

## 1.1 Overcharge Protection

(=> ISO 12405-1)

### 1.1.1 Rationale

~~Verify functionality of the overcharge protection~~

The purpose of the overcharge protection is to avoid severe events caused by an ~~overcharge current~~ overcharging, for example its interrupt the current or voltage or limits it to an acceptable value.

~~REMARKS: UN38.3 will not be sufficient to assess the functionality of the vehicle system.~~

### 1.1.2 Requirement 3.7.2.1 Conditions

The following requirements ~~tests~~ can be conducted with the RESS [or with module(s)] of the RESS.

[If requirements ~~tests~~ are performed on module basis, evidence shall be provided that the results are representative for RESS.]

~~Original text: The RESS shall be at RT, fully charged and under normal operating conditions with the cooling system operating (main contactors are closed if any; battery system is controlled by the BCU). The test shall be performed with integrated passive circuit protection devices operational. Active charge control of the test equipment shall be disconnected.~~

The RESS shall be at RT, fully charged and under normal operating conditions ~~with the cooling system operating;~~

**remark:** influence of no-cooling, switched-off cooling etc. has to be included AND to avoid safety reqs. on cooling system from battery, depends on decision of vehicle or battery manufacturer

(main contactors are closed ~~if any~~; battery system is controlled by the BCU)

If it includes safety features to prevent overcharging, if BCU has no safety features, battery or module have to be safe "stand-alone"

Remark: if test on module level, there is no bcu, or bcu has an special management function to prevent overcharging

). The test shall be performed with

All

Remark: probably there are several passive protection devices

~~integrated passive circuit protection devices operational. Active charge control of the test equipment shall be disconnected.~~

The normal charging of the application shall be described as multiple from 1C-Rate from cells. If cells with different C-Rates are used, the highest value shall be used.

The RESS shall be overcharged ~~at a constant~~ with at least two times C-Rate referring to normal charge mode of application

Remark: to respect different cell-types and charging mechanism

which is agreed by manufacturer supplier and Technical Service customer. The recommended constant charge current should be 5C. The upper limit for the power supply voltage should be set not to exceed 20 % of the maximum battery system voltage. –

Charging shall be continued

- until the DUT RESS (automatically) interrupt the charging or
- until the DUT RESS is thermal stationary, which means the temperature change is lower than [2] K within [30] min

by an automatic disconnect of the main contactors. The overcharge test shall be terminated when the SOC level is above 130 % or when cell temperature levels are above 55 °C.

[Limits for SOC and DUT cell temperature levels for premature abortion of terminating the over-charge protection test may be agreed between manufacturer supplier and Technical Service customer. > May be part of the information document see annex 6 of ECE R100]

~~According to ISO 12405-1 § 9.3.2~~

### 3.7.2.2 Acceptance criteria

During the test, including [1] h after the test, the battery system shall exhibit no evidence

- a) of undefined visible venting or
- b) battery enclosure rupture (no degradation of protection degree) or
- c) fire or
- d) 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  $\Omega$ /Volt.

[1] after the test the RESS shall be re-used]

Severity level 2 or 3 and ISO 12405-1 § 9.3.2 and § 9.3.3

SAE J 2464 is more detailed and has several criteria. Some of them are however difficult to conduct

### 1.1.3 Verification method

- a) to d) of 3.1.2.2 shall be checked by visible inspection after test
- b) Review of safety concept regarding ECE R13 H, Annex 8 or equal without test
- c) Analysis of measurement data and calculation

The isolation resistance shall be measured according to Annex 1.

Against acceptance criteria, ISO 12405-1 9.3.3 and § 6.2

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