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# **Certification**

C190311-1

model name	: CR1616		
Lithium me	etal cell or battery	☐ Lithium-ion	cell or battery
Lithium conte	ent	Watt-hour rating	
√ cell	☐ battery(pack)	□ cell	☐ battery(pack)
<b>▽</b> ≤ 0.3g	□ ≦ 0.3g	☐ ≦ 2.7Wh	☐ ≦ 2.7Wh
□ ≦ 1g	□ ≦ 2g	□ <b>≤</b> 20Wh	□ ≦ 100Wh
□ > 1g	□ > 2g	□ > 20Wh	□ > 100Wh
		Nominal Voltage	V
		Rated Capacity	mAh
Transport tests	and results		
Test number		Results	Remarks
T-1	Altitude	Accepted	
T-2	Thermal cycling	Accepted	
T-3	Vibration	Accepted	
T-4	Shock	Accepted	
T-5	External short circuit	Accepted	
T-6	Crush	Accepted	
T-7	Overcharge	Not applicable	for rechargeable battery only
T-8	Forced Discharge	Accepted	
of the UN Recomn Amendment2), Pa	nendations on the Trans rt Ⅲ, sub-section 38.3 Name / Title of Signator	port of Dangerous G y ashi Kimura / Seni	the Manual of Tests and Criteria oods(5th revised edition or Manager, MD Design Dept.
	March 11 2019		,

Test No.					C-18	04-4						
Test			T	.1: Altitu	ude	de simulation						
						Appro	ved by	Checked by	Prepared by			
Item (Status)		CR' Undisc	1616 charged	d)		18:5		竹内 18,5.30	18,5,30			
Place	Safety t	est hous	se E	Equipment N	lo.	P-23	3-01	Туре	Li content			
	nber of pecimen	10						Cell	0.02 g			
Perfo	rmed by	Koya nakatani			ni			Battery	5.52 g			
Time and	Test time	Start	2018/	4/5	9:15	5	Finish	2018/4/5	15:15			
	Temperature	ature Start 20.3°C					FILISH	20	.5°C			
tempera-	Observe time 2		2018/	8/4/5 15:15		15		2018/4/5	16:16			
ture	Temperature	Start 20.3°C				Finish		20	.3°C			
Test proce	dure					u i		V - 2 7				

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least 6 hours at ambient temperature (20  $\pm$  5 °C).

## Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

## Test result

	No.	1	2	3	4	5	6	7	8	9	10
	∟ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	condition	Test tim Pressur		than 11.	6kPa						
	Pre-test(V <sub>1</sub> ) [V]	3.245	3.239	3.248	3.241	3.237	3.243	3.251	3.238	3.235	3.244
Voltage	After-test(V <sub>2</sub> ) [V]	3.245	3.248	3.236	3.251	3.250	3.247	3.244	3.251	3.248	3.237
	Change rate <sup>*1</sup> [%]	100	100	100	100	100	100	100	100	100	100
	Pre-test(M <sub>1</sub> ) [g]	1.045	1.052	1.046	1.049	1.046	1.052	1.046	1.041	1.048	1.055
Mass	After-test(M <sub>2</sub> ) [g]	1.045	1.052	1.046	1.049	1.046	1.052	1.046	1.041	1.048	1.055
	Mass loss 2 [%]	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00
Part	Leakage	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.
After-	Venting	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

Test No.				C	-1804-4							
Test			T	.1: Altitu	de sir	de simulation						
					Appr	oved by	Checked by	Prepared by				
Item (Status)	(F	CR' Fully dis	1616 scharge	ed)	(1	鈴 0.5,30 木	行内 '18,5,30 恭	18,5,30 洗				
Place	Safety t	est hous	se E	Equipment No	. P-2	23-01	Туре	Li content				
	nber of pecimen			10			Cell	0.02 g				
Perfo	rmed by			Koya nakatan	Í		Battery	0.02 g				
Time and	Test time	Start	2018/	4/5	9:15	Finish	2018/4/5	15:15				
	Temperature	20.3°C			FILISH	20.	5°C					
tempera-	Observe time	Start	2018/	4/5 1	5:15	France	2018/4/5	16:16				
ture	Temperature	Start		20.3°C		Finish	20.	3°C				
Test proce	dure				2.00							

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least 6 hours at ambient temperature (20  $\pm$  5 °C).

Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire.

## Test result

	No.	1	2	3	4	5	6	7	8	9	10
L	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	condition	Test tim Pressur		than 11.	6kPa						
	Pre-test(V <sub>1</sub> ) [V]	3.1	- ·	-		- 1-	-	-	DFT.	-	-
Voltage	After-test(V2) [V]			) <del>-</del>	-	-	-	leven.	-	4	14
	Change rate <sup>*1</sup> [%]		-	-	23ª E.	-1-		-	-	-	-
	Pre-test(M <sub>1</sub> ) [g]	1.053	1.042	1.048	1.042	1.038	1.036	1.046	1.047	1.043	1.046
Mass	After-test(M <sub>2</sub> ) [g]	1.053	1.042	1.048	1.041	1.038	1.036	1.046	1.048	1.043	1.046
	Mass loss*2 [%]	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00
0.4	Leakage	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.
After-	Venting	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.

M > 75g

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass loss limit
0.5%

0.1%

est No.					C-1	804-4						
Test				T.2:	The	nermal test						
						Appro	oved by	Checked by	Prepared by			
Item Status)		CR' Undiso	1616 charge	d)		18.5.30		18.5.30	18.5.30			
Place	Safety t	est hous	se	Equipmen	t No.	A-0	2-01	Туре	Li content			
Number test spe	POPULATOR AND	10						Cell	0.02 g			
Perform	ned by			Koya naka	atani			Battery	5.52 g			
me and Te	Test time	Stort	2018	/4/6	13:	00	Finish	2018/4/11	15:15			
16	Temperature	Start _					FILISH	21	.0°C			
. 101	Observe time	oserve time 20		4/11	18:00		Challet	2018/4/12	18:45			
Te	emperature	Start	21.2°C		Finish		21.2°C					
me and Tempera-	Temperature Dbserve time Temperature	Start	2018/	- '4/11	18:		Finish	21 2018/4/12				

Test cells and batteries are to be stored for at least 6 hours at a test temperature equal to  $72 \pm 2$  °C, followed by storage for at least 6 hours at a test temperature equal to -  $40 \pm 2$  °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature ( $20 \pm 5$  °C).

## Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

Test result

	No.	1	2	3	4	5	6	7	8	9	10
- (1	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	condition	Setting	tempera time: 6h cycle:10		°C/-40°C						
	Pre-test(V <sub>1</sub> ) [V]	3.232	3.248	3.249	3.251	3.250	3.250	3.247	3.247	3.241	3.245
Voltage	After-test(V2) [V]	3.250	3.255	3.254	3.253	3.245	3.254	3.248	3.253	3.251	3.254
	Change rate <sup>*1</sup> [%]	101	100	100	100	100	100	100	100	100	100
77.70	Pre-test(M <sub>1</sub> ) [g]		1.047	1.041	1.042	1.045	1.048	1.048	1.037	1.049	1.041
Mass	After-test(M <sub>2</sub> ) [g]	1.053	1.048	1.041	1.042	1.045	1.048	1.048	1.037	1.049	1.041
	Mass loss 2 [%]	0.01	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00
	Leakage	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.
After-	Venting	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

Test No.				C.	1804-4				
Test				T.2: Th	erma	l test			
		024				oved by	Checked by	Prepared by	
Item (Status)	(F		<b>1616</b> scharge	ed)	(1	鈴 8,5,30 木	竹内 18,5,30 恭	中谷 18,5,30 洗	
Place	Safety t	est hou	se E	Equipment No	. A-(	02-01	Туре	Li content	
	nber of pecimen	10					Cell	0.02 g	
Perfo	rmed by			Koya nakatan			Battery	0.02 g	
Time and	Test time	Start	2018/	4/6 1	3:00	Finish	2018/4/11	15:15	
	Temperature	Start		-		FILIISH	21.	0°C	
tempera-	Observe time	2018		1/11 1	3:00	Flatab	2018/4/12	18:45	
ture	Temperature	Start	Start 21.2°C			Finish	21.2°C		
Test proce	dure							100	

Test cells and batteries are to be stored for at least 6 hours at a test temperature equal to  $72 \pm 2$  °C, followed by storage for at least six hours at a test temperature equal to -  $40 \pm 2$  °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature ( $20 \pm 5$  °C).

## Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire.

#### Test result

	No.	1	2	3	4	5	6	7	8	9	10
L	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	condition	Setting	tempera time: 6h cycle:10		°C/-40°C						
e wast	Pre-test(V <sub>1</sub> ) [V]	-			- T.	Expo.	-	-	-	-	-
Voltage	After-test(V2) [V]	Ev.	1	-	-	9	-00-				4
	Change rate <sup>*1</sup> [%]	A.	-	4	-	-	-	-	-	-	
	Pre-test(M <sub>1</sub> ) [g]	1.047	1.049	1.048	1.052	1.040	1.039	1.051	1.051	1.036	1.046
Mass	After-test(M <sub>2</sub> ) [g]	1.047	1.049	1.048	1.052	1.040	1.039	1.051	1.051	1.036	1.046
	Mass loss*2 [%]	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01
3.54	Leakage	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.
After-	Venting	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass loss[%]= $(M_1-M_2)/M_1 \times 100$	
Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
14. 75.	0.40/

Test No.					C-1	804-4				
Test				T.	3: V	brat	on			
			1.50.5			Approved by		Checkedby	Prepared by 中谷 18,5,30 洗	
Item (Status)		CR: Undiso	1616 charge	ed)				18.5.30		
Place	Safety t	est hou	se	Equipmer	it No.	A-0	7-01	Туре	Li content	
	nber of pecimen			10				Cell	0.02 g	
Perfo	rmed by	Koya nakatani						Battery	g	
Time and	Test time	Start	2018	/4/20	9:0	0	Finish	2018/4/20	18:00	
	Lemperature		21.0°C			Finish		21.0°C		
tempera-	Observe time	Ctort	2018	/4/20	18:	00	Cinink	2018/4/20	18:45	
ture	Temperature	Start		20.0°0			Finish	20.	8°C	
Test proce	dure									

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 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 cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.

## Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

#### Test result

	No.	1	2	3	4	5	6	7	8	9	10
	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	Vibration: 7Hz -200Hz-7Hz  Test condition  Test time: 3 hours for each direction(x, y, z); total 9 hours										
	Pre-test(V <sub>1</sub> ) [V]	3.259	3.254	3.256	3.264	3.265	3.250	3.254	3.255	3.265	3.250
Voltage	After-test(V2) [V]	3.268	3.271	3.272	3.280	3.281	3.266	3.283	3.280	3.280	3.291
	Change rate <sup>*1</sup> [%]	100	101	100	100	100	100	101	101	100	101
	Pre-test(M <sub>1</sub> ) [g]										
Mass	After-test(M <sub>2</sub> ) [g]										
	Mass loss 2 [%]	######	#####	######	######	######	######	#####	######	#####	#####
F., (1)	Leakage	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.
After-	Venting	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

Test No.				C-	1804-4			
Test				T.3: \	ibrat	ion		
Item (Status)	(F		1616 scharge	ed)	(18.	by b	Checked by /18 5.30	Prepared by 18,5,30 洗
Place	Safety t	est hou	se E	Equipment No.	A-0	7-01	Туре	Li content
	nber of pecimen			10			Cell	0.02 g
Perfo	rmed by			Koya nakatani			Battery	0.02 g
Time and	Test time	Start	2018/4	1/20 9	00	Finish	2018/4/20	18:00
	Temperature	Start		21.0°C		FILISH	21.	0°C
tempera-	Observe time	Ctort	2018/4	/20 18	:00	Photos	2018/4/20	18:45
ture	Temperature	Start		20.0°C		Finish	20.	8°C
Test proce	dure							

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 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 cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.

#### Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire.

#### Test result

	No.	1	2	3	4	5	6	7	8	9	10
	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	Vibration: 7Hz -200Hz-7Hz Test condition Test time: 3 hours for each direction(x, y, z); total 9 hours										
	Pre-test(V <sub>1</sub> ) [V]		5		E. G.	73-2		-	-		-
Voltage	After-test(V2) [V]	-	-		-	-	7 O-		4	1.2	4.
	Change rate <sup><sup>+1</sup></sup> [%]	- 4	1	A	- ( - (			-	-	-	-
	Pre-test(M <sub>1</sub> ) [g]	1.045	1.045	1.046	1.038	1.045	1.050	1.044	1.046	1.049	1.048
Mass	After-test(M <sub>2</sub> ) [g]	1.045	1.045	1.046	1.038	1.045	1.050	1.044	1.046	1.049	1.048
	Mass loss*2 [%]	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
	Leakage	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.
After-	Venting	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

Test No.				C-1	804-4			
Test				T.4:	Shoc	k		
					Appro	oved by	Checked by	Prepared by
Item (Status)			1616 charged)			<b>给</b> 8.5.30 未	<b>竹内</b> (18, 5,30) 恭	中谷 (18,5,30) 洸
Place	Safety t	est hou	se Equ	ipment No.	A-0	8-01	Туре	Li content
	nber of pecimen			10	10		Cell	0.02 g
Perfo	rmed by		Koy	a nakatani			Battery	0.02 g
Time and	Test time	Start	2018/4/19	10:	45	Finish	2018/4/19	11:45
	Temperature	Start		20.1°C		FILIISH	20.	1°C
tempera-	Observe time	Start	2018/4/19	11:	45	Cisials	2018/4/19	12:15
ture	Temperature	Start		20.1°C		Finish	20.	1°C
Test proce	dure							

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

#### Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

## Test result

	No.	1	2	3	4	5	6	7	8	9	10
L	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	Peak acceleration: 150 gn Pulse duration: 6 ms										
	Pre-test(V <sub>1</sub> ) [V]	3.288	3.287	3.283	3.283	3.291	3.289	3.293	3.284	3.285	3.285
Voltage	After-test(V2) [V]	3.284	3.295	3.293	3.300	3.286	3.299	3.294	3.299	3.297	3.292
	Change rate <sup>*1</sup> [%]	100	100	100	101	100	100	100	100	100	100
	Pre-test(M <sub>1</sub> ) [g]	1.048	1.054	1.048	1.037	1.039	1.054	1.046	1.044	1.045	1.033
Mass	After-test(M <sub>2</sub> ) [g]	1.048	1.054	1.048	1.036	1.039	1.054	1.046	1.044	1.045	1.033
	Mass loss*2 [%]	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00
	Leakage	N.L.									
After-	Venting	N.V.									
test	Disassembly	N.D.									
Status	Rupture	N.R.									
	Fire	N.F.									

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

l'a			C-1	804-4			
			T.4:	Shoc	k		
	No.	ouwa		Approved by		Checked by	Prepared by
(F						竹内 18,5,30 恭	甲谷 18.5.30 洸
Safety t	est hou	se Equi	pment No.	A-08	8-01	Type	Li content
nber of pecimen			10			Cell	0.02 g
rmed by		Koya	a nakatani			Battery	0.02 g
Test time	Stort	2018/4/19	10:	45	Einiah	2018/4/19	11:45
Temperature	Start		20.1°C	Finish		20.	1°C
Observe time	Ctort	2018/4/19	11:	45	Fields	2018/4/19	12:15
Temperature	Start		20.1°C		rinish	20.	1°C
	Safety to the specimen specime	Safety test house the start of	Test time Temperature Observe time  Start  Start  Test time Temperature  Start  Start  2018/4/19	CR1616  (Fully discharged)  Safety test house Equipment No.  The strime Temperature Observe time Start Start CR1616  (Fully discharged)  Equipment No.  Equipment No.  10  Koya nakatani  2018/4/19 10: 2018/4/19 11:	CR1616  (Fully discharged)  Safety test house Equipment No. A-08 pecimen rmed by Koya nakatani Test time Temperature Observe time Start 2018/4/19 11:45	CR1616  (Fully discharged)  Safety test house Equipment No. A-08-01  Test time Temperature Observe time  CR1616  Approved by  A-08-01  A-08-01  Finish  A-08-01  A-08	T.4: Shock  CR1616  (Fully discharged)  Safety test house Equipment No. A-08-01 Type  The rof pecimen remed by Koya nakatani  Test time Temperature Observe time Start 2018/4/19  T.4: Shock  Approved by Checked by (18,5,30) (1

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

Requirements

There is no leakage (no mass loss), no venting, no disassembly, no rupture and no fire.

#### Test result

	No.	1	2	3	4	5	6	7	8	9	10
	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test	condition	ccelerati uration:	on: 150 ( 6 ms	gn							
	Pre-test(V <sub>1</sub> ) [V]		•	-	-	1 2	1.3		_		-
Voltage	After-test(V2) [V]	-		-			l D <del>y</del> q	-	-	4	-
	Change rate*1 [%]			L 640-	-	<u> </u>	A A		-		-
	Pre-test(M <sub>1</sub> ) [g]	1.048	1.051	1.042	1.050	1.038	1.043	1.047	1.049	1.052	1.043
Mass	After-test(M <sub>2</sub> ) [g]	1.048	1.051	1.042	1.050	1.038	1.043	1.047	1.049	1.052	1.043
	Mass loss*2 [%]	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00
	Leakage	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.	N.L.
After-	Venting	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.	N.V.
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.

\*1: Change rate[%]=V<sub>2</sub>/V<sub>1</sub> x 100 Limit Change rate: 90%

Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

Test No.				C-1	804-4						
Test			T.5	5: Externa	Isho	short circuit					
Item		CR	1616		Approved by		Checked by	Prepared by			
(Status)		charged	J)	1	5,30	18 5.30	洗				
Place	Safety test house		se E	quipment No.	A-02-30		Type	Li content			
	nber of pecimen			10			Cell	0.02 g			
Perfo	rmed by		H	Koya nakatani			Battery	0.02 g			
Time and	Test time	Start	2018/4	/23 9:0	00	Finish	2018/4/23	16:00			
	Temperature	ature 21.0°C		21.0°C	Finish		21.2°C				
tempera-	Observe time	Start	2018/4/23 16		00		2018/4/24	9:00			
ture	Temperature	Start		21.2°C	Finish		20.9°C				
Test proc	rocedure										

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches  $55 \pm 2$  °C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at  $55 \pm 2$  °C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to  $55 \pm 2$  °C. The cell or battery must be observed for a further six hours for the test to be concluded.

## Requirements

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire within six hours of this test.

## Test result

	No.	1	2	3	4	5	6	7	8	9	10	
L	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	
Test	condition	Setting Temperature of chamber: 55°C Resistance: Less than 0.1ohm										
Voltage	Pre-test [V]	3.283	3.278	3.289	3.291	3.289	3.285	3.296	3.290	3.298	3.284	
Mass	Pre-test [g]	1.039	1.054	1.042	1.045	1.047	1.047	1.049	1.045	1.045	1.040	
Max. Ter	mperature (°C)	59.5	59.1	59.5	59.9	59.8	60.2	59.4	59.3	60.1	59.8	
	Leakage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
After-	Venting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	

			U-	C-1804-4						
		T.5	: Extern	al short circuit						
				Appro	oved by	Checked by	Prepared by			
(F				5,30	行内 '18.5.30 恭	中谷 18.5.30 洗				
Place Safety test ho		se E	quipment No	. A-0	2-30	Туре	Li content			
er of cimen			10			Cell	0.02 g			
ed by		ŀ	Koya nakatani			Battery	0.02 g			
st time	Stort	2018/4	/23 9	:00	Einigh	2018/4/23	16:00			
e and Temperature Start 2010			21.0°C		FILISH	21.	2°C			
serve time	Ctort	2018/4	/23 16	5:00	Cinini	2018/4/24	9:00			
mperature	Start		21.2°C		rinish	20.9°C				
	Safety to r of cimen ed by st time mperature serve time	(Fully dis	CR1616  (Fully discharge Safety test house End of Start Star	CR1616  (Fully discharged)  Safety test house Equipment Nover of the series of the ser	CR1616  (Fully discharged)  Safety test house Equipment No. A-0 or of cimen ed by Koya nakatani set time mperature serve time mperature serve time mperature Start 2018/4/23 9:00 21.0°C 2018/4/23 16:00 21.2°C	CR1616  (Fully discharged)  Safety test house Equipment No. A-02-30  or of cimen ed by Koya nakatani set time mperature mperature serve time mperature mperature mperature Start 2018/4/23 16:00  Start 2018/4/23 16:00  Start 2018/4/23 Finish	CR1616			

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches  $55 \pm 2$  °C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at  $55 \pm 2$  °C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to  $55 \pm 2$  °C. The cell or battery must be observed for a further six hours for the test to be concluded.

## Requirements

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire within six hours of this test.

#### Test result

	No.	1	2	3	4	5	6	7	8	9	10	
L	ot No.	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	
Test	condition	_	Setting Temperature of chamber: 55°C Resistance: Less than 0.1ohm									
Voltage	Pre-test(V <sub>1</sub> ) [V]	-	-		-	1 2 11		1 4				
Mass	Pre-test(M <sub>1</sub> ) [g]	1.043	1.050	1.042	1.041	1.036	1.051	1.041	1.048	1.045	1.053	
Max. Ter	mperature (°C)	55.2	55.4	55.0	55.0	55.1	55.5	55.2	55.5	55.5	55.1	
	Leakage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
After-	Venting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	
Status	Rupture	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	

(Revision	date	: 1-Jan-2013)
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			T.6:	.6: Crush							
	00	1010		Approved by		Checked by	Prepared by				
						1312 3					
			use			Nominal Voltage	Rated Capacity				
nber of pecimen			5		2.01/	EE- AL					
rmed by	Atsushi Yamano			6	-1	3.00	55mAh				
Test time	Stort	2013/12/1	10:15	Ei.	nich	2013/12/1	10:45				
Temperature Start 20.5		).5°C	Finis		21.	.0°C					
Observe time	Ctort	2013/12/1	10:45		-1-1-	2013/12/2	18:15				
Temperature	Start 21.0°C					19.5°C					
	ber of pecimen med by Test time Temperature Observe time	(Undisconding to the control of the	Description   Description	CR1616  (Undischarged)  Safety test house  Safety test house  Atsushi Yamano  Test time Temperature Observe time  CR1616  (Undischarged)  Safety test house  5  2013/12/1 10:15  20.5°C  2013/12/1 10:45	CR1616  (Undischarged)  Safety test house  Safety test house  Atsushi Yamano  Test time Temperature  Observe time  Start  CR1616  (Undischarged)  Safety test house  5  CR1616  (Undischarged)  Safety test house  5  CR1616  Safety test house  5  CR	CR1616  (Undischarged)  Safety test house  Secimen  Test time Temperature  Observe time  Start  CR1616  Approved by  Atsushi Yamano  Finish  Start  2013/12/1 10:45  Finish  Finish  Finish	CR1616  (Undischarged)  Safety test house  Safety test house  Nominal Voltage  Nominal Voltage  Approved by  Nominal Voltage  3.0V  Test time Temperature  Observe time  Start  2013/12/1 10:45  Finish  2013/12/2  Finish  Checked by  Approved by  Checked by  Approved by  Start  2013/12/1 10:45  Finish  Checked by  Approved by  Checked by  Approved by  Start  2013/12/1 10:45  Finish  2013/12/2  Finish  Checked by				

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

- (a) The applied force reaches 13 kN ± 0.78 kN;
- (b) The voltage of the cell drops by at least 100 mV; or
- (c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis. Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

#### Requirements

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire within six hours of this test.

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	No.	1	2	3	4	5	6	7	8	9	10
L	ot No.	131024	131024	131024	131024	131024					/
Test	condition	Ram dia	ameter:	: 1.5cm 32 force : V	/s mm Videst si		essure:	13KN (	17	Мра	)
Force	Peak (kN)	15.000	15.000	15.000	15.000	15.000					
	Pre-test(V <sub>1</sub> ) [V]	3.240	3.237	3.243	3.248	3.239					
Voltage	After-test(V <sub>2</sub> ) [V]	3.234	3.230	3.240	3.245	3.234					
	Drop*1 [V]	0.006	0.007	0.003	0.003	0.005					
Mass	Pre-test [g]	2042 Y		·		-					
Thick-	Pre-test(T <sub>1</sub> ) [mm]	1.561	1.572	1.563	1.557	1.547					
ness	After-test(T <sub>2</sub> ) [mm]	1.566	1.579	1.572	1.567	1.571					
11033	Change rate 2 [%]	100%	100%	101%	101%	102%					
Max. Ter	mperature (°C)	30°C<	30°C<	30°C<	30°C<	30°C<					
	Leakage	N/A	N/A	N/A	N/A	N/A					
After-	Venting	N/A	N/A	N/A	N/A	N/A					
test	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.					
Status	Rupture	N/A	N/A	N/A	N/A	N/A					/
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.			/	/	/

<sup>\*1:</sup> Drop\*1 [V]=V<sub>1</sub>-V<sub>2</sub>

<sup>\*2:</sup> Change rate[%]=T2/T1 x 100

(Revision date: 1-Jan-2013)

Test				T.6:	Crush					
		0.0	1010		Approved by		Checked by	Prepared by		
Item (Status)	(F		1616 scharged)				1312 3			
Place			Safety test ho	use			Nominal Voltage	Rated Capacity		
Number of test specimen				5			3.0V	55mAh		
Perfo	rmed by		Atsushi Yamano				3.00	55mAh		
Time and	Test time	Start	2013/12/1	10:15		Einich	2013/12/1	10:45		
	Temperature	e Start 20.5°C		).5°C	Finisl		21.0°C			
	Observe time	Ctort	2013/12/1	10:45		Tiole b	2013/12/2	18:15		
ture	Temperature	Start	21	.0°C		rinish	19.	5°C		
tempera- ture Test proc	Observe time Temperature	Start -	2013/12/1	10:45		Finish	2013/12/2	18:		

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

- (a) The applied force reaches 13 kN  $\pm$  0.78 kN;
- (b) The voltage of the cell drops by at least 100 mV; or
- (c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis. Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

#### Requirements

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire within six hours of this test.

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	No.	1	2	3	4	5	6	7	8	9	10	
	ot No.	131024	131024	131024	131024	131024		/			/	
Test	condition	Ram dia	rushing speed: 1.5cm/s am diameter: 32 mm Pressure: 13KN ( 17 Mpa ) irection of the force : Widest side									
Force	Peak (kN)	15.000	15.000	15.000	15.000	15.000	/			/	/	
	Pre-test(V <sub>1</sub> ) [V]	2.810	2.824	2.811	2.819	2.814				/	/	
Voltage	After-test(V2) [V]	2.796	2.816	2.803	2.816	2.808			/	/		
	Drop*1 [V]	0.014	0.008	0.008	0.003	0.006						
Mass	Pre-test [g]		).	,	-	-						
Thick-	Pre-test(T <sub>1</sub> ) [mm]	1.534	1.549	1.571	1.530	1.552						
ness	After-test(T2) [mm]	1.541	1.561	1.579	1.534	1.561						
A 22 A	Change rate*2 [%]	100%	101%	101%	100%	101%						
Max. Ter	nperature (°C)	30°C<	30°C<	30°C<	30°C<	30°C<						
	Leakage	N/A	N/A	N/A	N/A	N/A						
After-	Venting	N/A	N/A	N/A	N/A	N/A					/	
	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.						
Status	Rupture	N/A	N/A	N/A	N/A	N/A					/	
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.						

<sup>\*1:</sup> Drop\*1 [V]=V<sub>1</sub>-V<sub>2</sub>

<sup>\*2:</sup> Change rate[%]=T2/T1 x 100

Test No.		C-1804-4									
Test		T.8: Forced discharge									
	CR1616 (Fully discharged)					oved by	Checked by	Prepared by			
Item (Status)						鈴 5.30 木	18,5,30	中谷 18.5.30 洗			
Place	Safety t	est hou	se E	quipment No.	E-07-27		Туре	Li content			
Number of test specimen				10			Cell	0.02 g			
Performed by			K	oya nakatani			Battery				
Time and	Test time Temperature	Start	2018/4	/20 9:	30	Finish	2018/4/23	9:30			
tempera- ture				21.1℃		FILISH	20.9°C				
	Observe time	Ctort :	2018/4/	/23 9:	30	Figure	2018/5/7	9:00			
	Temperature	Start		20.9°C	Finish		21.0°C				
Test proc	edure										

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current(in Ampere).

## Requirements

There is no disassembly and no fire during the test and within seven days of the test.

#### Test result

No.		1	2	3	4	5	6	7	8	9	10
Lot No.		18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04	18-04
Test condition		Discharge current: 2mA Forced discharge time: 28h									
Voltage	Pre-test [V]	T 4	LZ	1 2 3 4		-7-7	=		-		-
Mass	Pre-test [g]		4	To record	-	To each	-	-			- 4
After- test Status	Leakage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Venting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Disassembly	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
	Rupture	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Fire	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.