

### 3.1 Vibration

#### 3.1.1 Rationale

The purpose of this test is to verify the safety performance of the [RESS] (or a sub-assembly of [RESS]) under a vibration environment which the RESS will likely experience during the normal operation of the vehicle.

#### 3.1.2 Requirement

##### 3.1.2.1 Conditions

This test shall be carried out with a complete RESS or, at the discretion of the manufacturer, with Pack(s) of RESS.

If the manufacturer chose the test with Pack(s) of RESS, the manufacturer shall demonstrate that such test result can reasonably represent the performance of RESS with respect to the safety performance under similar condition.

For the purpose of this test, the devices of the [RESS] subject to the vibration test shall be referred to as DUT (Device Under Test). DUT shall be firmly secured to the platform of the vibration machine in such a manner as to faithfully transmit the vibration. If certain electronic management unit for [RESS] is not integrated, such control unit may not be installed on DUT.

Adjust the State of Charge (SOC) to a minimum 50 % before starting the vibration test profile.

The vibration shall be a sinusoidal waveform with a logarithmic sweep between 5 Hz and 50 Hz and back to 5 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the [DUT].

The correlation between frequency and acceleration shall be conducted as shown in table 1:

Table1:

frequency [Hz]	acceleration [m/s <sup>2</sup> ]
5 - 18	10
18 - 30	5
30 - 50	2

At the request of the manufacturer, a higher acceleration level as well as a higher maximum frequency can be conducted. In the case of a higher maximum frequency, the lowest frequency can be greater than 5 Hz, but shall not exceed 10% of the highest frequency.

At the request of the manufacturer a test profile determined by the vehicle-manufacturer, verified to the vehicle application and agreed by the Technical Service can be used as a substitute of the frequency – acceleration correlation of table 1.

### **3.1.2.2 Acceptance criteria based on [RESS]**

During the test, including [1] h after the test, the [DUT] shall exhibit no evidence of

- a) venting
- b) battery enclosure rupture
- c) fire
- d) explosion.
- e) electrolyte leakage
- f) 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  $\Omega$ /Volt.
- g) A standard charging shall be performed, if not inhibited by the [RESS]

### **3.1.3 Verification**

The evidence of a) to e) of 3.1.2.2 shall be checked by visual inspection.

The evidence of f) shall be done in accordance with annex 1 or equivalent.

The evidence of g) shall be demonstrated by the manufacturer.