

TÜV Rheinland Battery Testing Center - Shenzhen



March 2012

Content

1

BTC (Battery Testing Center)
Introduction

2

Test Experience & Challenges

3

Comparison Between BATSO 01
and UL 2271

1

BTC (Battery Testing Center Introduction

1 BTC Introduction

Lab authorizations and accreditations:

Sven-Olaf Steinke: sos@sz.chn.tuv.com

Tel: +86 755 82681102

Hotline: 400-883-1300/800-999-3668

Location Shenzhen, South China

Germany: Dakks (DIN EN 62133, IEEE 1625, IEEE 1725)

International: CBTL (IEC 62133)

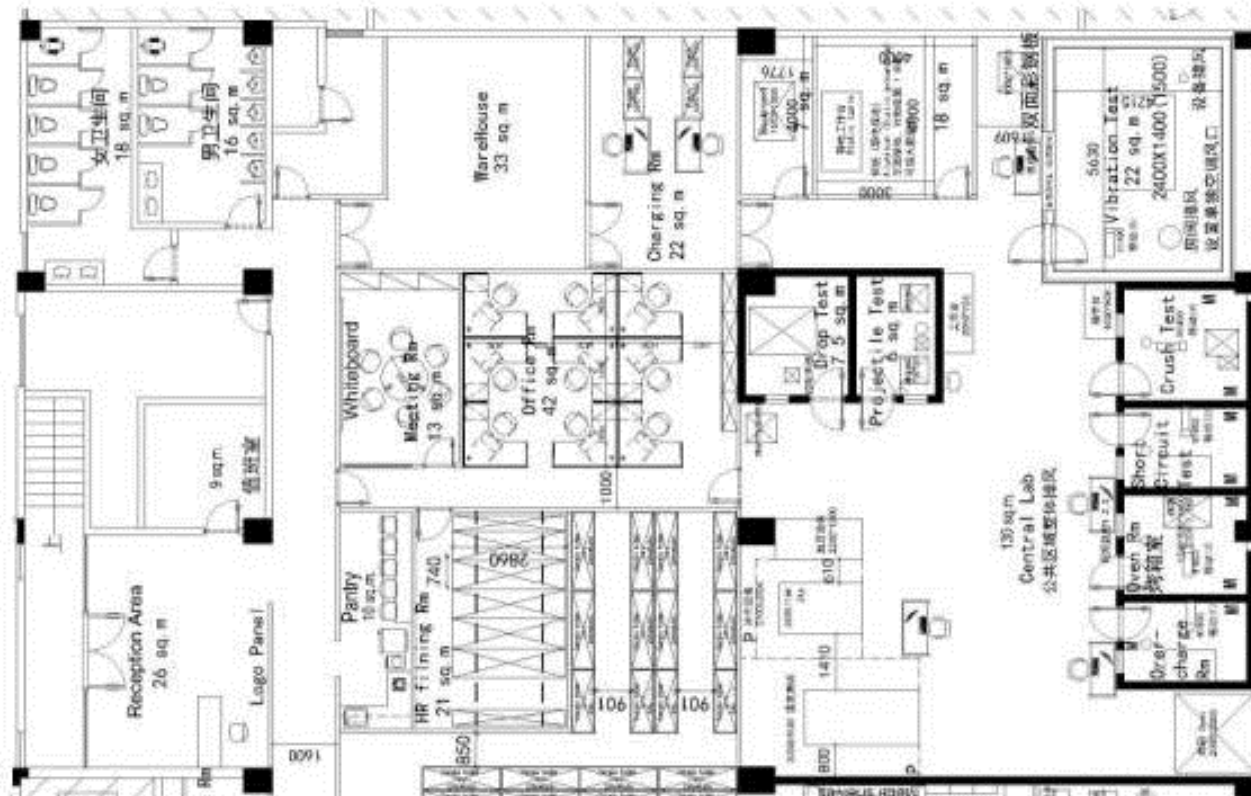
Local: CNAS (UL 1642, UL 2050, IEC 62133, UN 38.3, JIS C 8712, JIS C 8714)

America: NRTL Snap Site (UL 1642, UL 2050, UL 2271)

America: CATL (American Wireless association IEEE 1625, IEEE 1725) in middle of 2012

1 BTC Introduction

Lab layout:



1 BTC Introduction

Lab capacity:

Equipment	Capacity	Standards
Altitude Chamber	Max 600mmX600mmX600mm	UN38.3, IEC 62133, UL1642, BATSO,
Vibration Tester	350kG, Max 400mm 7 to 3000HZ Random 100ms, 10ms Sine, >90dB	UN38.3, IEC 62133, UL1642, BATSO,
Shock	Max 50kg, 50-6000m/s ² , 30-1.5ms	UN38.3, IEC 62133, UL1642, BATSO,
Oven for Short Circuit	Max 80kg, Max 600mmX600mmX600mm,	UN38.3, IEC 62133, UL1642, BATSO,UL2054
Charger and Discharger	Max 80V, 50A, Data scan speed: 1 seconds	UN38.3, IEC 62133, UL1642, BATSO,UL2054
Tempertature cycling	Ramp speed 7 to 8 °C/min, Range -60°C-150°C; battery weight < 160kg,	UN38.3, IEC 62133, UL1642, BATSO,
Crush Tester	15KN to 150KN, Max Battery dimension < 600mm	IEC 62133, UL1642, BATSO,UL2054

1 BTC Introduction

Equipment:



Shock Tester



Temperature cycling Tester

1 BTC Introduction

Equipment:



Vibration Tester

1 BTC Introduction

Equipment:



Crush Tester

1 BTC Introduction

Equipment:



Altitude simulator



Drop Tester

1 BTC Introduction

Test room:



Independent Testing Lab



Warehouse

1 BTC Introduction

Safety protection:



Automatic fire-fighting system

1 BTC Introduction

Safety protection:



Metal box



Double metal door



Metal sample case

2

Test Experience & Challenges

2 Test Experience & Challenges

1. Overcharge

Test method	Challenges	Easy to fail?
Current: Max.1C rate, Voltage: 6 times the number of cells in series	None	★★★★☆

2 Test Experience & Challenges

2. External short circuit

Test method	Challenges	Easy to fail?
Connecting the positive and negative terminals of battery pack with max. 10mΩ wire	<p>The connection points of weld on cells in-between are easy to disconnect because of high temperature made by large current.</p> <p>Acceptance of open circuiting of connections/conductive parts is currently subject of an inquiry handled by the BATSO Technical Committee.</p>	★★★★☆

2 Test Experience & Challenges

3. Vibration

Test method	Challenges	Easy to fail?
7Hz~200Hz~7Hz with 15min, 12 times, 3 hours for each of three mutually perpendicular directions.	None	★★★★★

2 Test Experience & Challenges

4. Partial short circuit

Test method	Challenges	Easy to fail?
Connecting part of cells of the positive and negative terminals with max. 10mΩ wire	The connection points of cells are easy to disconnect because of high temperature made by short current. <i>Acceptance of open circuiting of connections/conductive parts is currently subject of an inquiry handled by the BATSO Technical Committee.</i>	★★★★★

2 Test Experience & Challenges

5. Crush

Test method	Challenges	Easy to fail?
1. 100KN (Two orientations) 2. 30% deformation	Irregular shape battery pack test method is undefined in standard. This topic is currently subject of an inquiry handled by the BATSO Technical Committee.	★★★★★

2 Test Experience & Challenges

6. Shock

Test method	Challenges	Easy to fail?
Same as T.4 in UN38.3	None	★★★★★

2 Test Experience & Challenges

7. Drop

Test method	Challenges	Easy to fail?
1m, concrete flat surface, 3 times	None	★★★★★

2 Test Experience & Challenges

8. Altitude simulation

Test method	Challenges	Easy to fail?
Same as T.1 in UN38.3	None	★★★★★

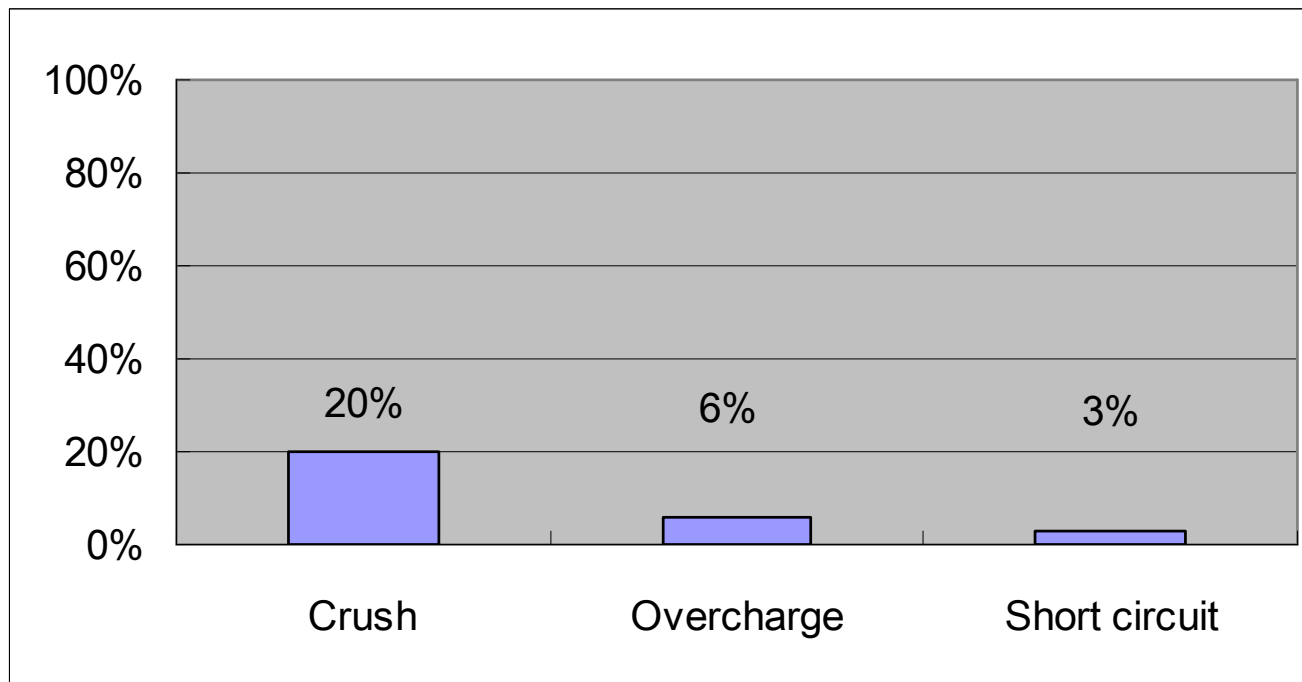
2 Test Experience & Challenges

9. Thermal test

Test method	Challenges	Easy to fail?
Same as T.2 in UN38.3	None	★★★★★

2 Test Experience & Challenges

Fail items 2011-2012



2 Test Experience & Challenges

Pictures of fail sample



Crush

2 Test Experience & Challenges

Pictures of fail sample



Short circuit



Overcharge

2 Test Experience & Challenges

Other Challenges

No.	Item	Challenges	Solution
1	Charging/ discharging connector	Many manufacturers use standard mains connector (IEC/EN 60320-1) as charging/discharging connector. It is dangerous because the connector is likely to connect to AC mains through appropriate power cord	Standard mains connector prohibited
2	Rated voltage of current fuse	The rated voltage of a current fuse as passive protective device is sometimes less than the rated voltage of the battery pack. It might not provide protection reliably once short-circuit takes place	The rated voltage of the current fuse shall be equal to or greater than the rated voltage of the battery pack

2 Test Experience & Challenges

Other Challenges

No.	Item	Challenges	Solution
3	External Charger	When the operation temperature (normally 25 deg C) of the charger can not catch up to the operation temperature of the battery pack (normally 45 deg C), will it lead to any issue? for example, is it possible to charge out of the area within 25 deg C, such a garage in summer?	Specify in the user manual that the charging process must be conducted in room temperature

2 Test Experience & Challenges

Other Challenges

No.	Item	Challenges	Solution
4	Single fault for passive protective devices	<p>There are two kinds of passive protective devices. One is re-settable protective device (e.g. PTC) and another is unrecoverable protective device (e.g. FUSE).</p> <ol style="list-style-type: none">1. For those protective devices, do we need to bypass or remain them on the circuits. if they have been approved?2. When unrecoverable protective devices operate during the test, do we need to connect the maximum load that does not cause the protective devices to operate? (method refers to UL2054)3. When re-settable protective devices operate during the test, do we need to reset and repeat many times but no less than 10 times? (method refers to UL2054)	We are going to adopt these test methods

3

Comparison Between BATSO 01 and UL2271

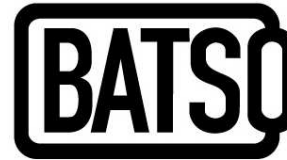
3 Comparison Between BATSO 01 and UL 2271

We render the test and certification service for LEV Battery according to BATSO 01 and UL2271, we provide a package price when applied together by our clients

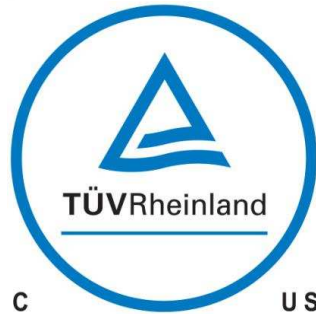
BATSO Mark



• BATSO approved



cTUVus Mark



3 Comparison Between BATSO 01 and UL 2271

Item	BATSO 01:2011-03	UL 2271:2010
Scope	Safety of secondary lithium batteries (not cells) for LEV of 12 kg or less weight	Covers nickel, lithium ion and lithium ion polymer batteries and battery packs for use in light electric vehicles (LEVs), with a maximum output of 60 Vdc
Coverage of UN-T 38.3	Yes (two Test Options)	No
UV testing of external thermoplastic materials	Covered (ISO 4892-2 condition A)	Enclosure material – UV Resistance and Water Exposure (UL 746C) Metal enclosure – corrosion requirements for outdoor use (UL 50E)
IP testing	IP 54 required (IEC 60529)	See above
Temperature measurement locations	Battery/Cell casing	Battery/cell casing
Overcharge test	cl. 5.1.1: Overcharge test	cl. 7.1: Abnormal charge test cl. 7.2: Abuse overcharge test
Moulded case stress at high ambient temperature	Not specified, but actually covered by the Temperature test cl. 5.3.2	cl. 8.6: Mold stress relief
External short circuit	cl. 5.1.2: External short circuit test	cl. 7.3: Short circuit test

3 Comparison Between BATSO 01 and UL 2271

Item	BATSO 01:2011-03	UL 2271:2010
Normal temperature test	cl. 4.3: Samples preparation	cl. 7.4: Normal temperature test on components and battery back surface
Charger/system compatibility test	cl. 4.3: Not specified to monitor voltage and current of cell block	cl. 7.5: Charger/system compatibility test
Vibration	cl. 5.1.3: Vibration test	cl. 8.1: Mechanical tests for sealed portable secondary cells and batteries, IEC 61959
Partial short circuit	cl. 5.1.4: Partial short circuit test	cl. 7.6: Imbalance pack test
Reverse charge test	Not specified	cl. 7.7: Reverse charge test
Insulation resistance test	Not specified	cl. 7.8: Insulation resistance test
Impact test	Not specified	cl. 8.3: Impact test
Crush test	cl. 5.2.1: Crush test -100 kN or 30% compression	cl. 8.4 – Crush and impact test (crush test 13Kn, Impact test 9.1kg)
Shock test	cl. 5.2.2: 150 gn for 6ms, three shocks for positive and negative direction for each of the three perpendicular directions	cl. 8.2: A half-sine shock of peak acceleration of 50 gn and pulse duration of 11 ms

3 Comparison Between BATSO 01 and UL 2271

Item	BATSO 01:2011-03	UL 2271:2010
Drop test	cl. 5.2.3: Three drops from 1 m onto concrete floor	cl.8.5: Three drops from 1 m onto concrete floor, both cell and battery pack
Nail penetration	Not specified	cl. 8.7: Test on cell - penetration test in accordance with Electric Vehicle Battery Abuse Testing, SAE J2464
Resistance to moisture test	Not specified	cl. 9.1: Battery pack shall be immersed in 3.5% NaCl salt water for min. 2hours
Altitude simulation	cl. 5.3.1: 11.6 kPa or less at 20 °C for 6 h	Not specified
Temperature cycle test	cl. 5.3.2: 11 cycles of 75 °C (6 h) - -40 °C (6.5 h)	Not specified
Environmental Management System Evaluation	Annex B - not yet available	Not specified
Marking requirements	Annex C - similar to cl. 5.3 of IEC 61960:2003, plus marking of external fuses	cl.10: marking (refer to UL2054)

Thank you!
Q & A?