Type'. 7. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest". 8. Terminate the charge session after 150 sec. 9. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>• EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>• EV and EVSE execute the Smart Charge Scheduling session.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	Multi-Step Smart Charge Scheduling with an intermediate pause (zero-power) (pause and resume)													
<b>Test Identifier</b>	ITP-02-11-002													
<b>Test Type</b>	Smart Charge Scheduling (SCS)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To ensure EV and EVSE can perform a charging session with Smart Charge Scheduling with a zero current/power step within the charge schedule.													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;50%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 10kWh, DepartureTime: 3600 (1 hour)</td> </tr> <tr> <td><b>EVSE charge scheduling values</b></td> <td>PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 0 W [2] start: 90, Pmax: "nonzero" W [3] start: 110, Pmax: "nonzero" W</td> </tr> </table>		<b>EV Initial SoC</b>	<50%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)	<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 0 W [2] start: 90, Pmax: "nonzero" W [3] start: 110, Pmax: "nonzero" W
<b>EV Initial SoC</b>	<50%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)													
<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 0 W [2] start: 90, Pmax: "nonzero" W [3] start: 110, Pmax: "nonzero" W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>2. Set EVSE authentication option to 'Authentication Type'.</li> <li>3. Set 'EV HMI charging schedule' values.</li> <li>4. Set 'EVSE charge availability' values.</li> <li>5. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>6. Provide 'Authentication Type'.</li> <li>7. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>8. Observe power transfer, observe 'SessionStopReq: 'Pause'' 30 sec into power transfer.</li> <li>9. Observe full power charge session begins 60 sec after 'Pause'.</li> <li>10. After 150 sec into the charge session, terminate the charge session.</li> <li>11. Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>• EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>• EV and EVSE execute the Smart Charge Scheduling session.</li> <li>• EV sends a SessionStopRequest at 30 sec into the power transfer.</li> <li>• EVSE acknowledges the request and the charging power reduces to 0W.</li> <li>• The charging power increases at the end of the scheduled zero power period.</li> </ul>													
<b>Comments</b>														

<b>Test Name</b>	<b>Multi-Step Smart Charge Scheduling with a zero power step at the beginning</b>													
<b>Test Identifier</b>	ITP-02-11-003													
<b>Test Type</b>	Smart Charge Scheduling (SCS)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To ensure EV and EVSE can perform a charging session with Smart Charge Scheduling with a zero current/power step at the start of the charge schedule.													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;50%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 10kWh, DepartureTime: 3600 (1 hour)</td> </tr> <tr> <td><b>EVSE charge scheduling values</b></td> <td>PMaxScheduleEntry: [0] start: 0, PMax: 0 W [1] start: 30, PMax: "nonzero" W [2] start: 90, Pmax: "nonzero" W</td> </tr> </table>		<b>EV Initial SoC</b>	<50%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)	<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: 0 W [1] start: 30, PMax: "nonzero" W [2] start: 90, Pmax: "nonzero" W
<b>EV Initial SoC</b>	<50%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)													
<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: 0 W [1] start: 30, PMax: "nonzero" W [2] start: 90, Pmax: "nonzero" W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>Set EVSE authentication option to 'Authentication Type'.</li> <li>Set 'EV HMI charging schedule' values.</li> <li>Set 'EVSE charge availability' values.</li> <li>Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>Provide 'Authentication Type'.</li> <li>Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>Observe power transfer, observe 'SessionStopReq: 'Pause'' at the start of the power transfer.</li> <li>Observe full power charge session begins 30 sec after 'Pause'.</li> <li>After 150 sec into the charge session, terminate the charge session.</li> <li>Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>EV and EVSE execute the Smart Charge Scheduling session.</li> <li>EV sends a SessionStopRequest at the start of the power transfer.</li> <li>EVSE acknowledges the request and the charging power remains 0W.</li> <li>The charging power increases at the end of the scheduled zero power period.</li> </ul>													
<b>Comments</b>														

<b>Test Name</b>	<b>Multi-Step Smart Charge Scheduling with non-zero relative start time</b>	
<b>Test Identifier</b>	ITP-02-11-004	
<b>Test Type</b>	Smart Charge Scheduling (SCS)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To check the effect of a non-zero relative start time in PMaxSchedule.	
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	--	
<b>Test Conditions</b>	<b>EV Initial SoC</b> <50% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> ISO 15118-2, ISO 15118-20 <b>Involved System/s</b> EV, EVSE <b>EV HMI charge scheduling values</b> EAmount: 10kWh, DepartureTime: 3600 (1 hour) <b>EVSE charge scheduling values</b> PMaxScheduleEntry: [0] start: 10, PMax: "nonzero" W [1] start: 30, PMax: "nonzero" W [2] start: 90, Pmax: "nonzero" W	
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to 'Authentication Type'. 3. Set 'EV HMI charging schedule' values. 4. Set 'EVSE charge availability' values. 5. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs. 6. Provide 'Authentication Type'. 7. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest". 8. Terminate the charge session after 150 sec. 9. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>• EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>• The scheduling starts 10 sec after the start of the charge session.</li> <li>• EV and EVSE execute the Smart Charge Scheduling session.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	Multi-Step Smart Charge Scheduling with multiple consecutive relative zero start times with different power levels													
<b>Test Identifier</b>	ITP-02-11-005													
<b>Test Type</b>	Smart Charge Scheduling (SCS)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To check the effect of multiple consecutive steps with relative zero start times in PMaxSchedule													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;50%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 10kWh, DepartureTime: 3600 (1 hour)</td> </tr> <tr> <td><b>EVSE charge scheduling values</b></td> <td>PMaxScheduleEntry: [0] start: 0, PMax: 10000 W [1] start: 0, PMax: 20000 W [2] start: 30, Pmax: "nonzero" W [2] start: 50, Pmax: "nonzero" W</td> </tr> </table>		<b>EV Initial SoC</b>	<50%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)	<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: 10000 W [1] start: 0, PMax: 20000 W [2] start: 30, Pmax: "nonzero" W [2] start: 50, Pmax: "nonzero" W
<b>EV Initial SoC</b>	<50%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)													
<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: 10000 W [1] start: 0, PMax: 20000 W [2] start: 30, Pmax: "nonzero" W [2] start: 50, Pmax: "nonzero" W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>Set EVSE authentication option to 'Authentication Type'.</li> <li>Set 'EV HMI charging schedule' values.</li> <li>Set 'EVSE charge availability' values.</li> <li>Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>Provide 'Authentication Type'.</li> <li>Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>Terminate the charge session after 150 sec.</li> <li>Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>The first step in the PMaxScheduleEntry is neglected, and charge scheduling starts from step 2.</li> <li>EV and EVSE execute the Smart Charge Scheduling session.</li> </ul>													
<b>Comments</b>														

<b>Test Name</b>	<b>Multi-Step Smart Charge Scheduling with multiple non-consecutive relative zero start times with different power levels</b>													
<b>Test Identifier</b>	ITP-02-11-006													
<b>Test Type</b>	Smart Charge Scheduling (SCS)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To check the effect of multiple non-consecutive steps with relative zero start times in PMaxSchedule													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
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<b>EV Initial SoC</b>	<50%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)													
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<b>Steps</b>	<ol style="list-style-type: none"> <li>Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>Set EVSE authentication option to 'Authentication Type'.</li> <li>Set 'EV HMI charging schedule' values.</li> <li>Set 'EVSE charge availability' values.</li> <li>Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>Provide 'Authentication Type'.</li> <li>Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>Terminate the charge session after 150 sec.</li> <li>Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>EV responds to non-consecutive zero time steps with a correction in the PowerDeliveryRequest.</li> <li>EV and EVSE execute the Smart Charge Scheduling session.</li> </ul>													
<b>Comments</b>														

<b>Test Name</b>	Multi-Step Smart Charge Scheduling with multiple consecutive relative non-zero start times													
<b>Test Identifier</b>	ITP-02-11-007													
<b>Test Type</b>	Smart Charge Scheduling (SCS)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To check the effect of multiple consecutive steps with relative zero start times in PMaxSchedule													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;50%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 10kWh, DepartureTime: 3600 (1 hour)</td> </tr> <tr> <td><b>EVSE charge scheduling values</b></td> <td>PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 10000 W [2] start: 30, Pmax:20000 W [2] start: 50, Pmax: "nonzero" W</td> </tr> </table>		<b>EV Initial SoC</b>	<50%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)	<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 10000 W [2] start: 30, Pmax:20000 W [2] start: 50, Pmax: "nonzero" W
<b>EV Initial SoC</b>	<50%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)													
<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 10000 W [2] start: 30, Pmax:20000 W [2] start: 50, Pmax: "nonzero" W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>Set EVSE authentication option to 'Authentication Type'.</li> <li>Set 'EV HMI charging schedule' values.</li> <li>Set 'EVSE charge availability' values.</li> <li>Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>Provide 'Authentication Type'.</li> <li>Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>Terminate the charge session after 150 sec.</li> <li>Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>EV responds to consecutive steps with the same non-zero start times and corrects it in the PowerDeliveryRequest.</li> <li>EV and EVSE execute the Smart Charge Scheduling session.</li> </ul>													
<b>Comments</b>														

<b>Test Name</b>	Multi-Step Smart Charge Scheduling with multiple non-consecutive relative non-zero start times													
<b>Test Identifier</b>	ITP-02-11-008													
<b>Test Type</b>	Smart Charge Scheduling (SCS)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To check the effect of multiple non-consecutive steps with relative zero start times in PMaxSchedule													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;50%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 10kWh, DepartureTime: 3600 (1 hour)</td> </tr> <tr> <td><b>EVSE charge scheduling values</b></td> <td>PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 10000 W [2] start: 50, Pmax: "nonzero" W [3] start: 30, Pmax: 20000 W [4] start: 90, Pmax: "nonzero" W</td> </tr> </table>		<b>EV Initial SoC</b>	<50%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)	<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 10000 W [2] start: 50, Pmax: "nonzero" W [3] start: 30, Pmax: 20000 W [4] start: 90, Pmax: "nonzero" W
<b>EV Initial SoC</b>	<50%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 10kWh, DepartureTime: 3600 (1 hour)													
<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 30, PMax: 10000 W [2] start: 50, Pmax: "nonzero" W [3] start: 30, Pmax: 20000 W [4] start: 90, Pmax: "nonzero" W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>Set EVSE authentication option to 'Authentication Type'.</li> <li>Set 'EV HMI charging schedule' values.</li> <li>Set 'EVSE charge availability' values.</li> <li>Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>Provide 'Authentication Type'.</li> <li>Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>Terminate the charge session after 150 sec.</li> <li>Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>EV responds to non-consecutive non-zero time steps with a correction in the PowerDeliveryRequest.</li> <li>EV and EVSE execute the Smart Charge Scheduling session.</li> </ul>													
<b>Comments</b>														

<b>Test Name</b>	Smart charge scheduling not sufficient to charge the EV													
<b>Test Identifier</b>	ITP-02-11-009													
<b>Test Type</b>	Smart Charge Scheduling (SCS)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To check how an EV reacts when the PMaxSchedule provided by the EVSE is not sufficient to achieve the desired EAmount in DepartureTime													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;10%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 40 kWh, DepartureTime: 3600 (1 hour)</td> </tr> <tr> <td><b>EVSE charge scheduling values</b></td> <td>PMaxScheduleEntry: [0] start: 0, PMax: 20000 W [1] start: 600, PMax: 0 W [2] start: 1800, Pmax: 20000 W</td> </tr> </table>		<b>EV Initial SoC</b>	<10%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 40 kWh, DepartureTime: 3600 (1 hour)	<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: 20000 W [1] start: 600, PMax: 0 W [2] start: 1800, Pmax: 20000 W
<b>EV Initial SoC</b>	<10%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 40 kWh, DepartureTime: 3600 (1 hour)													
<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: 20000 W [1] start: 600, PMax: 0 W [2] start: 1800, Pmax: 20000 W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>Set EVSE authentication option to 'Authentication Type'.</li> <li>Set 'EV HMI charging schedule' values.</li> <li>Set 'EVSE charge availability' values.</li> <li>Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>Provide 'Authentication Type'.</li> <li>Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>Terminate the charge session after 1200 sec.</li> <li>Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>EV creates a PowerDeliveryRequest that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>EV does not attain the desired charging EAmount.</li> </ul>													
<b>Comments</b>														

Test Name	Smart charge scheduling x OCCP Curtailment [Multiple enumerations]	
Test Identifier	ITP-02-11-010	
Test Type	Smart Charge Scheduling (SCS)	
Test Category	Advanced Charging Tests	
Test Purpose	To check how an EVSE and EV react when there is an OCPP curtailment request during a negotiated and ongoing smart charge scheduling session.	
Observed Metrics	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]	
Intended MRECs/Errors	--	
Other Possible MRECs	--	
Test Conditions	<b>EV Initial SoC</b> <10% <b>EV SoC Charge Limit</b> 100% <b>HLC Protocol/s</b> 1. ISO 15118-2 2. ISO 15118-20 <b>OCPP Protocol/s</b> 1. OCPP 2.0.1 2. OCPP 2.1 <b>Involved System/s</b> EV, EVSE, CSMS <b>EV HMI charge scheduling values</b> EAmount: 40 kWh, DepartureTime: 3600 (1 hour) <b>EVSE charge scheduling values</b> PMaxScheduleEntry: [0] start: 0, PMax: 20000 W [1] start: 600, PMax: 0 W [2] start: 1800, Pmax: 20000 W	
Steps	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to 'Authentication Type'. 3. Make sure the EVSE and CSMS support 'OCPP Protocols'. 4. Establish a connection between EVSE and CSMS. 5. Set 'EV HMI charging schedule' values. 6. Set 'EVSE charge availability' values. 7. Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs. 8. Provide 'Authentication Type'. 9. Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest". 10. After 3 min, curtail EVSE current via OCPP corresponding to the power limit of 1kW and curtailment duration of 5 min. Terminate the charge session after 10 min. 11. Unplug EV.	
Pass Criteria (Check box if met)	<ul style="list-style-type: none"> <li>• EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>• EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>• EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>• EVSE and EV respond to the curtailment request from CSMS and set up a new negotiation sequence.</li> </ul>	
Comments		

<b>Test Name</b>	Multi-Step Smart Charge Scheduling with bi-directional power transfer [Multiple enumerations]													
<b>Test Identifier</b>	ITP-02-12-001													
<b>Test Type</b>	Scheduled Bi-directional Power Transfer (SBPT)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To ensure EV and EVSE can perform bidirectional power transfer with Smart Charge Scheduling.													
<b>Observed Metrics</b>	Current [A(DC)], EVSE Available Current [A(DC)], EV Current Req [A(DC)]													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	--													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;50%</td> </tr> <tr> <td><b>EV SoC Charge Limit</b></td> <td>100%</td> </tr> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-2, ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV HMI charge scheduling values</b></td> <td>EAmount: 25kWh, DepartureTime: 600 (1 hour)</td> </tr> <tr> <td><b>EVSE charge scheduling values</b></td> <td>PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 50, PMax: "negative" W [2] start: 100, Pmax: "nonzero" W [3] start: 300, Pmax: "nonzero" W</td> </tr> </table>		<b>EV Initial SoC</b>	<50%	<b>EV SoC Charge Limit</b>	100%	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV HMI charge scheduling values</b>	EAmount: 25kWh, DepartureTime: 600 (1 hour)	<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 50, PMax: "negative" W [2] start: 100, Pmax: "nonzero" W [3] start: 300, Pmax: "nonzero" W
<b>EV Initial SoC</b>	<50%													
<b>EV SoC Charge Limit</b>	100%													
<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20													
<b>Involved System/s</b>	EV, EVSE													
<b>EV HMI charge scheduling values</b>	EAmount: 25kWh, DepartureTime: 600 (1 hour)													
<b>EVSE charge scheduling values</b>	PMaxScheduleEntry: [0] start: 0, PMax: "nonzero" W [1] start: 50, PMax: "negative" W [2] start: 100, Pmax: "nonzero" W [3] start: 300, Pmax: "nonzero" W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>Set EVSE authentication option to 'Authentication Type'.</li> <li>Set 'EV HMI charging schedule values'.</li> <li>Set 'EVSE charge availability' values.</li> <li>Plug-in vehicle. Ensure the vehicle is plugged in before any session timeout occurs.</li> <li>Provide 'Authentication Type'.</li> <li>Observe session initialization HLC Messaging and record "ChargingProfile" within the EV message "PowerDeliveryRequest".</li> <li>Terminate the charge session after 150 sec.</li> <li>Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV communicates Charge Parameters via a ChargeParameterDiscoveryRequest.</li> <li>EVSE responds with ChargeParameterDiscoveryResponse and provides available charge availability.</li> <li>EV creates a ChargingProfile that accommodates the PMaxScheduleEntry within the ChargeParameterDiscoveryResponse.</li> <li>EV and EVSE execute the Smart Charge Scheduling session.</li> </ul>													
<b>Comments</b>														

<b>Test Name</b>	V2G Dynamic BPT using ISO 15118-20, Command -5Amps																	
<b>Test Identifier</b>	ITP-02-13-001																	
<b>Test Type</b>	Dynamic Bi-directional Power Transfer (DBPT)																	
<b>Test Category</b>	Advanced Charging Tests																	
<b>Test Purpose</b>	- To test ISO 15118-20 V2G Dynamic Bidirectional Power Transfer charging feature - To test charge scheduling capabilities within Dynamic BPT																	
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response, HLC Messaging																	
<b>Intended MRECs/Errors</b>	--																	
<b>Other Possible MRECs</b>	MessageSequenceFailure, Other failure																	
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-20</td> </tr> <tr> <td><b>Involved System/s</b></td> <td>EV, EVSE</td> </tr> <tr> <td><b>EV Initial SoC</b></td> <td>&lt;50%</td> </tr> <tr> <td><b>EV ServiceID/s</b></td> <td>ServiceDiscoveryRequest: ServiceID:17</td> </tr> <tr> <td><b>EV Charge Parameters</b></td> <td>ChargeParameterDiscoveryReq: EVMinimumEnergyRequest: -5000W EVMaximumDischargePower: -10000W EVMaximumDischargeCurrent: -10A MinimumSOC: 5%</td> </tr> <tr> <td><b>EVSE Charge Parameters</b></td> <td>ChargeParameterDiscoveryRes: EVSEMaximumDischargePower: -10000W EVSEMaximumDischargeCurrent: -10A</td> </tr> <tr> <td><b>EV Bidirectional Control</b></td> <td>DC_BidirectionalControlReq: EVTargetCurrent: 'value' EVMaximumDischargeCurrent: -10A EVMaximumDischargePower: -10000W</td> </tr> <tr> <td><b>EVSE Bidirectional Control</b></td> <td>DC_BidirectionalControlRes: EVSEPresentCurrent: -5A</td> </tr> </table>		<b>HLC Protocol/s</b>	ISO 15118-20	<b>Involved System/s</b>	EV, EVSE	<b>EV Initial SoC</b>	<50%	<b>EV ServiceID/s</b>	ServiceDiscoveryRequest: ServiceID:17	<b>EV Charge Parameters</b>	ChargeParameterDiscoveryReq: EVMinimumEnergyRequest: -5000W EVMaximumDischargePower: -10000W EVMaximumDischargeCurrent: -10A MinimumSOC: 5%	<b>EVSE Charge Parameters</b>	ChargeParameterDiscoveryRes: EVSEMaximumDischargePower: -10000W EVSEMaximumDischargeCurrent: -10A	<b>EV Bidirectional Control</b>	DC_BidirectionalControlReq: EVTargetCurrent: 'value' EVMaximumDischargeCurrent: -10A EVMaximumDischargePower: -10000W	<b>EVSE Bidirectional Control</b>	DC_BidirectionalControlRes: EVSEPresentCurrent: -5A
<b>HLC Protocol/s</b>	ISO 15118-20																	
<b>Involved System/s</b>	EV, EVSE																	
<b>EV Initial SoC</b>	<50%																	
<b>EV ServiceID/s</b>	ServiceDiscoveryRequest: ServiceID:17																	
<b>EV Charge Parameters</b>	ChargeParameterDiscoveryReq: EVMinimumEnergyRequest: -5000W EVMaximumDischargePower: -10000W EVMaximumDischargeCurrent: -10A MinimumSOC: 5%																	
<b>EVSE Charge Parameters</b>	ChargeParameterDiscoveryRes: EVSEMaximumDischargePower: -10000W EVSEMaximumDischargeCurrent: -10A																	
<b>EV Bidirectional Control</b>	DC_BidirectionalControlReq: EVTargetCurrent: 'value' EVMaximumDischargeCurrent: -10A EVMaximumDischargePower: -10000W																	
<b>EVSE Bidirectional Control</b>	DC_BidirectionalControlRes: EVSEPresentCurrent: -5A																	
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>2. Set EVSE authentication option to 'Authentication Type'.</li> <li>3. Set EV available service IDs to 'EV ServiceIDs'.</li> <li>4. Set EV charge parameters to include 'EV Charge Parameters' values.</li> <li>5. Set EVSE charge parameters to include 'EVSE Charge Parameters' values.</li> <li>6. Plug-in vehicle Within 30 seconds.</li> <li>7. Provide 'Authentication Type'.</li> <li>8. Observe the session initialization into power transfer.</li> <li>9. Ensure EV continuously sends (over HLC) 'EV Bidirectional Control'.</li> <li>10. Ensure EVSE continuously responds (over HLC) with 'EVSE Bidirectional Control'.</li> <li>11. If no fault occurs, after 60 seconds terminate charge session. Unplug EV.</li> </ol>																	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The EV and EVSE execute a reverse Power Transfer, i.e.</li> <li>• EV battery supplying the grid.</li> </ul>																	
<b>Comments</b>																		

<b>Test Name</b>	V2G Dynamic BPT using ISO 15118-20, Power request from -20kW to 20kW every 5 seconds.	
<b>Test Identifier</b>	ITP-02-13-002	
<b>Test Type</b>	Dynamic Bi-directional Power Transfer (DBPT)	
<b>Test Category</b>	Advanced Charging Tests	
<b>Test Purpose</b>	To ensure that rapid change in power flow can be handled during DBPT.	
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence	
<b>Intended MRECs/Errors</b>	--	
<b>Other Possible MRECs</b>	MessageSequenceFailure, Other failure	
<b>Test Conditions</b>	<b>HLC Protocol/s</b>	ISO 15118-20
	<b>EV ServiceID/s</b>	ServiceDiscoveryRequest: ServiceID:17
	<b>EV Charge Parameters</b>	ChargeParameterDiscoveryReq: EVMaximumChargePower: 20000W EVMaximumDischargePower: -20000W MinimumSOC: 5%
	<b>EVSE Charge Parameters</b>	ChargeParameterDiscoveryRes: EVSEMaximumDischargePower: 20000W EVSEMaximumDischargePower: -20000W
	<b>EV Bidirectional Control</b>	DC_BidirectionalControlReq: EVTargetCurrent: 'value' [Step-1] EVMaximumDischargePower: -20000W, Duration: 5 sec [Step-2] EVMaximumChargePower: 20000W, Duration: 5 sec [Step-3] EVMaximumDischargePower: -20000W, Duration: 5 sec [Step-4] EVMaximumChargePower: 20000W, Duration: 5 sec
	<b>EVSE Bidirectional Control</b>	DC_BidirectionalControlRes: [Step-1] EVSEMaximumDischargePower: -20000W [Step-2] EVSEMaximumChargePower: 20000W [Step-3] EVSEMaximumDischargePower: -20000W [Step-4] EVSEMaximumChargePower: 20000W
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to 'Authentication Type'. 3. Set EV available service IDs to 'EV ServiceIDs'. 4. Set EV charge parameters to include 'EV Charge Parameters' values. 5. Set EVSE charge parameters to include 'EVSE Charge Parameters' values. 6. Plug-in vehicle Within 30 seconds. 7. Provide 'Authentication Type'. 8. Observe the session initialization into the power transfer. 9. Ensure EV continuously sends (over HLC) 'EV Bidirectional Control'. 10. Ensure EVSE continuously responds (over HLC) with 'EVSE Bidirectional Control'. 11. Observe the change in the power flow handled by the EVSE and EV. 12. If no fault occurs, after 60 sec, terminate the charge session. Unplug EV.	
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The EV and EVSE execute a Bidirectional Power Transfer.</li> <li>• The EVSE and EV can handle rapid bidirectional scheduled power flow.</li> </ul>	
<b>Comments</b>		

<b>Test Name</b>	V2G Dynamic BPT using ISO 15118-20; Request max rated negative power.													
<b>Test Identifier</b>	ITP-02-13-003													
<b>Test Type</b>	Dynamic Bi-directional Power Transfer (DBPT)													
<b>Test Category</b>	Advanced Charging Tests													
<b>Test Purpose</b>	To ensure the nameplate-rated bi-directional power flow is functional.													
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence													
<b>Intended MRECs/Errors</b>	--													
<b>Other Possible MRECs</b>	MessageSequenceFailure, Other failure													
<b>Test Conditions</b>	<table border="1"> <tr> <td><b>HLC Protocol/s</b></td> <td>ISO 15118-20</td> </tr> <tr> <td><b>EV ServiceID/s</b></td> <td>ServiceDiscoveryRequest: ServiceID:17</td> </tr> <tr> <td><b>EV Charge Parameters</b></td> <td>ChargeParameterDiscoveryReq: EVMaximumDischargePower: -120000W MinimumSOC: 5%</td> </tr> <tr> <td><b>EVSE Charge Parameters</b></td> <td>ChargeParameterDiscoveryRes: EVSEMaximumDischargePower: -120000W</td> </tr> <tr> <td><b>EV Bidirectional Control</b></td> <td>DC_BidirectionalControlReq: EVMaximumDischargePower: -120000W</td> </tr> <tr> <td><b>EVSE Bidirectional Control</b></td> <td>DC_BidirectionalControlRes: EVSEMaximumDischargePower: -120000W</td> </tr> </table>		<b>HLC Protocol/s</b>	ISO 15118-20	<b>EV ServiceID/s</b>	ServiceDiscoveryRequest: ServiceID:17	<b>EV Charge Parameters</b>	ChargeParameterDiscoveryReq: EVMaximumDischargePower: -120000W MinimumSOC: 5%	<b>EVSE Charge Parameters</b>	ChargeParameterDiscoveryRes: EVSEMaximumDischargePower: -120000W	<b>EV Bidirectional Control</b>	DC_BidirectionalControlReq: EVMaximumDischargePower: -120000W	<b>EVSE Bidirectional Control</b>	DC_BidirectionalControlRes: EVSEMaximumDischargePower: -120000W
<b>HLC Protocol/s</b>	ISO 15118-20													
<b>EV ServiceID/s</b>	ServiceDiscoveryRequest: ServiceID:17													
<b>EV Charge Parameters</b>	ChargeParameterDiscoveryReq: EVMaximumDischargePower: -120000W MinimumSOC: 5%													
<b>EVSE Charge Parameters</b>	ChargeParameterDiscoveryRes: EVSEMaximumDischargePower: -120000W													
<b>EV Bidirectional Control</b>	DC_BidirectionalControlReq: EVMaximumDischargePower: -120000W													
<b>EVSE Bidirectional Control</b>	DC_BidirectionalControlRes: EVSEMaximumDischargePower: -120000W													
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>2. Set EVSE authentication option to 'Authentication Type'.</li> <li>3. Set EV available service IDs to 'EV ServiceIDs'.</li> <li>4. Set EV charge parameters to include 'EV Charge Parameters' values.</li> <li>5. Set EVSE charge parameters to include 'EVSE Charge Parameters' values.</li> <li>6. Plug-in vehicle Within 30 seconds.</li> <li>7. Provide 'Authentication Type'.</li> <li>8. Observe the session initialization into the power transfer.</li> <li>9. Ensure EV continuously sends (over HLC) 'EV Bidirectional Control'.</li> <li>10. Ensure EVSE continuously responds (over HLC) with 'EVSE Bidirectional Control'.</li> <li>11. Observe the maximum negative power flow handled by the EVSE and EV.</li> <li>12. If no fault occurs, after 60 sec, terminate the charge session. Unplug EV.</li> </ol>													
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• The EV and EVSE perform bidirectional power transfer at the EV's maximum rated negative power capacity.</li> </ul> <input type="checkbox"/>													
<b>Comments</b>														

<b>Test Name</b>	PnC with all valid certificates		
<b>Test Identifier</b>	ITP-03-14-001		
<b>Test Type</b>	Basic Certificate Validity Tests		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE can establish a secure communication session using valid PKI certificates following the ISO 15118 standard.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	1. Ensure "Valid Certificate/s" are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Set EVSE HLC highest priority to 'HLC Protocol'. 4. Set EVSE authentication option to 'Authentication Type'. 5. Plug-in vehicle. 6. Observe the session initialization into power transfer. 7. Terminate charge session 30-60s into power transfer. 8. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE validates Leaf certificates successfully, accepts valid EV certificates, and the charging session starts.</li> <li>• EV validates and accepts EVSE certificates, and the charging session starts.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Invalid "EV provisioning certificate" [Multiple enumerations]		
<b>Test Identifier</b>	ITP-03-14-002		
<b>Test Type</b>	Basic Certificate Validity Tests		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if invalid PKI certificates are present.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	EV Provisioning Cert
<b>Steps</b>	<b>Reason/s for Certificate/s Invalidity</b>		
	1. Expired certificate, 2. Invalid signature, 3. Corrupted certificate chain, 4. Revoked Certificate, 5. Mismatched CN or SAN, 6. Tampered format		
	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment.		
	2. Ensure all certificates form a valid chain to a common trust anchor.		
	3. Ensure the EV Provisioning Cert is invalid due to one of the "Reason/s for Certificate/s Invalidity".		
	4. Set EVSE HLC highest priority to 'HLC Protocol'.		
	5. Set EVSE authentication option to 'Authentication Type'.		
	6. Plug-in vehicle.		
	7. Observe the session initialization into power transfer.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• SECC Leaf certificate is valid, EVSE rejects invalid EV provisioning certificate.</li> <li>• EVSE prompts user to use EIM without unplugging the EV.</li> </ul>		
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Invalid "Contract Certificate" [Multiple enumerations]		
<b>Test Identifier</b>	ITP-03-14-003		
<b>Test Type</b>	Basic Certificate Validity Tests		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if invalid PKI certificates are present.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, SECC Leaf Certificate, EV Provisioning Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	Contract Cert
<b>Steps</b>	<b>Reason/s for Certificate/s Invalidity</b>		
	1. Expired certificate, 2. Invalid signature, 3. Corrupted certificate chain, 4. Revoked Certificate, 5. Mismatched CN or SAN, 6. Tampered format		
	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment.		
	2. Ensure all certificates form a valid chain to a common trust anchor.		
	3. Ensure the Contract Certificate is invalid due to one of the "Reason/s for Certificate/s Invalidity".		
	4. Set EVSE HLC highest priority to 'HLC Protocol'.		
	5. Set EVSE authentication option to 'Authentication Type'.		
	6. Plug-in vehicle.		
	7. Observe the session initialization into power transfer.		
<b>Pass Criteria (Check box if met)</b>	8. If power transfer begins, terminate the charge session 30-60s into power transfer.		
	9. Unplug EV.		
	<ul style="list-style-type: none"> <li>• EVSE cannot authenticate the invalid contract certificate.</li> <li>• The charging session doesn't start.</li> <li>• EVSE prompts user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Invalid "SECC Leaf Certificate" [Multiple enumerations]		
<b>Test Identifier</b>	ITP-03-14-004		
<b>Test Type</b>	Basic Certificate Validity Tests		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if invalid PKI certificates are present.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	SECC Leaf Cert
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Ensure the SECC Leaf Certificate is invalid due to one of the "Reason/s for Certificate/s Invalidity". 4. Set EVSE HLC highest priority to 'HLC Protocol'. 5. Set EVSE authentication option to 'Authentication Type'. 6. Plug-in vehicle. 7. Observe the session initialization into power transfer. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
	<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV rejects invalid EVSE Leaf certificate, charging session doesn't begin.</li> <li>• EVSE prompts user to use EIM without unplugging the EV.</li> </ul>	
		<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	
<b>Comments</b>			

<b>Test Name</b>	Invalid ProvServe Certificate/ Signature. [Multiple enumerations]		
<b>Test Identifier</b>	ITP-03-14-005		
<b>Test Type</b>	Basic Certificate Validity Tests		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if invalid PKI certificates are present.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert)
		<b>Invalid Certificate/s</b>	ProvServ Certificate
		<b>Reason/s for Certificate/s Invalidity</b>	1. Invalid signature, 2. Tampered format, 3. Expired certificate
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Ensure the ProvServe Certificate/ Signature is invalid due to one of the "Reason/s for Certificate/s Invalidity". 4. Set EVSE HLC highest priority to 'HLC Protocol'. 5. Set EVSE authentication option to 'Authentication Type'. 6. Plug-in vehicle. 7. Observe the session initialization into power transfer. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>The contract certificate cannot be installed due to an invalid ProvServ certificate/signature.</li> <li>EVSE prompts user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Valid Certificate Concatenation testing.		
<b>Test Identifier</b>	ITP-03-14-006		
<b>Test Type</b>	Basic Certificate Validity Tests		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure EVSE can send a certificate chain in a concatenated/ bundled form.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all EVSE-related certificates (SECC Leaf cert, CSO SubCA1 Cert, CSO SubCA2 Cert, V2G Root CA Cert) form a valid chain to a common trust anchor. 3. Set EVSE HLC highest priority to 'HLC Protocol'. 4. Set EVSE authentication option to 'Authentication Type'. 5. Plug-in vehicle. 6. Observe the session initialization into power transfer. 7. If power transfer begins, terminate the charge session 30-60s into power transfer. 8. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE sends the concatenated/ bundled chain of all EVSE-related PKI Certificates during a TLS session setup or certificate installation.</li> <li>• EV accepts the concatenated message payload and authenticates the validity of the certificate chain.</li> <li>• EV validates the EVSE certificates and a charging session begins.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	CRL to verify PKI certificates and check revocation [NREL 1.1.1]		
<b>Test Identifier</b>	ITP-03-15-001		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure EVSE can retrieve, validate and use a Certificate Revocation List (CRL) from a CA or SubCA.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert,(Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Disable OCSP connections to ensure the EVSE depends solely on CRL retrieval for certificate validation. 4. Ensure the Certificate Revocation List (CRL) is updated and none of the valid PKI certificates are listed in the CRL. 5. Set EVSE HLC highest priority to 'HLC Protocol'. 6. Set EVSE authentication option to 'Authentication Type'. 7. Plug-in vehicle. 8. Observe the session initialization into power transfer. 9. Terminate charge session 30-60s into power transfer. 10. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE gets a signed CRL from the CA/ SubCAs and validates that it is correctly signed.</li> <li>• The certificate chain to issue valid EVSE and Contract certificates is operational.</li> <li>• A charging session begins.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	OCSP to verify PKI certificate validity and revocation status [NREL 1.1.2]		
<b>Test Identifier</b>	ITP-03-15-002		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure EVSE can retrieve the status of a particular EV certificate using OCSP.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert,(Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Clear cached CRLs to force EVSE to use OCSP for certificate validation. 4. Set EVSE HLC highest priority to 'HLC Protocol'. 5. Set EVSE authentication option to 'Authentication Type'. 6. Plug-in vehicle. 7. Observe the session initialization into power transfer. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• During the certificate validation process, EVSE requests a status response on a particular PKI certificate or certificate chain using OCSP.</li> <li>• EVSE receives a response and ensures the validity of the certificates and trust anchor with a correctly signed OCSP response.</li> <li>• A charging session begins.</li> <li>• ** OCSP Pass Criteria **</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Revoked "EV Contract Certificate" [Multiple enumerations] [NREL 1.1.3]		
<b>Test Identifier</b>	ITP-03-15-003		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if a PKI certificate is revoked.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	Contract Cert
		<b>Reason/s for Certificate/s Invalidity</b>	1. Revoked Certificate (Listed in CRL). 2. Revoked Certificate (OCSP Response)
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Ensure the Contract Certificate is invalid due to the "Reason/s for Certificate/s Invalidity". 4. Set EVSE HLC highest priority to 'HLC Protocol'. 5. Set EVSE authentication option to 'Authentication Type'. 6. Plug-in vehicle. 7. If power transfer begins, terminate the charge session 30-60s into power transfer. 8. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE gets a signed CRL/ OCSP response from the CA and validates that it is correctly signed.</li> <li>• The Contract Certificate is identified as revoked, and the EVSE prevents the charging session from starting.</li> <li>• EVSE prompts user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Valid "EV Contract Certificate" and check for valid EMAID [NREL 1.1.4]		
<b>Test Identifier</b>	ITP-03-15-004		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE can establish a secure communication session using valid PKI certificates following the ISO 15118 standard.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment.</li> <li>2. Ensure all certificates form a valid chain to a common trust anchor.</li> <li>3. Ensure the Certificate Revocation List (CRL) is updated and none of the valid PKI certificates are listed in the CRL.</li> <li>4. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>5. Plug-in vehicle.</li> <li>6. Observe the session initialization into power transfer.</li> <li>7. Terminate charge session 30-60s into power transfer.</li> <li>8. Unplug EV.</li> </ol>		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE checks the cached revocation list or retrieves an updated CRI or gets a contract certificate status using OCSP.</li> <li>• The EVSE identifies EMAID and a valid Contract Certificate.</li> <li>• The charging session is allowed to proceed.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Valid "EV Contract Certificate" but Invalid CRL Signature (OCSP disabled) [NREL 1.1.5]		
<b>Test Identifier</b>	ITP-03-15-005		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To test the outcome when the EV Contract Certificate is valid but EVSE cannot use CRL because it is invalid.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
		<b>Reason/s for Certificate/s Invalidity</b>	Invalid CRL signature
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Disable OCSP connections to ensure the EVSE depends solely on CRL retrieval for certificate validation. 4. Ensure the Certificate Revocation List (CRL) provided by CA/ SubCAs or retrieved from cache has an invalid signature. 5. Set EVSE HLC highest priority to 'HLC Protocol'. 6. Set EVSE authentication option to 'Authentication Type'. 7. Plug-in vehicle. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE gets a signed CRL from the CA and checks the validity of the signature.</li> <li>• The CRL signature is identified as invalid, and the EVSE prevents the charging session from starting.</li> <li>• EVSE prompts the user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Invalid "SECC Leaf Certificate", stapled OCSP shows revoked certificate [NREL 1.1.6]		
<b>Test Identifier</b>	ITP-03-15-006		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure the EV can retrieve the status of a specific EVSE certificate using OCSP and determine whether to initiate the charging session based on the certificate/ certificate chain status.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	SECC Leaf Certificate
		<b>Reason/s for Certificate/s Invalidity</b>	Revoked certificate (OCSP Response)
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Clear cached CRLs to force EVSE to use OCSP for certificate validation. 4. Ensure the SECC Leaf Certificate is invalid due to the "Reason/s for Certificate/s Invalidity". 4. Ensure the OCSP response for the SECC Leaf Certificate is stapled to TLS. 6. Set EVSE HLC highest priority to 'HLC Protocol'. 7. Set EVSE authentication option to 'Authentication Type'. 8. Plug-in vehicle. 9. If power transfer begins, terminate the charge session 30-60s into power transfer. 10. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV checks the stapled response for SECC Leaf Certificate status via OCSP and does not proceed with the charge session.</li> <li>EVSE prompts the user to use EIM without unplugging the EV.</li> </ul> <input type="checkbox"/> <input checked="" type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Valid "SECC Leaf Certificate", stapled OCSP shows not revoked [NREL 1.1.7]		
<b>Test Identifier</b>	ITP-03-15-007		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure the EV can retrieve the status of a specific EVSE certificate using OCSP and determine whether to initiate the charging session based on the certificate/ certificate chain status.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	--		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, Contract Cert, SECC Leaf Certificate, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	1. Ensure "Valid Certificate/s" are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Clear cached CRLs to force EVSE to use OCSP for certificate validation. 4. Ensure the OCSP response for the SECC Leaf Certificate is stapled to TLS. 5. Set EVSE HLC highest priority to 'HLC Protocol'. 6. Set EVSE authentication option to 'Authentication Type'. 7. Plug-in vehicle. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV should check the stapled response to validate it is not revoked and proceed with the rest of certificate validation.</li> </ul> <input type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Valid "SECC Leaf Certificate", stapled OCSP has invalid root signature [NREL 1.1.8]		
<b>Test Identifier</b>	ITP-03-15-008		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure the EV can retrieve the status of a specific EVSE certificate using OCSP and determine whether to initiate the charging session based on the certificate/ certificate chain status.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, Contract Cert, SECC Leaf Certificate, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
		<b>Reason/s for Certificate/s Invalidity</b>	Invalid Root Signature (OCSP Response)
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Clear cached CRLs to force EVSE to use OCSP for certificate validation. 4. Ensure the SECC Leaf Certificate has OCSP response with invalid root signature stapled to TLS. 5. Set EVSE HLC highest priority to 'HLC Protocol'. 6. Set EVSE authentication option to 'Authentication Type'. 7. Plug-in vehicle. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>EV sees that the stapled response has an invalid root signature; the charge session does not proceed.</li> <li>EVSE prompts the user to use EIM without unplugging the EV.</li> </ul> <input type="checkbox"/> <input checked="" type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Valid PKI Certificates, No CRL or OCSP availability to validate certificates [Multiple enumerations]		
<b>Test Identifier</b>	ITP-03-15-009		
<b>Test Type</b>	Revocation: EVSE & Contract Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure the EVSE does not initiate a charging session without confirming the validity of the PKI certificates.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, Contract Cert, SECC Leaf Certificate, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment.</li> <li>2. Ensure all certificates form a valid chain to a common trust anchor.</li> <li>3. Ensure no cached CRL is available.</li> <li>4. Take the EVSE offline to disable OCSP connections and prevent it from downloading an updated CRL.</li> <li>5. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>6. Set EVSE authentication option to 'Authentication Type'.</li> <li>7. Plug-in vehicle.</li> <li>8. If power transfer begins, terminate the charge session 30-60s into power transfer.</li> <li>9. Unplug EV.</li> </ol>	<input type="checkbox"/>	
		<input type="checkbox"/>	
<b>Comments</b>			

<b>Test Name</b>	Valid PKI certificates, updated/valid CRL, CRL shows revoked CSO SubCA2 certificate [NREL 1.2.1]		
<b>Test Identifier</b>	ITP-03-16-001		
<b>Test Type</b>	Revocation: Sub-CA2 Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if invalid PKI certificates are present.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	CSO SubCA2 Cert
		<b>Reason/s for Certificate/s Invalidity</b>	Revoked certificate (Listed in CRL)
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Ensure the CSO SubCA2 Certificate is invalid due to one of the "Reason/s for Certificate/s Invalidity". 4. Set EVSE HLC highest priority to 'HLC Protocol'. 5. Set EVSE authentication option to 'Authentication Type'. 6. Plug-in vehicle. 7. Observe the session initialization into power transfer. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE identifies the invalidity of CSO SubCA2 certificate.</li> <li>• The charge session is not initiated.</li> <li>• EVSE prompts the user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Valid PKI certificates, updated/valid CRL, CRL shows revoked EV SubCA2 Certificate [NREL 1.2.2]		
<b>Test Identifier</b>	ITP-03-16-002		
<b>Test Type</b>	Revocation: Sub-CA2 Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if invalid PKI certificates are present.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	EV SubCA2 Cert
		<b>Reason/s for Certificate/s Invalidity</b>	Revoked certificate (Listed in CRL)
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Ensure the EV SubCA2 Certificate is invalid due to one of the "Reason/s for Certificate/s Invalidity". 4. Set EVSE HLC highest priority to 'HLC Protocol'. 5. Set EVSE authentication option to 'Authentication Type'. 6. Plug-in vehicle. 7. Observe the session initialization into power transfer. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE identifies the invalidity of the EV SubCA2 certificate.</li> <li>• The charge session is not initiated.</li> <li>• EVSE prompts the user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Valid PKI certificates, expired CRL/OCSP cache outside 4 weeks for SubCA Certificates [Multiple enumerations] [NREL 1.2.3]		
<b>Test Identifier</b>	ITP-03-16-003		
<b>Test Type</b>	Revocation: Sub-CA2 Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure the EVSE does not initiate a charging session without confirming the validity of the PKI certificates.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, (Optionally: ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Ensure the cached CRL/ cached OCSP response is dated before 4 weeks. (Manually alter the date of the cache stored) 4. Take the EVSE offline to disable OCSP connections and prevent it from downloading an updated CRL. 5. Set EVSE HLC highest priority to 'HLC Protocol'. 6. Set EVSE authentication option to 'Authentication Type'. 7. Plug-in vehicle. 8. If power transfer begins, terminate the charge session 30-60s into power transfer. 9. Unplug EV.		
	• EVSE tries to get an updated CRL by accessing the CRL Distribution point provided in the certificate metadata. • With no or hanging OCSP response, EVSE cannot get an updated certificate validity information. • The charge session is not initiated.  • EVSE prompts the user to use EIM without unplugging the EV.		
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
<b>Comments</b>			

<b>Test Name</b>	Valid PKI certificates, CRL/OCSP cache not updated for 1 week for SubCA Certificates [Multiple enumerations] [NREL 1.2.4]		
<b>Test Identifier</b>	ITP-03-16-004		
<b>Test Type</b>	Revocation: Sub-CA2 Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure the EVSE does not initiate a charging session without confirming the validity of the PKI certificates.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, (Optionally: EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	None
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment.</li> <li>2. Ensure all certificates form a valid chain to a common trust anchor.</li> <li>3. Ensure the cached CRL/ cached OCSP response is dated before 7 days. (Manually alter the date of the cache stored)</li> <li>4. Set EVSE HLC highest priority to 'HLC Protocol'.</li> <li>5. Set EVSE authentication option to 'Authentication Type'.</li> <li>6. Plug-in vehicle.</li> <li>7. If power transfer begins, terminate the charge session 30-60s into power transfer.</li> <li>8. Unplug EV.</li> </ol>		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE gets an updated CRL/ OCSP Response by accessing the CRL Distribution point provided in the certificate metadata.</li> <li>• The EVSE checks valid Contract Certificates.</li> <li>• The charging session is allowed to proceed.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	EVSE sends OCSP stapled response to EV, but the CSO SubCA2 Certificate has been revoked. [NREL 1.2.5]		
<b>Test Identifier</b>	ITP-03-16-005		
<b>Test Type</b>	Revocation: Sub-CA2 Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure the EV can retrieve the status of a specific EVSE certificate using OCSP and determine whether to initiate the charging session based on the certificate/ certificate chain status.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert, EV SubCA1 Cert, EV SubCA2 Cert, CSO SubCA1 Cert, CSO SubCA2 Cert (Optionally: ProvServ Cert)
		<b>Invalid Certificate/s</b>	CSO SubCA2
		<b>Reason/s for Certificate/s Invalidity</b>	Revoked Certificate (OCSP response)
<b>Steps</b>	1. Ensure 'Valid Certificate/s' are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Clear cached CRLs to force EVSE to use OCSP for certificate validation. 4. Ensure the OCSP response for the SECC Leaf Certificate chain is stapled to TLS. 5. Ensure the CSO SubCA2 Cert is revoked. 6. Set EVSE HLC highest priority to 'HLC Protocol'. 7. Set EVSE authentication option to 'Authentication Type'. 8. Plug-in vehicle. 9. If power transfer begins, terminate the charge session 30-60s into power transfer. 10. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV catches the stapled response shows that it is invalidly signed.</li> <li>• The charge session is not initiated.</li> <li>• EVSE prompts the user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Both EV SubCA2 and CSO SubCA2 Certificates are revoked [Multiple enumerations] [NREL 1.2.6]		
<b>Test Identifier</b>	ITP-03-16-006		
<b>Test Type</b>	Revocation: Sub-CA2 Certs [NREL Test Cases]		
<b>Test Category</b>	Single PKI Tests		
<b>Test Purpose</b>	To ensure that the EV and EVSE cannot establish a secure communication session in accordance with the ISO 15118 standard, if a PKI certificates are revoked.		
<b>Observed Metrics</b>	Session Initialization, Messages, EV UI response, EVSE UI response, HLC Message Sequence		
<b>Intended MRECs/Errors</b>	--		
<b>Other Possible MRECs</b>	InvalidToken, InvalidPayment		
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC	
	<b>HLC Protocol/s</b>	ISO 15118-2, ISO 15118-20	
	<b>Involved System/s</b>	EV, EVSE, PKI Provider	
	<b>Certificate/s (PKI)</b>	<b>Valid Certificate/s</b>	V2G Root CA Cert, EV Provisioning Cert, SECC Leaf Certificate, Contract Cert (Optionally: EV SubCA1 Cert, , CSO SubCA1 Cert, CSO SubCA2 Cert, ProvServ Cert)
		<b>Invalid Certificate/s</b>	EV SubCA2 Cert, CSO SubCA2 Cert
		<b>Reason/s for Certificate/s Invalidity</b>	1. Revoked SubCA2s (Listed in CRL). 2. Revoked Certificates (OCSP Response)
<b>Steps</b>	1. Ensure 'Valid Certificate/s" are installed on the appropriate entity within the charging environment. 2. Ensure all certificates form a valid chain to a common trust anchor. 3. Ensure the SubCA2 Certificates are invalid due to the "Reason/s for Certificate/s Invalidity". 4. Set EVSE HLC highest priority to 'HLC Protocol'. 5. Set EVSE authentication option to 'Authentication Type'. 6. Plug-in vehicle. 7. If power transfer begins, terminate the charge session 30-60s into power transfer. 8. Unplug EV.		
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EVSE sees that both EVSE and EV SubCAs are revoked.</li> <li>• The charge session is not initiated.</li> <li>• EVSE prompts the user to use EIM without unplugging the EV.</li> </ul>		
<b>Comments</b>			

<b>Test Name</b>	Adapter plug-in to connector first				
<b>Test Identifier</b>	ITP-02-17-001				
<b>Test Type</b>	Adapter Tests				
<b>Test Category</b>	Advanced Charging Tests				
<b>Test Purpose</b>	- To test interoperability of adapters - To ensure different sequence methods of using adapters is accepted				
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	InvalidSequence				
<b>Test Conditions</b>	<b>Authentication Type/s</b>	EIM			
	<b>Plug or Authenticate first</b>	Authenticate			
	<b>HLC Protocol/s</b>	DIN 70121, J1772, ISO 15118-2, ISO 15118-20			
	<b>Involved System/s</b>	EV, EVSE, Adapters			
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to 'Authentication Type'. 3. Provide 'Authentication Type'. 4. Plug the adapter into the EVSE connector first. 5. Within 30seconds, Plug-in the adapter to vehicle. 6. Observe the session initialization into power transfer. 7. After 30 seconds, terminate the charge session. 8. Unplug EV				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV and EVSE allows for adapter to be connected to connector first, session begins.</li> <li>• eSDP recognizes adapter is being used.</li> </ul>				
<b>Comments</b>					

<b>Test Name</b>	<b>Adapter plug-in to vehicle first</b>				
<b>Test Identifier</b>	ITP-02-17-002				
<b>Test Type</b>	Adapter Tests				
<b>Test Category</b>	Advanced Charging Tests				
<b>Test Purpose</b>	- To test interoperability of adapters - To ensure different sequence methods of using adapters is accepted				
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	InvalidSequence				
<b>Test Conditions</b>	<b>Authentication Type/s</b>	EIM			
	<b>Plug or Authenticate first</b>	Authenticate			
	<b>HLC Protocol/s</b>	DIN 70121, J1772, ISO 15118-2, ISO 15118-20			
	<b>Involved System/s</b>	EV, EVSE, Adapters			
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to 'Authentication Type'. 3. Provide 'Authentication Type'. 4. Plug adapter into vehicle inlet first. 5. Within 30seconds, Plug-in connector to adapter. 6. Observe the session initialization into power transfer. 7. After 30 seconds, terminate the charge session. 8. Unplug EV				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV and EVSE allow for adapter to be connected to vehicle first, session begins.</li> <li>• eSDP recognizes adapter is being used.</li> </ul>				
<b>Comments</b>					

<b>Test Name</b>	PnC with adapter				
<b>Test Identifier</b>	ITP-02-17-003				
<b>Test Type</b>	Adapter Tests				
<b>Test Category</b>	Advanced Charging Tests				
<b>Test Purpose</b>	- To test the interoperability of adapters - To ensure PnC authentication method functions using adapters				
<b>Observed Metrics</b>	Session initialization stages, EV UI response, EVSE UI response				
<b>Intended MRECs/Errors</b>	--				
<b>Other Possible MRECs</b>	InvalidSequence				
<b>Test Conditions</b>	<b>Authentication Type/s</b>	PnC			
	<b>Plug or Authenticate first</b>	Plug			
	<b>HLC Protocol/s</b>	DIN 70121, J1772, ISO 15118-2, ISO 15118-20			
	<b>Involved System/s</b>	EV, EVSE, Adapters			
<b>Steps</b>	1. Set EVSE HLC highest priority to 'HLC Protocol'. 2. Set EVSE authentication option to 'Authentication Type'. 3. Plug adapter into vehicle inlet first. 4. Within 30seconds, Plug-in connector to adapter. 5. Observe the session initialization into power transfer. 6. After 30 seconds, terminate the charge session. 7. Unplug EV				
<b>Pass Criteria (Check box if met)</b>	<ul style="list-style-type: none"> <li>• EV and EVSE allow for adapter to begin a PnC session.</li> <li>• eSDP recognizes adapter is being used.</li> </ul>				
<b>Comments</b>					



## About the ChargeX Consortium

The National Charging Experience Consortium (ChargeX Consortium) is a collaborative effort between Argonne National Laboratory, Idaho National Laboratory, National Renewable Energy Laboratory, electric vehicle charging industry experts, consumer advocates, and other stakeholders. Funded by the Joint Office of Energy and Transportation, the ChargeX Consortium's mission is to work together to measure and significantly improve public charging reliability and usability by June 2025. For more information, visit [chargex.inl.gov](http://chargex.inl.gov).

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