
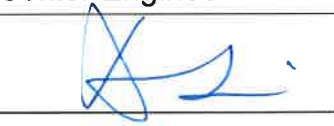






A D T

<b>Test Report No.:</b>	<b>UNT140403C17</b>		
<b>Client</b>			
Name :	<b>GMET Mfg Processes Co., Ltd.</b>		
Address :	<b>No.50, Guangfu S. Rd., Hukou Township, Hsinchu County 303, Taiwan</b>		
<b>Test Item :</b>	<b>Lithium iron phosphate Rechargeable Battery Cell</b>		
<b>Identification :</b>	<b>G23103158</b>		
<b>Testing laboratory</b>			
Name :	<b>Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch</b>		
Address :	<b>No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan ( R.O.C )</b>		
<b>Test specification</b>			
Standard :	<b>United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5<sup>th</sup>, Amendment 1), Section 38.3</b>		
<b>Test Result :</b>	<b>The test item passed.</b>		
<b>Prepared By :</b>			
		<u>May 20, 2014</u>	
	Signature	Date	
	<u>Bob Tsai</u>		
	Senior Engineer		
<b>Approved By:</b>			
		<u>May 20, 2014</u>	
	Signature	Date	
	<u>Danny Lin</u>		
	Assistant Manager		
This report should not be used by the client to claim product certification, approval, or endorsement by TAF, NVLAP, NIST or any government agencies.		 	
<p>This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.</p>			

**TEST REPORT**

United Nations, Recommendations on the Transport of Dangerous Goods,  
Manual of Test and Criteria (Rev. 5<sup>th</sup>, Amendment 1), Section 38.3

**Report Reference No.**.....: UNT140403C17

Compiled by .....: See cover sheet

Approved by .....: See cover sheet

Date of issue.....: May 20, 2014

Total number of pages .....: 21

**Testing Laboratory** .....: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Address .....: No. 19, Hwa Ya 2nd Rd, Kueishan Taoyuan, Taiwan, R.O.C.

**Applicant's name**.....: GMET Mfg Processes Co., Ltd.

Address .....: No.50, Guangfu S. Rd., Hukou Township, Hsinchu County 303, Taiwan

**Test specification:**

Standard .....: United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5<sup>th</sup>, Amendment 1), Section 38.3.

**Test item description**.....: Lithium iron phosphate Rechargeable Battery Cell

Trade Mark .....:

**GMET**

GMET or 

Manufacturer .....: GMET Mfg Processes Co., Ltd.

Model/Type reference.....: G23103158

Ratings .....: 3.2V, 20Ah

**Summary of testing:**

The load conditions used during testing: The battery pack is charged and discharged according to its rating.

Nominal capacity (Ah):	20
Nominal voltage (Vdc):	3.2
Minimum end voltage of discharge (Vdc)	2.0
Max. charge voltage (Vdc):	3.6
Max. charge current (A):	20
Max. continue discharge current (A)	100



Tests performed (name of test and test clause):

Reference Standard	Clause	Contents of Test
UN 38.3	38.3.4.1	Altitude simulation
UN 38.3	38.3.4.2	Thermal test
UN 38.3	38.3.4.3	Vibration
UN 38.3	38.3.4.4	Shock
UN 38.3	38.3.4.5	External short circuit
UN 38.3	38.3.4.6	Crush (For Prismatic cell)
UN 38.3	38.3.4.8	Forced discharge



Copy of marking plate:





<b>Test item particulars</b> .....	
Classification of installation and use .....	Built-in
Supply Connection.....	Customized terminal
.....	
.....	
<b>Possible test case verdicts:</b>	
- test case does not apply to the test object.....	N/A
- test object does meet the requirement .....	P (Pass)
- test object does not meet the requirement .....	F (Fail)
<b>Testing</b> .....	
Date of receipt of test item .....	April 03, 2014
Date (s) of performance of tests .....	April 15, 2014 – May 13, 2014
<b>General remarks:</b>	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a point is used as the decimal separator.</p>	
<b>General product information:</b>	
<p>1) The equipment under test (EUT) is a Lithium iron phosphate Rechargeable Battery Cell.</p> <p>2) The maximum ambient temperature is specified as Max. 45 °C for Charging and 60 °C for Discharging.</p> <p>3) Dimension of the battery: (T) 23mm by (W) 103mm by (L) 158mm.</p> <p>4) Weight: 660g.</p>	
<b>Test condition:</b>	
Temperature: 20±5°C	
Relative humidity: 60%	
Air pressure: 950 mbar	
<p>The test samples were pre-production samples without serial number.</p>	



United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5 <sup>th</sup> , Amendment 1), Section 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

<b>38.3</b>	<b>Lithium batteries</b>		<b>P</b>
-------------	--------------------------	--	----------

<b>38.3.1</b>	<b>Purpose</b>		<b>P</b>
<b>38.3.2</b>	<b>Scope</b>		<b>P</b>
38.3.2.1	Lithium cells or batteries which differ from a tested type by: (a) A change of more than 0.1 g or 20% by mass, whichever is greater, to the cathode, to the anode, or to the electrolyte; or (b) A change that would materially affect the test results.	This a new product (new application)	N/A
38.3.2.2	Classification	The EUT is a Lithium iron phosphate Rechargeable Battery Cell.	<b>P</b>
<b>38.3.3</b>	<b>The number and condition of cells and batteries</b>		<b>P</b>
	Cells (Primary/Rechargeable)	The EUT is a Lithium iron phosphate Rechargeable Battery Cell.	<b>P</b>
	Batteries (Primary/Rechargeable)	The EUT is a Lithium iron phosphate Rechargeable Battery Cell.	N/A
<b>38.3.4</b>	<b>Procedure</b>		<b>P</b>
	Each cell and battery type must be subjected to tests 1 to 8. Tests 1 to 5 must be conducted in sequence on the same cell or battery. Tests 6 and 8 should be conducted using not otherwise tested cells or batteries. Test 7 may be conducted using undamaged batteries previously used in Tests 1 to 5 for purposes of testing on cycled batteries.	The sequence Test 1 to Test 5 tests were conducted on the same samples.  Test 6 was conducted on the new component cell samples.  Test 8 was conducted on the new component cell samples.	<b>P</b>
38.3.4.1	Altitude simulation	The cells were no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and the OCV of batteries after testing was not less than 90% of its voltage before testing.	<b>P</b>



United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5 <sup>th</sup> , Amendment 1), Section 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.2	Thermal test	The cells were no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and the OCV of batteries after testing was not less than 90% of its voltage before testing.	P
38.3.4.3	Vibration	The cells were no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and the OCV of batteries after testing was not less than 90% of its voltage before testing.	P
38.3.4.4	Shock	The cells were no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and the OCV of batteries after testing was not less than 90% of its voltage before testing.	P
38.3.4.5	External short test	The cells were no disassembly, no fire and no rupture, and the external temperature did not exceed 170 °C.	P
38.3.4.6	Impact	The cell is a prismatic type.	N/A
	Crush	The cells were no disassembly, no fire and no rupture, and the external temperature did not exceed 170 °C.	P
38.3.4.7	Overcharge	The EUT is a Lithium iron phosphate Rechargeable Battery Cell.	N/A
38.3.4.8	Forced discharge	The cells were no disassembly and no fire.	P



United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5 <sup>th</sup> , Amendment 1), Section 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.2.2	TABLE: List of critical Components					N/A
Object/part No.	Manufacturer/ trademark	Type/Model	Technical Data	Standard	Marks of Conformity	
--	--	--	--	--	--	
supplementary information: --						

38.3.4.1	Altitude simulation							P
Model / Sample No.	Sample Status	Before test		After test		Mass loss (%)	Residual OCV (%)	Other Event
		Weight (g)	OCV (V)	Weight (g)	OCV (V)			
G23103158 / 001	At first cycle	660	3.60	660	3.58	0	99	OK
G23103158 / 002	At first cycle	660	3.59	660	3.58	0	99	OK
G23103158 / 003	At first cycle	660	3.61	660	3.59	0	99	OK
G23103158 / 004	At first cycle	660	3.60	660	3.58	0	99	OK
G23103158 / 005	At first cycle	660	3.60	660	3.58	0	99	OK
G23103158 / 006	At first cycle	660	3.59	660	3.58	0	99	OK
G23103158 / 007	At first cycle	660	3.61	660	3.59	0	99	OK
G23103158 / 008	At first cycle	660	3.60	660	3.59	0	99	OK
G23103158 / 009	At first cycle	660	3.60	660	3.58	0	99	OK
G23103158 / 010	At first cycle	660	3.59	660	3.58	0	99	OK
Note(s):								
Mass loss limit:								
Mass M of cell or battery		Mass loss limit						
M<1g		0.5%						
1g<M<5g		0.2%						
M>5g		0.1%						
L-Leakage V-Venting D-Disassembly R-Rupture F-Fire OK-No Leakage, No Venting, No Disassembly, No Rupture, No Fire								





United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5 <sup>th</sup> , Amendment 1), Section 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.2	Thermal test							P
Model / Sample No.	Sample Status	Before test		After test		Mass loss (%)	Residual OCV (%)	Other Event
		Weight (g)	OCV (V)	Weight (g)	OCV (V)			
G23103158 / 001	At first cycle	660	3.57	660	3.49	0	97	OK
G23103158 / 002	At first cycle	660	3.57	660	3.48	0	97	OK
G23103158 / 003	At first cycle	660	3.58	660	3.47	0	96	OK
G23103158 / 004	At first cycle	660	3.58	660	3.48	0	97	OK
G23103158 / 005	At first cycle	660	3.58	660	3.47	0	96	OK
G23103158 / 006	At first cycle	660	3.57	660	3.47	0	97	OK
G23103158 / 007	At first cycle	660	3.58	660	3.48	0	97	OK
G23103158 / 008	At first cycle	660	3.58	660	3.48	0	97	OK
G23103158 / 009	At first cycle	660	3.57	660	3.477	0	97	OK
G23103158 / 010	At first cycle	660	3.58	660	3.47	0	96	OK
Note(s):								
Mass loss limit:								
Mass M of cell or battery		Mass loss limit						
M<1g		0.5%						
1g<M<5g		0.2%						
M>5g		0.1%						
L-Leakage V-Venting D-Disassembly R-Rupture F-Fire OK-No Leakage, No Venting, No Disassembly, No Rupture, No Fire								



A D T

United Nations, Recommendations on the Transport of Dangerous Goods,  
Manual of Test and Criteria (Rev. 5<sup>th</sup>, Amendment 1), Section 38.3

Clause	Requirement + Test	Result - Remark	Verdict
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38.3.4.3	Vibration	P						
Model / Sample No.	Sample Status	Before test		After test		Mass loss (%)	Residual OCV (%)	Other Event
		Weight (g)	OCV (V)	Weight (g)	OCV (V)			
G23103158 / 001	At first cycle	660	3.46	660	3.44	0	99	OK
G23103158 / 002	At first cycle	660	3.45	660	3.43	0	99	OK
G23103158 / 003	At first cycle	660	3.44	660	3.42	0	99	OK
G23103158 / 004	At first cycle	660	3.45	660	3.43	0	99	OK
G23103158 / 005	At first cycle	660	3.45	660	3.43	0	99	OK
G23103158 / 006	At first cycle	660	3.45	660	3.42	0	99	OK
G23103158 / 007	At first cycle	660	3.45	660	3.43	0	99	OK
G23103158 / 008	At first cycle	660	3.46	660	3.42	0	99	OK
G23103158 / 009	At first cycle	660	3.44	660	3.42	0	99	OK
G23103158 / 010	At first cycle	660	3.45	660	3.43	0	99	OK

Note(s):

Mass loss limit:

Mass M of cell or battery	Mass loss limit
M<1g	0.5%
1g<M<5g	0.2%
M>5g	0.1%

L-Leakage

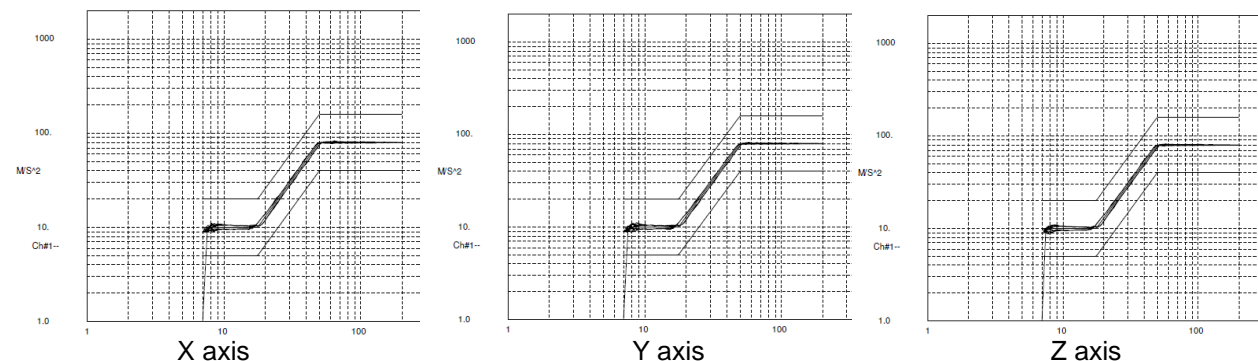
V-Venting

D-Disassembly

R-Rupture

F-Fire

OK-No Leakage, No Venting, No Disassembly, No Rupture, No Fire





A D T

United Nations, Recommendations on the Transport of Dangerous Goods,  
Manual of Test and Criteria (Rev. 5<sup>th</sup>, Amendment 1), Section 38.3

Clause	Requirement + Test	Result - Remark	Verdict
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38.3.4.4	Shock	P						
Model / Sample No.	Sample Status	Before test		After test		Mass loss (%)	Residual OCV (%)	Other Event
		Weight (g)	OCV (V)	Weight (g)	OCV (V)			
G23103158 / 001	At first cycle	660	3.44	660	3.42	0	99	OK
G23103158 / 002	At first cycle	660	3.43	660	3.42	0	99	OK
G23103158 / 003	At first cycle	660	3.42	660	3.41	0	99	OK
G23103158 / 004	At first cycle	660	3.43	660	3.42	0	99	OK
G23103158 / 005	At first cycle	660	3.43	660	3.42	0	99	OK
G23103158 / 006	At first cycle	660	3.42	660	3.41	0	99	OK
G23103158 / 007	At first cycle	660	3.43	660	3.42	0	99	OK
G23103158 / 008	At first cycle	660	3.42	660	3.41	0	99	OK
G23103158 / 009	At first cycle	660	3.42	660	3.40	0	99	OK
G23103158 / 010	At first cycle	660	3.43	660	3.41	0	99	OK

Note(s):

Mass loss limit:

Mass M of cell or battery	Mass loss limit
M<1g	0.5%
1g<M<5g	0.2%
M>5g	0.1%

L-Leakage

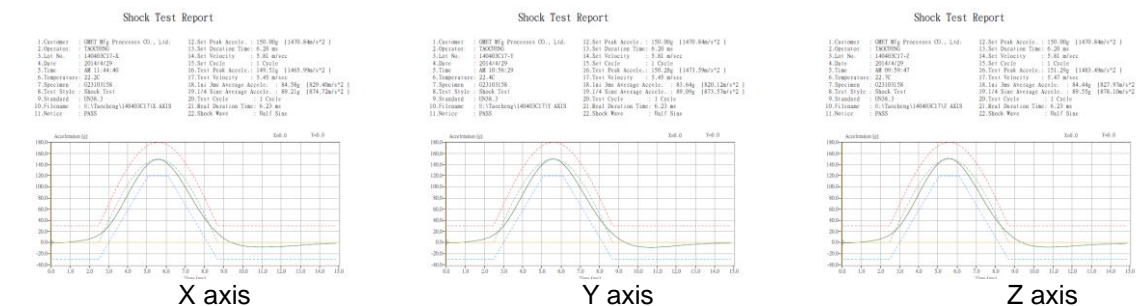
V-Venting

D-Disassembly

R-Rupture

F-Fire

OK-No Leakage, No Venting, No Disassembly, No Rupture, No Fire





United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5 <sup>th</sup> , Amendment 1), Section 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.5		External short circuit		P
Model / Sample No.	Sample Status	Max. External temperature of EUT surface(°C)	Other Event	
G23103158 / 001	At first cycle	93.6	OK	
G23103158 / 002	At first cycle	105.3	OK	
G23103158 / 003	At first cycle	91.6	OK	
G23103158 / 004	At first cycle	94.5	OK	
G23103158 / 005	At first cycle	99.8	OK	
G23103158 / 006	At first cycle	97.8	OK	
G23103158 / 007	At first cycle	93.2	OK	
G23103158 / 008	At first cycle	87.9	OK	
G23103158 / 009	At first cycle	103.6	OK	
G23103158 / 010	At first cycle	92.3	OK	
Note(s): D-Disassembly R-Rupture F-Fire OK- No Disassembly, No Fire, The external temperature of cell not exceeds 170°C.				



United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5 <sup>th</sup> , Amendment 1), Section 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
<b>38.3.4.6</b>	<b>Impact</b>		N/A
Model / Sample No.	Sample Status	Max. External temperature of EUT surface(°C)	Other Event
--	--	--	--
Note(s): The component cell is a prismatic type			

<b>38.3.4.6</b>	<b>Crush</b>		P
Model / Sample No.	Sample Status	Max. External temperature of EUT surface(°C)	Other Event
G23103158 / 011	At first cycle 50% of the design rated capacity	23.4	OK
G23103158 / 012	At first cycle 50% of the design rated capacity	23.7	OK
G23103158 / 013	At first cycle 50% of the design rated capacity	22.6	OK
G23103158 / 014	At first cycle 50% of the design rated capacity	22.9	OK
G23103158 / 015	At first cycle 50% of the design rated capacity	23.8	OK
Note(s): D-Disassembly F-Fire OK- No Disassembly, No Fire, The external temperature of cell not exceeds 170°C.			

38.3.4.7	Overcharge		N/A
Model / Sample No.	Sample Status	Other Event	
--	--	--	
Note(s): EUT is a lithium ion battery cell			



United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (Rev. 5 <sup>th</sup> , Amendment 1), Section 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.8	Forced discharge		P
Model / Sample No.	Sample Status	Other Event	
G23103158 / 016	At first cycle	OK	
G23103158 / 017	At first cycle	OK	
G23103158 / 018	At first cycle	OK	
G23103158 / 019	At first cycle	OK	
G23103158 / 020	At first cycle	OK	
G23103158 / 021	At first cycle	OK	
G23103158 / 022	At first cycle	OK	
G23103158 / 023	At first cycle	OK	
G23103158 / 024	At first cycle	OK	
G23103158 / 025	At first cycle	OK	
G23103158 / 026	After 50 cycles	OK	
G23103158 / 027	After 50 cycles	OK	
G23103158 / 028	After 50 cycles	OK	
G23103158 / 029	After 50 cycles	OK	
G23103158 / 030	After 50 cycles	OK	
G23103158 / 031	After 50 cycles	OK	
G23103158 / 032	After 50 cycles	OK	
G23103158 / 033	After 50 cycles	OK	
G23103158 / 034	After 50 cycles	OK	
G23103158 / 035	After 50 cycles	OK	
Note(s): D-Disassembly F-Fire OK- No Disassembly, No Fire			

**List of test equipment used:**

(Note: This is an example of the required attachment. Other forms with a different layout but containing similar information are also acceptable.)

[illegible]

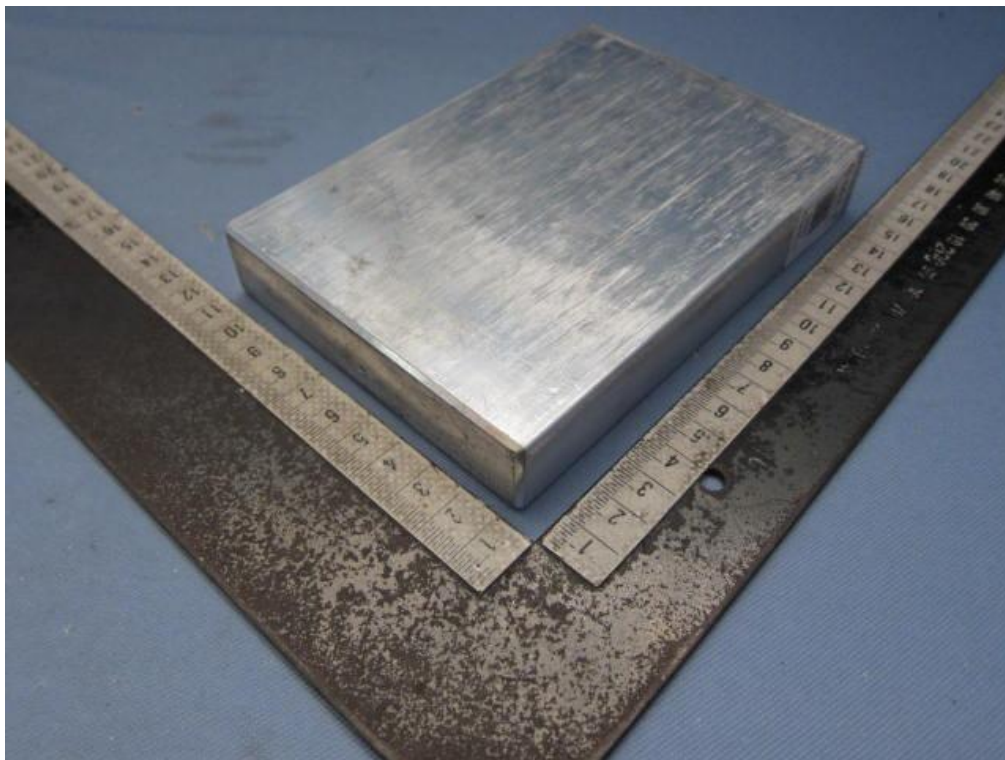
### MAXIMUM UNCERTAINTIES OF MEASUREMENTS

This table indicates the maximum values of uncertainties associated with the tests being able to be present in this document.

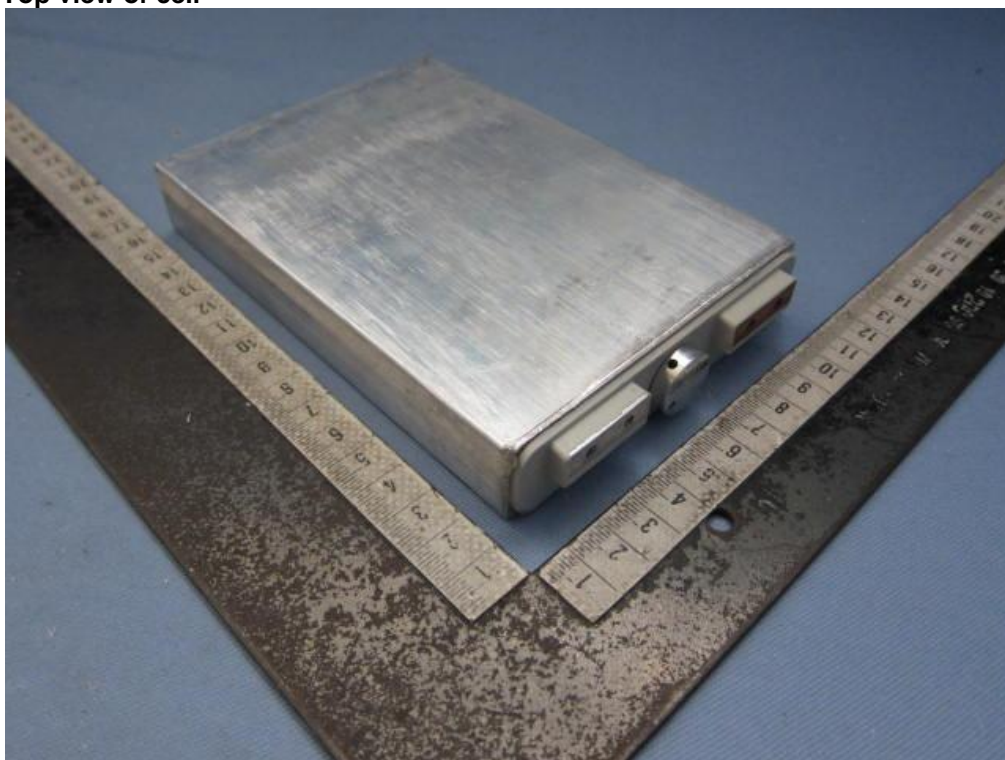
Type of measurement	Uncertainty of measurement (k=2)
Generic measure of electrical value by direct reading of digital instrument) <ul style="list-style-type: none"> <li>● Voltage (V)</li> <li>● Current (A)</li> <li>● Power (W)</li> <li>● Resistance (Ohms)</li> </ul>	(V) meter accuracy 0.1% (A) meter accuracy 0.5% (W) meter accuracy 1.0% (Ohms) meter accuracy 1.5%
Generic measure of time	+/- 0.38 Second
Generic measure of length value	caliper (0-200mm): +/-0.15 mm tape measure (0-500cm): +/-1.4 mm
Generic measure of weight value	scale (0-600g): +/- 0.55 g balance (0-150kg): +/- 15.95 g



**Photos:**



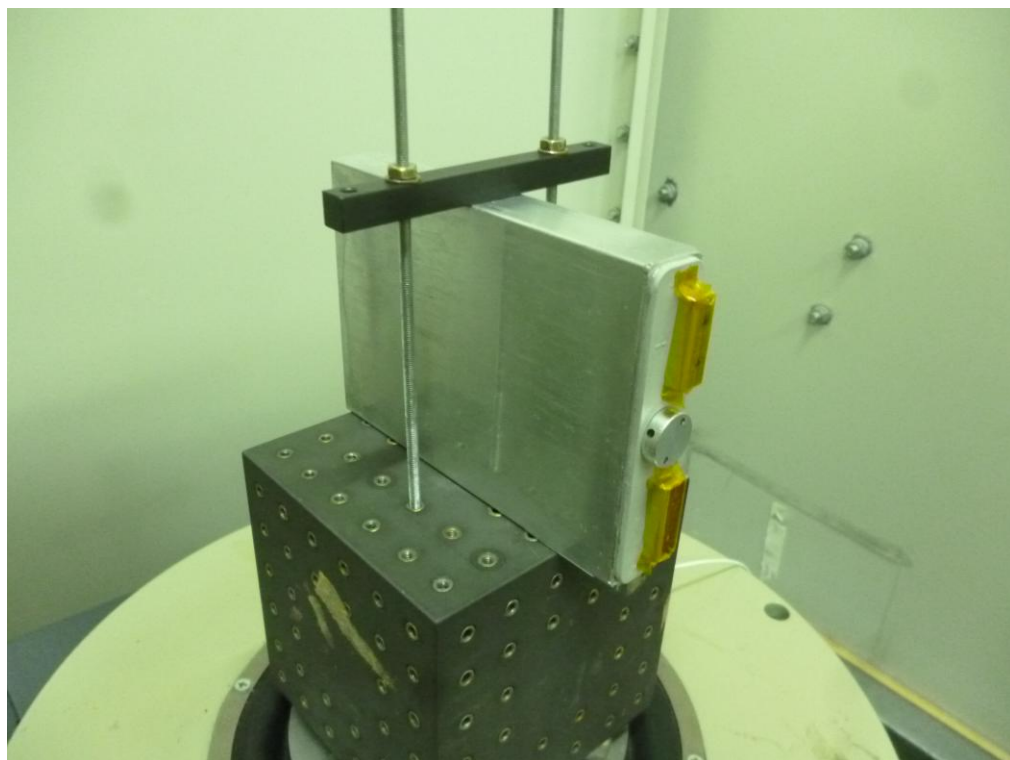
**Top view of cell**



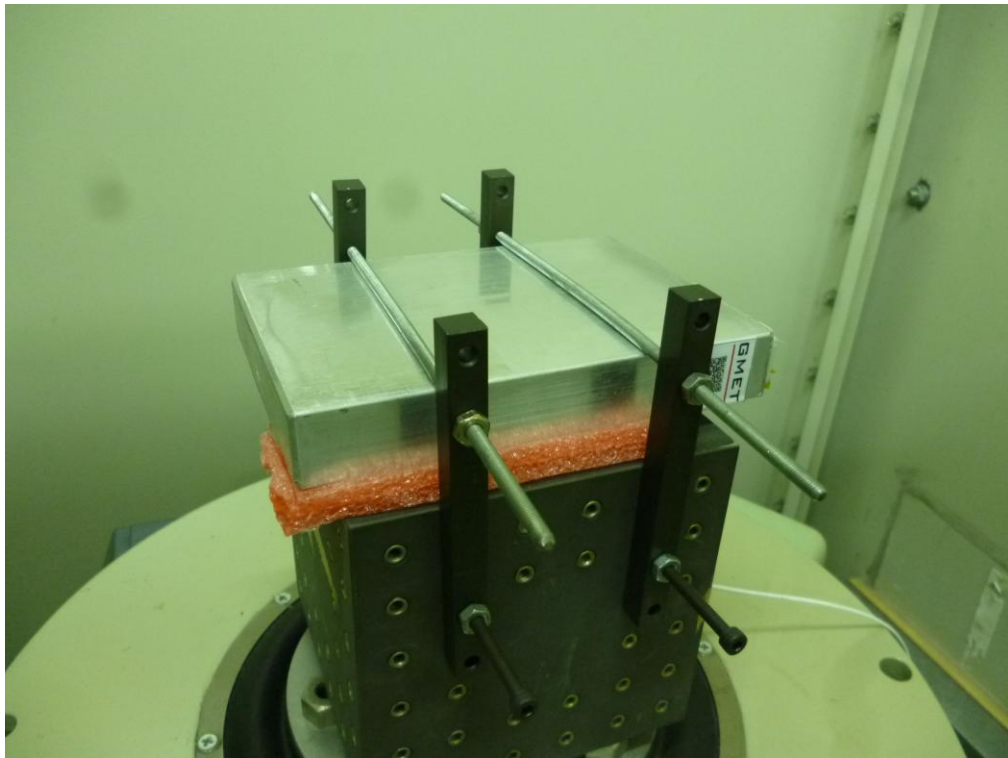
**Bottom view of cell**



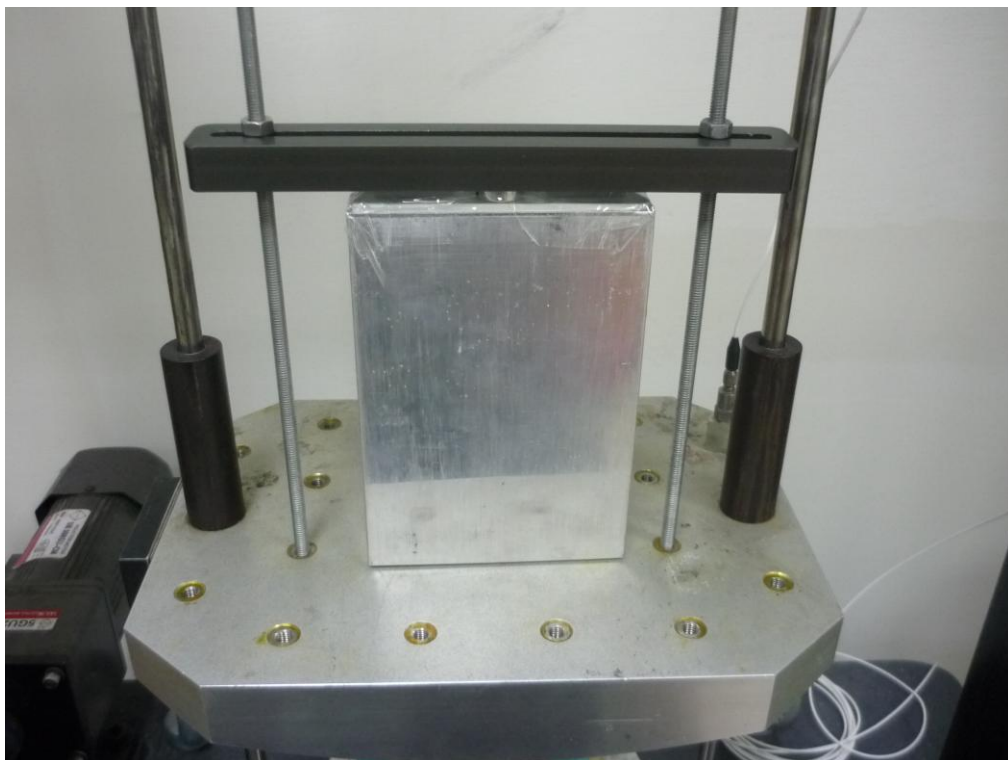
**Vibration test condition -1 (X axis direction)**



**Vibration test condition -2 (Y axis direction)**

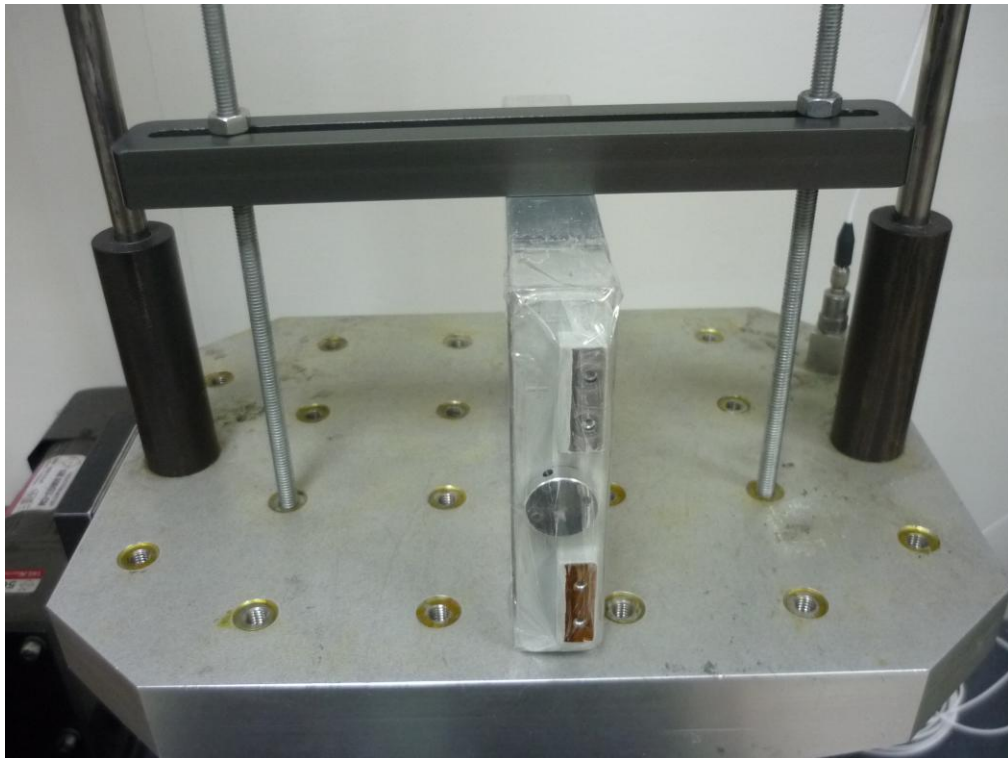


**Vibration test condition -3 (Z axis direction)**

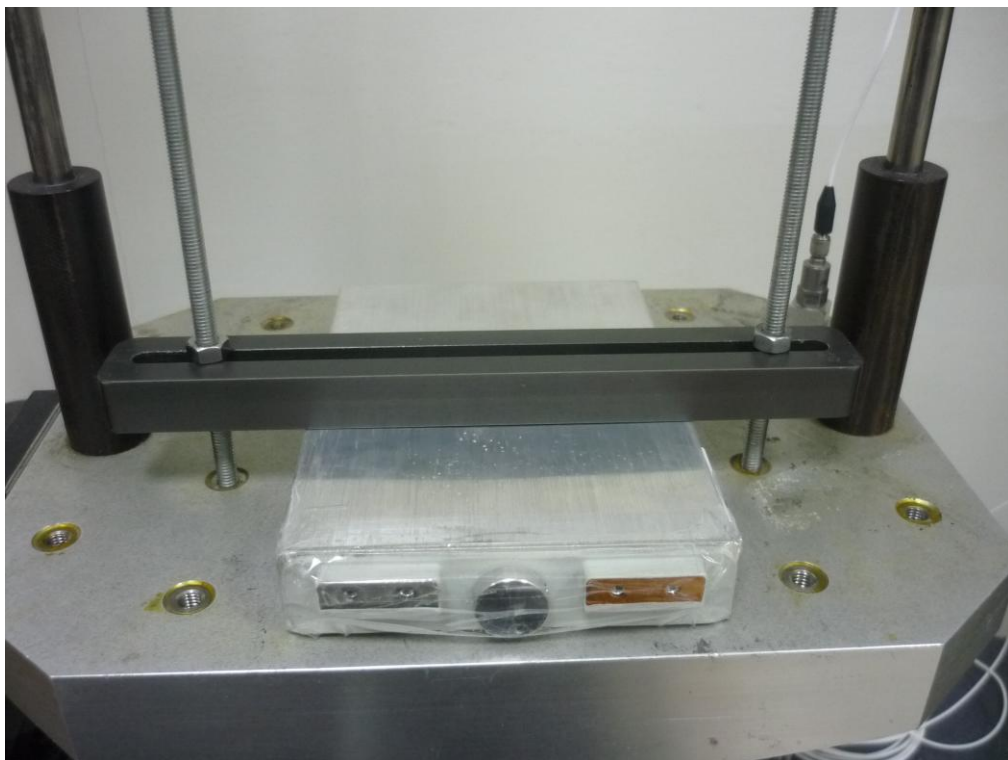


**Shock test condition -1 (X axis direction)**

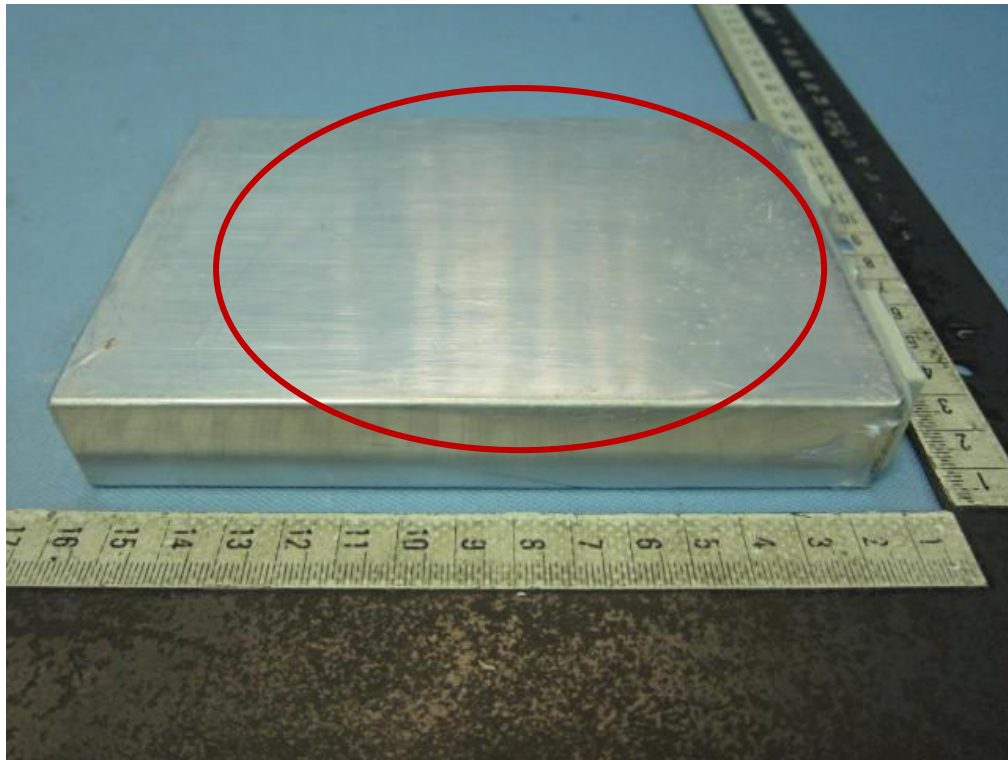




**Shock test condition -2 (Y axis direction)**



**Shock test condition -3 (Z axis direction)**



Crush (after test)