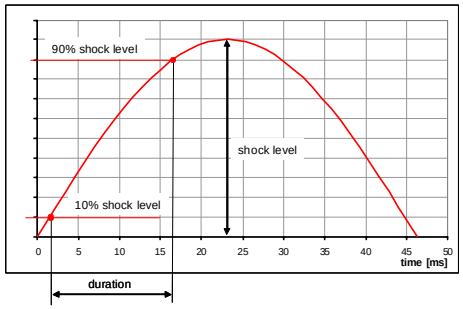
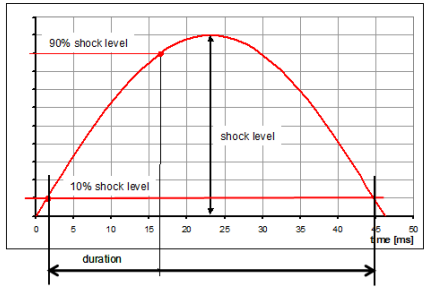
.Requestor	Ref. Clause No./ Annex	Text	Proposed change by the Requestor	Comment (justification for change)
	3.1 Vibration 3.1.2.1 Conditions	The following test can be conducted with the complete [RESS] or, at the discretion of the manufacturer, with ~~[module(s) of the RESS]~~ the battery module(s) and related subsystems (module-based test). If the manufacturer chose the module-based test, the manufacturer shall demonstrate such test result can reasonably represent the performance of the complete RESS with respect to the safety performance under similar condition.	Case 1. • The following test ~~can~~ shall be conducted with the complete [RESS] ~~or~~, ~~at the discretion of the manufacturer, with [module(s) of the RESS] the battery module(s) and related subsystems (module-based test).~~ ~~If the manufacturer chose the module-based test, the manufacturer shall demonstrate such test result can reasonably represent the performance of the complete RESS with respect to the safety performance under similar condition.~~	✓ It's hard to verify that module-based test represent [RESS] –based test.
			Case 2. • The following test ~~can~~ shall be conducted with the complete [RESS] or, at the discretion of the manufacturer, with [module(s) of the RESS] the battery module(s) and related subsystems (module-based test). ~~If the manufacturer chose the module-based test, the manufacturer shall demonstrate such test result can reasonably represent the performance of the complete RESS with respect to the safety performance under similar condition.~~	✓ If test unit(module or RESS) is selective, ambiguous mention would be better to delete.
	3.1.2.5 Acceptance criteria	In R 100, if high voltage DC and AC buses are galvanically connected, the isolation resistance shall be not less than 500 Ω/Volt. If the RESS is dedicated to a vehicle where there is no galvanical connection in between DC and AC high voltage buses, the isolation resistance cannot be less than 100 Ω/Volt, otherwise it shall be 500 Ω/Volt.		✓ Because R100 is based on vehicle level, it is not an appropriate measurement procedure for [RESS] and module.

	3.1.2.5 Acceptance criteria	Post-test open circuit voltage shall be no less than 90% of the pre-test open circuit voltage.	• To be deleted.	✓ If test condition is for safety(abuse) test, acceptance criteria also shall be related to safety ✓ Acceptance criteria of safety test should have interest in dangerous events.
	3.2 Thermal Shock		Case 1. • To be deleted.	✓ Vehicle will not experience such rapid temperature change in the whole life
			Case 2. • Or harmonize with ISO 12405 not with UN 38.3 which is transportation standard.	✓ It's not efficient doing same test with different test conditions.
	3.4.1 Mechanical shock 3.4.1.2.1.1 Vehicle based test	[RESS] installed in a vehicle of category [M1, M2, N1 and N2] that undergoes a vehicle crash test according to ECE-R12 Annex 3 or ECE-R 94 Annex 3 shall meet the acceptance criteria under 3.4.1.2.2. This test is equivalent to the test conditions described in table 5 in 3.4.1.2.1.2. [RESS] installed in a vehicle of category[M1, M2, N1 and N2] that undergoes a vehicle crash test according to ECE-R95 Annex 4 shall meet the acceptance criteria under 3.4.1.2.2. This test is equivalent to the test conditions described in table 6 in 3.4.1.2.1.2.		✓ ECE-R12, R 94, R95 is just for M1, N1 respectively. ✓ It's hard to apply to N2, M2 without revision of R 12, R94 & R95.
	3.4.1.2.1.2 Component based test			✓ Need to clear about vehicle of category between [M1, M2, N1 and N2] and [M1, M2, M3, N1, N2 and N3].

		[A complete [RESS] is to be tested for this condition. However, if conducting this test on a [RESS] is deemed inappropriate due to size or weight, this test may be conducted utilizing subsystem(s) including respective battery module(s) ~~[pack(s)]~~, provided that all portions of the [battery module(s) of the RESS ~~system~~] are evaluated. If tests are performed on [~~pack~~ subsystem basis], evidence shall be provided that the results are representative for [RESS].]	[A complete [RESS] is to be tested for this condition. However, if conducting this test on a [RESS] is deemed inappropriate due to size or weight, this test may be conducted utilizing subsystem(s) including respective battery module(s) ~~[pack(s)]~~, provided that all portions of the [battery module(s) of the RESS ~~system~~] are evaluated. ~~If tests are performed on [basis], evidence shall be provided that the results are representative for [RESS].]~~	✓ If test unit(module or RESS) is selective, ambiguous mention would be better to delete. ✓ Same opinion with 'Condition of vibration test'
		Diagram 2-sinus shock pulse 	• End duration point would be moved end of 10% shock level point not 90% shock level. 	✓ Definition of duration time would be better harmonized to avoid confusion. (between ISO 16750)
	3.4.1.2.2 Acceptance criteria	For [RESS] using high voltage the isolation resistance measured at the end of the test shall maintain high voltage to ground isolation no less than 100 Ω/Volt.		✓ Measuring insulation resistance could not applied to module-based test. ✓ Only necessary for vehicle-based test.
	3.4.2 Mechanical integrity 3.4.2.2.2 Acceptance criteria	For [RESS] using high voltage the isolation resistance measured at the end of the test shall maintain high voltage to ground isolation no less than 100 Ω/Volt.		✓ Measuring insulation resistance could not applied to module-based test. Only necessary for vehicle-based test.

	3.5 Fire resistance 3.5.2.1.5	The flame to which the [RESS] is exposed shall be obtained by burning ~~Heptanes~~ commercial fuel for positive-ignition engines (hereafter called "fuel") in a pan. The quantity of fuel ~~Heptanes~~ poured into the pan shall be sufficient to permit the flame, under free-burning conditions, to burn for the whole test procedure, i.e. at least 25 litres/m².		✓ Minimum fuel quantity(25 litres/m²) would be considered again. KATRI will present test data on the RESS 4th. Meeting.
	3.5.2.1.6	The pan filled with fuel ~~Heptanes~~ shall be placed under the [RESS] in such a way that the distance between the level of the fuel ~~Heptanes~~ in the pan and the [RESS] bottom corresponds to the design height of the [RESS] above the road surface at the unladen mass. Either the pan, or the testing fixture, or both, shall be freely movable.	• The pan filled with fuel shall be placed under the [RESS] in such a way that the distance between the level of the fuel in the pan and the [RESS] bottom corresponds to the design height of the [RESS] above the road surface at the unladen mass (within +/- 1 cm of deviation). Either the pan, or the testing fixture, or both, shall be freely movable.	✓ Distance tolerance should be documented due to measurement error.
	3.5.2.1.4 Phase D: End of test (Figure 4)	The burning pan covered with the screen shall be moved back to its original position (phase A). No extinguishing of the [RESS] shall be done. The [RESS] and its temperature shall ~~should~~ be monitored for ~~1h~~ 24 h after the removal of the pan. The phase D can be stopped as soon as a decrease of the RESS temperature is observed.]	• The burning pan covered with the screen shall be moved back to its original position(phase A). No extinguishing of the [RESS] shall be done. The [RESS] ~~(and its temperature)~~ shall be monitored for ~~24 h~~ 3 h after the removal of the pan. ~~The phase D can be stopped as soon as a decrease of the RESS temperature is observed.~~	✓ Temperature is too high to measure with thermocouple. Sensor with thermal shielding could measure about 1,000 degrees C. But it is hard to install a shielded sensor inside the RESS. ✓ 3 h of monitoring is enough. (24 h monitoring is too long)
	3.6 External short circuit 3.6.2.1 Conditions	The [RESS] to be tested shall be temperature stabilized so that its external case temperature reaches minimum [23 °C]	• The [RESS] to be tested shall be temperature stabilized so that its external case temperature ~~reaches minimum [23 °C]~~ decline by 20% of the maximum temperature rise or 55 °C.	✓ It's very dangerous without any protection function. ✓ Test duration is too long to reach minimum [23 °C]. (Some case, it may take several days) ✓ After inflection point, it could be assumed stabilized. ✓ IEC 62660-5 (20% decline)

		and then the [RESS] shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at minimum [23°C].	• and then the [RESS] shall be subjected to a short circuit condition with a total external resistance of 0.1 +0/-0.04 ohm at minimum [23°C].	✓ Lower limit would be better to document for test. ✓ Test with more low limit is disadvantageous. ✓ Appendix. ISO12405-1 : 100 +0/-40 m Ohm ✓ Appendix. ISO12405-2 : 20 +0/-10 m Ohm
	3.6.2.2 Acceptance criteria	Battery enclosure rupture	• To be deleted	✓ It's not a kind of safety test criteria. ✓ Sometimes [RESS] is designed ruptureable to avoid fire or explosion.
	3.7 Overcharge protection 3.7.2.1 Conditions	[If requirements are performed on [battery module basis], evidence shall be provided that the results are representative for [RESS].]		✓ It's hard to verify that module-based test represent [RESS]–based test. ✓ Same opinion with 'Condition of vibration test'
		Charging shall be continued - until the [RESS] (automatically) interrupt the charging or - until the [RESS] is thermal stationary, which means the temperature change is lower than [2] K within [30] min	Charging shall be continued - until the [RESS] (automatically) interrupt the charging or ~~- until the [RESS] is thermal stationary, which means the temperature change is lower than [2] K within [30] min~~ - Whether SOC level is above 130% or DUT temperature levels are above 55 °C.	✓ If there are no special reason, termination condition of electrical safety test would be better to harmonize with ISO 12405.
	3.7.2.2 Acceptance criteria	Battery enclosure rupture	• To be deleted	✓ It's not a kind of safety test criteria. ✓ Sometimes [RESS] is designed ruptureable to avoid fire or explosion.
		For [RESS] using high voltage the isolation resistance measured at the end of the test shall maintain high voltage to ground isolation no less than 100 Ω/Volt.	• To be deleted	✓ Measuring insulation resistance could not applied to module-based test.

	3.8 Over discharge protection 3.8.2.1 Conditions	For [RESS] which do not need an over-discharge protection the manufacturer shall demonstrate to provide evidence to the Technical Service which shows that any over-discharge and standard charge afterwards does not lead to any situation described in the acceptance criteria.	• To be deleted. ~~For [RESS] which do not need an over-discharge protection the manufacturer shall demonstrate to provide evidence to the Technical Service which shows that any over-discharge and standard charge afterwards does not lead to any situation described in the acceptance criteria.~~	✓ Over-discharge test is essential test to verify safety of RESS.
		[If tests are performed on [module basis], evidence shall be provided that the results are representative for [RESS].]		✓ It's hard to verify that module-based test represent [RESS]–based test. ✓ Same opinion with 'Condition of vibration test'
		Discharging shall be continued until the [RESS] interrupt the discharging automatically. Direct after the over-discharging a standard charging has to be conducted if not inhibited by the [RESS].	Discharging shall be continued until - the [RESS] interrupt the discharging automatically or - if 25% of the nominal voltage level or a time limit of 30 min after passing the normal discharge limits of the DUT have been achieved. ~~Direct after the over-discharging a standard charging has to be conducted if not inhibited by the [RESS].~~	✓ There is no condition for end of test. ✓ After inflection point, it could be assumed stabilized ✓ If there are no special reason, termination condition of electrical safety test would be better to harmonize with ISO 12405. ✓ If test condition is for safety(abuse) test, there should be no condition for reliability.
	3.8.2.2 Acceptance criteria	Battery enclosure rupture	• To be deleted	✓ It's not a kind of safety test criteria. ✓ Sometimes [RESS] is designed ruptureable to avoid fire or explosion.

	3.8.2.2 Acceptance criteria	For [RESS] using high voltage the isolation resistance measured at the end of the test shall maintain high voltage to ground isolation not less than 100 Ω/Volt when the RESS is dedicated to a vehicle where the RESS is not galavanical connected to an AC system. Otherwise the high voltage to ground isolation has to be not less than 500 Ω/Volt. However, if all AC high voltage buses are protected by one of the 2 following measures, isolation resistance between the high voltage bus and the electrical chassis shall have a minimum value of 100 Ω/V of the working voltage: (a) Double or more layers of solid insulators, barriers or enclosures that meet the requirement in paragraph [5.1.1. of ECE R100.0]1 independently, for example wiring harness; (b) Mechanically robust protections that have sufficient durability over vehicle service life such as motor housings, electronic converter cases or connectors;	• To be deleted	✓ Measuring insulation resistance could not applied to module-based test.
	3.9 Over temperature protection		Case 1. • To be deleted	✓ There is nearly no chance to happen any dangerous events.
	3.9.2.1 Condition	3.9 Over temperature protection The test shall be interrupted when the requirement is satisfied or when the [RESS] reaches or exceeds the maximum working temperature specified by the manufacturer for more than 5 min without satisfying the requirement.	Case 2. • 3.9 Heat exposure • The test shall be interrupted when the requirement is satisfied or when the [RESS] reaches or exceeds the maximum working temperature specified by the manufacturer for more than 4 hr without satisfying the requirement.	✓ Korea has similar test regulation which is 'Heat exposure' This 'Heat exposure' is to verify whether SOC 80% of DUT could stand in the 80°C of chamber during 4 hr or not.