Safety or abuse tests in standards on Li-ion batteries – Short indication of the contents of the tests applicable at cell level. Tests that do not exist at cell level are greyed out.

This table covers safety or abuse tests for Li-ion batteries. It is made in the European projects eCaiman, Spicy and Naiades. batterystandards.info

Test topic \ Standard	UN38.3	IEC/EN 62281	IEC/EN 62660-2	IEC 62660-03 NWP	IEC 62619	UL 1642	Ellicert Batteries	(DOE) SAND2005-3123
Mechanical								
Vibration	7-200Hz, 12h, 1 to 8 g_n	acc. UN38.3	10-2000Hz, 24h, 27,8 m/s^2			10-55Hz, 0.8mm, 95 min.	acc. UN38.3	
Mechanical Shock	150 g_n half sine of 6ms, 18x(cell)	acc. UN38.3	500m/s^2 half sine of 6ms, 30x(cell)	acc. Part2		shock from 75 to 150g_n, 3X	acc. IEC62660-2	(module)
Drop		(package box)			drop from 100cm		(battery)	(pack)
Cell impact	a bar on the cell, falling weight of 9kg, 60cm	acc. UN38.3			close to UN38.3	close to UN38.3		
Crush	crushing surfaces with 1,5cm/s until 13kN, 50% deformation or 100 mV voltage drop	acc. UN38.3	crushing bar or sphere, until 1000X cell weight, 15% deformation or voltage drop of 1/3 of V_{init}	acc. Part2, speed <6mm/min.		crushing surfaces with 1,5cm/s until 13kN	acc. IEC62660-2	(module)
Penetration							acc. SAE J2464	3mm steel rod with 8cm/s
Roll-over								
Thermal								
Temperature cycling	-40 to 72°C, 10X	acc. UN38.3	-40 or $T_{min\ from\ manufacturer}$ to 85°C or $T_{max\ from\ manufacturer}$, 30X, wit or without electrical operation	acc. Part2		close to UN38.3	acc. UN38.3	-40 to 80°C cycling, 5X
High temperature endurance			130°C, 30 min.	acc. Part 2, 6h observation	85°C, 3h	≥130°C, ≥10 min., depending on cell's temperature specification	acc. SAE J2464	storing in 40, 60 and 80°C until 20% capacity decrease
Thermal control check					(battery)			
Fire exposure						cell in flame until explosion or burn-out	(battery)	(module)
Propagation of thermal runaway					(battery)			
Rapid charging and discharging								(module)
Thermal stability (ARC)								30 to 200°C above operational temp. until self-heating
Electricity								
External short circuit	<0,1 Ohm @55°C, >1h	acc. UN38.3	<5mOhm, 10 min.	acc. Part2	30 mOhm, 6h	80mOhm until 0,2V	acc. IEC62660-2	(module)
Internal short circuit				several methods, preferably an inserted nickel particle	insertion of nickel particle			
Overcharge	(battery)	(battery)	$1I_{t\ (BEV)}$ or 5 $I_{t\ (HEV)}$ until 200% SOC equivalent or 2X Vmax	$1I_{t\ (BEV)}$ or 5 $I_{t\ (HEV)}$ until 1,2 X V_{max} or 130% SOC equivalent	charge until max. voltage of charger that lost control, except if double protection is used.	3X $I_{max.\ charge\ by\ manufacturer}$, for 7h or reaching end of charge condition by manufacturer	acc. IEC62660-2	(module)
Forced discharge	12V source in series	acc. UN38.3	discharging a discharged cell at $1I_t$ for 90 min.	discharging a discharged cell at $1I_t$ for 30 min. Until <0,25X V_{nom}	discharging a discharged cell at $1I_t$ for 90 min. The current is reduced depending on the number of available protections	discharging a discharged cell by the number of charged cells in the application in series and an 80mOhm resistor until V_{tot} <0,2V	acc. IEC62660-2	(module)
Imbalanced Charge								
Overcharge voltage control check					(battery)			
Overcharge current control check					(battery)			
Over-discharge current control check								
Environmental								
Altitude simulation	11,6 kPa, >6h	acc. UN38.3				close to UN38.3	acc. UN38.3	
Humidity								
Dewing								
Immersion							(battery)	
Salt spray / salt water immersion								2h in sea water
Rain test								
Electromagnetic susceptibility								

Despite our care we do not claim to cover all standards and that all test topics have been given here. The organisations that categorised the available test standards cannot be kept responsible for your decisions.

The involved institutes of this survey are:


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