

Objects to be tested and criteria

4<sup>th</sup> of July, 2011 OICA

1. Classification of event simulated by each test.

	Classification of event	Applicable test
A	The user is supposed to continue to use the vehicle after the event. In this case, stringent requirements (i.e. prohibit the lower severity risk event) should be applied to ensure the safety operation of vehicle.	Vibration, Thermal Shock & Cycling
B	The user is supposed to stop using the vehicle until certain repair/maintenance is conducted once subject to the event. In this case, the requirement relevant to the accident situation, in order to avoid additional risk to the occupants and the surrounding people, should be applied.	Mechanical Impact (Shock, Integrity), Fire resistance,
C	The proposed test procedure is to confirm the operation of protective function. The tests may be replaced by an expert verification of system safety concept. If such protective function does not exist, stringent requirements (i.e. prohibit the lower severity risk event) should be applied.	External short circuit Overcharge Protection, Over-discharge Protection, Over-temperature Protection.

2. Test ~~objects and~~ criteria

Test procedure	Objects to be tested To be confirmed	Required Criteria						
		Electrolyte Leakage	Enclosure Rupture	Fire	Explosion	Isolation	[venting]	Other Visible Events
Vibration		X	X	X	X	X	[X]	X
Thermal cycling		X	X	X	X	X	[X]	X
Mechanical Shock (vehicle)		*1	*1	X	X	*1		
Mechanical Shock (component)		X	X	X	X	X		
Mechanical Integrity (vehicle)		*1	*1	X	X	*1		
Mechanical Integrity (component)	Until practicable test procedure is developed, no specific test required and the installation condition shall be established for vehicle approval.							
Fire resistance			[X]		X			
External short circuit		X	X	X	X	X		X
Overcharge Protection		X	X	X	X	X		X
Over-discharge Protection		X	X	X	X	X		X
Over-temperature Protection		X	X	X	X	X		X

\*1: Fulfill relevant requirement of R12/94/95.

~~\*\*2: If test fails, a standard cycle has to be conducted~~

3. Definitions

	Term	Definition	Remarks
Object	RESS (Rechargeable energy storage system)	means the rechargeable energy storage system that provides electric energy for electric propulsion.	RESS-3-3r1, para.2.1, (= R100, para.2.23, R12, R94, R95)
	Cell	means a single encased electrochemical unit containing one positive and one negative electrode which exhibits a voltage differential across its two terminals.	RESS-3-3r1, para.2.2
	Lithium ion cell	means a rechargeable electrochemical cell whose electrical energy is derived from the insertion/extraction reactions of lithium ions between the anode and the cathode.	RESS-3-3r1, para.2.3
	<del>Battery</del> module	means an assembly of two or more cells which are electrically connected together fitted with devices necessary for use, for example, case, terminals, marking and protective devices.	RESS-3-3r1, para.2.4
	<del>Battery</del> enclosure	means the physical housing surrounding RESS components, particularly cells or battery modules.	RESS-3-3r1, para.2.5
	<del>Battery</del> pack	means an energy storage device <u>encased by a battery enclosure</u> that contains cells or battery modules normally connected with cell electronics, voltage class B circuit and overcurrent shut-off device including electrical interconnections, interfaces for external systems (e.g. cooling, voltage class B, auxiliary voltage class A and communication).	Modified from ISO12405-1, para.3.2.
Criteria	Electrolyte leakage	<del>means leakage of electrolyte that can be visually observed from the exterior of the battery DUT enclosure.</del>  A condition where liquid electrolyte escapes unintentionally through a rupture or crack or other unintended opening and is external to the device under test (DUT). Venting shall not be considered as electrolyte leakage.  <del>[If applicable test is conducted on battery module or other subsystems, the observation will be conducted without disassemble.]</del>	New definition
	<del>Battery</del> enclosure rupture	means openings through the <del>battery device under test (DUT)</del> enclosure which are created or enlarged by an event and which are sufficiently large for a 50 12 mm diameter <del>sphere test finger</del> to contact <del>battery device under test (DUT) live parts system internal components</del> (see ISO20653, IPXXA, IPXXB).	RESS-3-3r1, para.2.9
	Fire	means the emission of flames from a <del>battery device under test (DUT) [enclosure] that may spread to the other part of the vehicle.</del> Sparks are not flames.	RESS-3-3r1, para.2.7
	Explosion	means <del>very fast</del> release of energy sufficient to cause pressure waves and/or projectiles that may cause <del>considerable</del> structural and/or <del>physical bodily</del> damage to the surrounding of the device under test. Indicators for explosion include, but are not limited to: sudden occurrence of fire,	RESS-3-3r1, para.2.6

		emission of projectiles, loud noise.	
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	Isolation resistance	means conductive resistance Requirement of R100 para. 5.1.3, to be applied between the high voltage terminal of <del>battery pack</del> the device under test (DUT) and the <del>surface of battery enclosure connection point housing</del> which will be connected to the electric chassis of the vehicle.	Apply R100 requirement
	Voltage drop	<del>Difference of overall output voltage of battery pack (or sub-assembly) device DUT before and after the test.</del> <b>Verification</b>	When applying this requirement, no recharging after the test..
	<del>[Other visible events]</del> <b>To be confirmed</b>	means other visible phenomena than those described in paragraphs #.# – #.# (electrolyte leakage to explosion), such as smokes, that can be visually observed from the exterior of the battery enclosure. <del>[If applicable test is conducted on battery module or other subsystems, the observation will be conducted without disassemble.]</del>	New definition <b>To be confirmed</b>