

FILE NAME: SPECIFICATIONS OF
SEALED NICKEL CADMIUM
BATTERIES(FOR HIGH
TEMP)

MODEL: **KRMU 33/60 D4000mAh**

Specification No.: **S/RONDA0284-1**

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1. SCOPE

The specifications governs the performance of the following **RONDA** Nickel-Cadmium Cylindrical cell and its battery pack.. (Refer to the attached figure 1)

Rated capacity: **4000mAh**

Designation: **KRMU 33/60 D** ($D: 33.0^{0}_{-1.0}\text{mm}$ $H: 59.5^{0}_{-1.0}\text{mm}$)

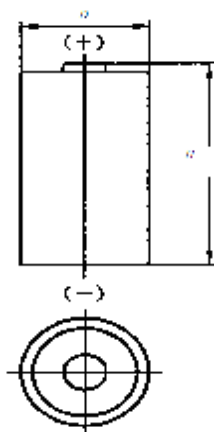


Figure 1- Jacketed cylindrical cells

2. DATA OF BATTERY PACK

The data of battery pack, including voltage and weight, is almost equivalent to the multiple numbers of the relevant single cells.

Example: Battery pack consisting three single cells

Nominal voltage of single cell = 1.2V

Nominal voltage of battery pack = $1.2\text{V} \times 3 = 3.6\text{V}$

3. RATINGS

Table 1 - Ratings of the cells

Description	Unit	Specification	Conditions
Nominal Voltage	V/Cell	1.2	Single cell
Rated Capacity	mAh	4000	Standard Charge/Discharge

4. PERFORMANCE

Unless otherwise stated, tests should be done within one month of delivery under the following conditions:

Ambient Temperature: $20 \pm 5^{\circ}\text{C}$

Relative Humidity: $65 \pm 20\%$

Standard Charge/Discharge Conditions:

Preparative: Prior to charging, the cell shall be discharged by **800mA**($0.2I_r$) to 1.0V

Charge: **400mA**($0.1I_r$) \times 16hours

Stand in charged condition:1~4h

 Discharge: 800mA(0.2I_A) to 1.0V/Cell 1

Table 2 – Performance and test methods

Test Item		Unit	Specification	Test Conditions	Remarks
Discharge performance	20℃ ^a	h	≥ 5	Standard Charge/Discharge	/
		min	≥ 48	After Standard Charge, stored for 1~4h, then discharged by 4000mA (1.0I _A) to 0.9V.	MU
	-18℃	h	≥ 2	After Standard Charge, stored for 16~24h in -18±2℃, then discharged by 800mA (0.2I _A) to 1.0V in -18±2℃.	/
Charge (capacity) retention		h/min	≥ 3h15min	After Standard Charge, stored on open circuit for a period of 28days, then discharged by 800mA (0.2I _A) to 1.0V.	/
Endurance in cycles		cycle	≥ 50	Appendix-table 3	/
Permanent charge endurance		A: ≥ 3h45min B: ≥ 42min 2 nd		Appendix-table 4	/
		A: ≥ 3h45min B: ≥ 42min 3 rd			
		A: ≥ 2h30min B: ≥ 24min 8 th			
		A: ≥ 2h30min B: ≥ 24min 9 th			
Over charge	Discharge A	h/min	≥ 4h15min	Appendix-table 5	/
	Discharge B	min	≥ 36		
Safety device operation		Not disrupt or burst		Undergo a forced discharge at constant current 800mA(0.2I _A) to 0V. Then discharged by 4000mA (1.0I _A) for 60min.	/
Storage		hour	≥ 5	Stored on open circuit for 12 months. Then standard charge/discharge.	/
Charge acceptance		/	/	IEC 61951-1 2006 7.9	Reference
Internal resistance		mΩ	≤ 18.0	Within 1~4h after standard Charge (1000Hz)	
Weight		g	115(approx)	/	Reference
Vibration		No leakage, no fire, no explosion		IEC 62133 2002 4.2.2	/
Free fall		No fire, no explosion		IEC 62133 2002 4.3.3	/

 a) Five cycles is permitted b) Unless otherwise stated, the cell shall be discharged by 800mA(0.2I_A) to 1.0V before test.

Notice: Test conditions is drawn according to IEC 61951-1 2006; Please refer to the related description of the standard.

5. CONFIGURATION, DIMENSIONS AND MARKINGS

Please refer to the attached drawing.

6. EXTERNAL APPEARANCE

The cell/battery shall be free from cracks, scars, breakage, rust, discoloration, leakage nor deformation.

7. CAUTION

- (1) Reverse charging is not acceptable.
- (2) Charge before use. The cells/batteries are delivered in an uncharged state.
- (3) Do not charge/discharge with more than our specified current.

- (4) Prevent short circuit, do not incinerate or disassemble the cell/battery.
- (5) Do not solder directly to the cell/battery for a long time.
- (6) The life expectancy may be reduced if the cell/battery is subjected adverse conditions like: extreme temperature, deep cycling, excessive overcharge/ over-discharge.
- (7) Store the cell/battery in a cool and dry place. Always discharge batteries before assemble or solder.
- (8) Always discharge batteries before bulk storage or shipment.
- (9) Do not mix batteries of different types and capacities.

Appendix

A) Endurance in cycles

Prior to the endurance on cycle test ,the cell shall be discharged at 800mA(0.2I_rA) to 1.0V. The following test shall be carried out in accordance with the conditions specified in Table 3.

Table 3 Endurance in cycles

Cycle number	Charge	Stand in charged condition	Discharge
1	0.1I _r A for 16h	none	0.25I _r A for 2h20min
2~48	0.25I _r A for 3h10min	none	0.25I _r A for 2h20min
49	0.25I _r A for 3h10min	none	0.25I _r A to 1.0V
50	0.1I _r A for 16h	1h~4h	0.20I _r A to 1.0V ^a

a) Cycles 1 to 50 shall be repeated until the discharge duration on any 50th Cycle becomes less than 3h or the cell voltage drops below 1.0V during 1~48th cycle.

B) Permanent charge endurance

The permanent charge endurance test shall be performed in three steps according to the conditions specified in table 4.

It consists of:

- I A charge acceptance test at +50°C;
- I An ageing period of six months at +70°C;
- I A final charge acceptance test to check the cell' s performance after ageing.

NOTE The twelve months ageing period and the temperature of +70 ° C have been selected to simulate four years of permanent charge operation at +50 ° C.

Table 4 Permanent charge endurance

Cycle number	Ambient temperature	Charge	Discharge A or B ^a	Minimum discharge duration
1	50°C ± 2°C	0.05I _r A for 48h	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	No requirement
2		0.05I _r A for 24h	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	3h45min 42min
3		0.05I _r A for 24h	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	3h45min 42min
4	70°C ± 2°C	0.05I _r A for 120d	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	No requirement
5		0.05I _r A for 120d	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	
6		0.05I _r A for 120d	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	
7	50°C ± 2°C	0.05I _r A for 48h	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	No requirement
8		0.05I _r A for 24h	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	2h30min 24min
9		0.05I _r A for 24h	A: 0.2I _r A to 1.0V or B: 1.0I _r A to 1.0V	2h30min 24min

a) A: for LU、MU、HU cells; B: for MU、HU cells only.

C) Over charge

The ability of the cell to withstand an overcharge shall be determined by the following test at 0°C ± 2°C in circulating air.

The test shall be carried out according to the specified in table 5.

Table 5 Overcharge at 0°C

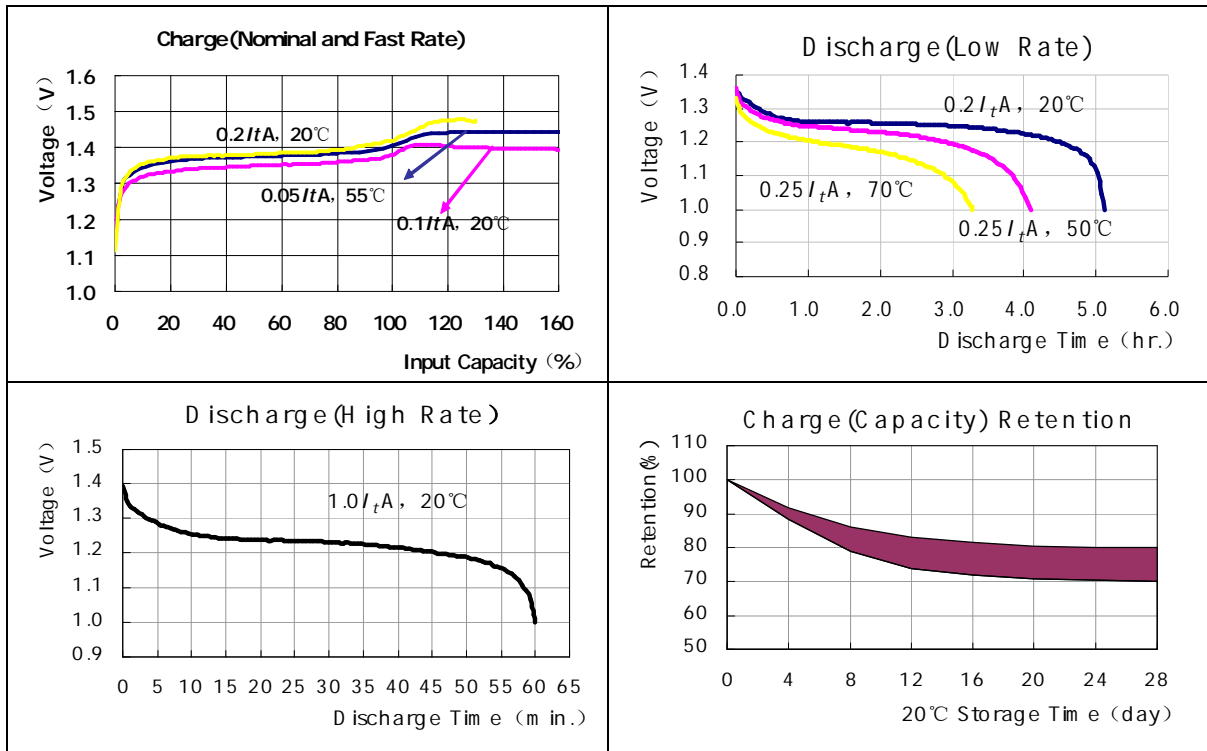
Charge	Discharge A ^a	Discharge B ^a
	LU、MU、HU cells	MU、HU cells
0.05 I _r A for 28d	0.2I _r A to 1.0V	1.0I _r A to 1.0V

a) The discharge is carried out immediately on the charging

Base Data:

		Nominal voltage		1.2V		
		Capacity comparison(mAh)		0.2I _t A	1.0I _t A	
				4000	3200	
		Weight(g)		115		
		Internal Impedance at 1000Hz (After Charge;mΩ)		≤ 18.0		
		Charge current		Trickle	200mA	
				Standard	400mA	
				Rapid	800mA	
		Charge time		Trickle	48h	
				Standard	16h	
				Rapid	6.5h	
D				33.0 ⁰ _{-0.10} mm		
H				59.5 ⁰ _{-0.10} mm		
/				/		
/				/		
Temperature		Ambient		charge		0~+70°C
				Discharge		-20~+70°C
				Storage		-30~+70°C
		Max. Test Temperature		70°C		

Electrical Performance:



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KRMU 33/60 D4000 毫安时

1. 范围

本规格书适用于下述的朗达牌 Ni-Cd 圆柱型电池单体及电池组的全部性能指标。

额定容量: 4000mAh

电池型号: KRMU 33/60 D ($D: 33.0_{-1.0}^0\text{mm}$ $H: 59.5_{-1.0}^0\text{mm}$)

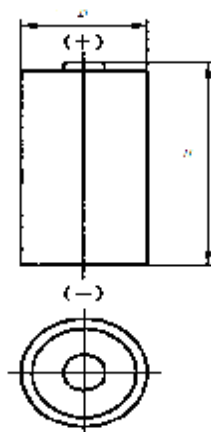


图 1 带防护外套的圆柱型密封镍镉可充单体电池

2. 组合电池的指标

组合电池的电压、重量等数据，近似等于单体电池数与对应值之乘积。

例如：组合电池包括三个单体电池

单体电池的额定电压=1.2V

则电池组的额定电压=1.2V×3=3.6V

3. 额定性能

表 1 电池的额定性能

项目	单位	指标	备注
标称电压	V	1.2	单体
额定容量	mAh	4000	标准充放

4. 电池性能与测试方法

除非另有说明，测试须在发货后一个月内在下述条件下进行：

环境温度: $20 \pm 5^\circ\text{C}$

相对湿度: $65 \pm 20\%$

标准充放条件：

准备：充电前电池要以 $0.2I_t$ 恒流放电至终点电压 1.0V；

充电：400mA($0.1I_t$)充 16 小时；

搁置：1~4 小时；

放电：800mA($0.2I_t$)至 1.0V。

电池性能和测试方法见表 2

表 2 电池性能及测试方法

测试项目		单位	标准	测试方法	备注
放电性能	20°C ¹⁾	h	≥5	标准充放	/
		min	≥48	标准充电后搁置 1~4 小时, 以 4000mA(1.0I _A)放电至 0.9V。	HU
	-18°C	h	≥2	标准充电后在-18°C ± 2°C 搁置 16~24 小时, 以 800mA(0.2I _A)放电至 1.0V。	/
荷电保持率		h/min	≥3h15min	标准充电后, 开路搁置 28 天(20°C ± 2°C), 随后标准放电(0.2I _A)至 1.0V。	/
循环寿命		Cycle	≥50	见附录表 3	/
耐充电寿命		A: ≥ 3h45min B: ≥ 42min 2 nd		见附录表 4	/
		A: ≥ 3h45min B: ≥ 42min 3 rd			
		A: ≥ 2h30min B: ≥ 24min 8 th			
		A: ≥ 2h30min B: ≥ 24min 9 th			
过充测试	放电 A	h/min	≥4h15min	见附录表 5	/
	放电 B	min	≥36		
安全装置操作		/	无爆炸、无破裂	以 800mA(0.2I _A) 放电至 0V 后再以 4000mA(1.0 I _A)强制放电 60 分钟。	/
贮存 ¹⁾		h	≥5	以 800mA(0.2I _A)放电至 1.0V 后搁置 12 个月, 再进行标准充放。	/
内阻		mΩ	≤18	电池应以 0.2I _A 放电至 1.0V, 然后标准充电, 搁置 1~4 小时; 在频率为 1.0kHz ± 0.1kHz 的交流电流下测电池内阻。	/
重量		g	115(大约)	/	参考
碰撞试验		不漏液、不着火、不爆炸		IEC 62133 2002 4.2.2	/
自由落体		不着火、不爆炸		IEC 62133 2002 4.3.3	/

 1) 允许最多测试五次 2) 如未特别说明电池在测试前必须以 0.2I_A 恒流放电至终点电压 1.0V

注: 本规格书中的测试方法根据 IEC 61951-1 2006 制订, 详细测试方法请参考该标准的相关条款。

5. 电池外观尺寸

参见附图

6. 外观

无裂缝、疤痕、破裂、锈蚀、脏污、漏液、变形

7. 使用注意事项

- 1) 勿将电池反极充电;
- 2) 如电池已带电, 初次使用前先放电后再充电;

- 3) 避免以高于指定的电流充放电；
- 4) 防止电池短路，不要拆解或焚烧电池；
- 5) 勿在电池上直接锡焊焊接；
- 6) 如极端高温、大于规定的过充、过放电，电池的使用寿命可能会下降；
- 7) 电池应存放于凉爽阴凉处，电池在组装或焊接前应将电池放电；
- 8) 建议在运输或散装贮存时将电池放电；
- 9) 不要将不同类型或不同容量的电池组合使用。

附录
1) 循环寿命测试

循环寿命试验前，电池应以 $0.2I_A$ 放电至终止电压 1.0V，然后，在环境温度 $20^\circ\text{C} \pm 5^\circ\text{C}$ 下作循环寿命测试；测试循环见表 3。

表 3 循环寿命

循环次数	充电	充电态搁置	放电
1	$0.1I_A$ 16h	无	$0.25I_A$ 2h20min
2~48	$0.25I_A$ 3h10min	无	$0.25I_A$ 2h20min
49	$0.25I_A$ 3h10min	无	$0.25I_A$ 放电至 1.0V
50	$0.1I_A$ 16h	1h~4h	$0.20I_A$ 放电至 1.0V ^{b)}

循环至第 50 次放电时间不足 3 小时或在 1~48 个循环中电压降至 1.0V 以下为止。

2) 耐充电寿命

按表 4 规定的条件，耐充电寿命试验应分三步进行，它包括：

——充电效率试验

——在 70°C 下十二个月的老化周期；

注： 70°C 的试验是模拟 50°C 时 4 年的耐充电寿命。

——最后充电效率试验检查电池老化后的性能。

表 4 LU、MU、HU 电池的耐充电寿命

循环次数	环境温度	充电	放电 A 或 B ^a	最少放电时间
1	50°C ± 2°C	0.05I _A 48h	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	无要求
2		0.05I _A 24h	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	3h45min 42min
3		0.05I _A 24h	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	3h45min 42min
4	70°C ± 2°C	0.05I _A 120d	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	无要求
5		0.05I _A 120d	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	
6		0.05I _A 120d	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	
7	50°C ± 2°C	0.05I _A 48h	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	无要求
8		0.05I _A 24h	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	2h30min 24min
9		0.05I _A 24h	A: 0.2I _A 放电至 1.0V 或 B: 1.0I _A 放电至 1.0V	2h30min 24min

a) A: 适用于 LU、MU、HU 电池; B: 仅适用于 MU、HU 电池。

3) 过充电测试

试验前, 电池应在 20°C ± 5°C 下以 0.2I_A 放电至终止电压 1.0V, 并在 0°C ± 2°C 下搁置 16h-24h。在 0°C ± 2°C 循环空气中, 电池的耐过充电能力应由下面试验来决定, 测试条件见表

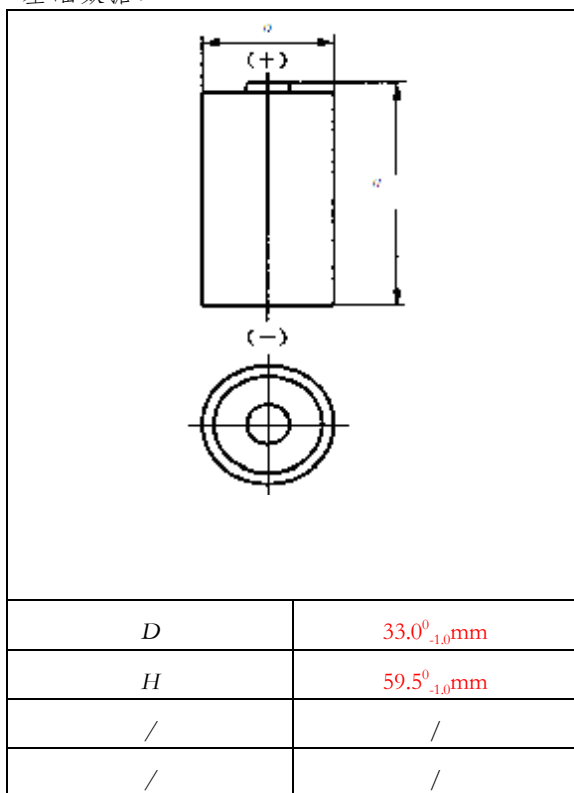
表 5 0°C 过充电

充电	放电 ^a	
	LU、MU、HU 电池	MU、HU 电池
0.05I _A 充 28d	0.2I _A 放电至 1.0V	1.0I _A 放电至 1.0V

a) 充电结束后立即放电

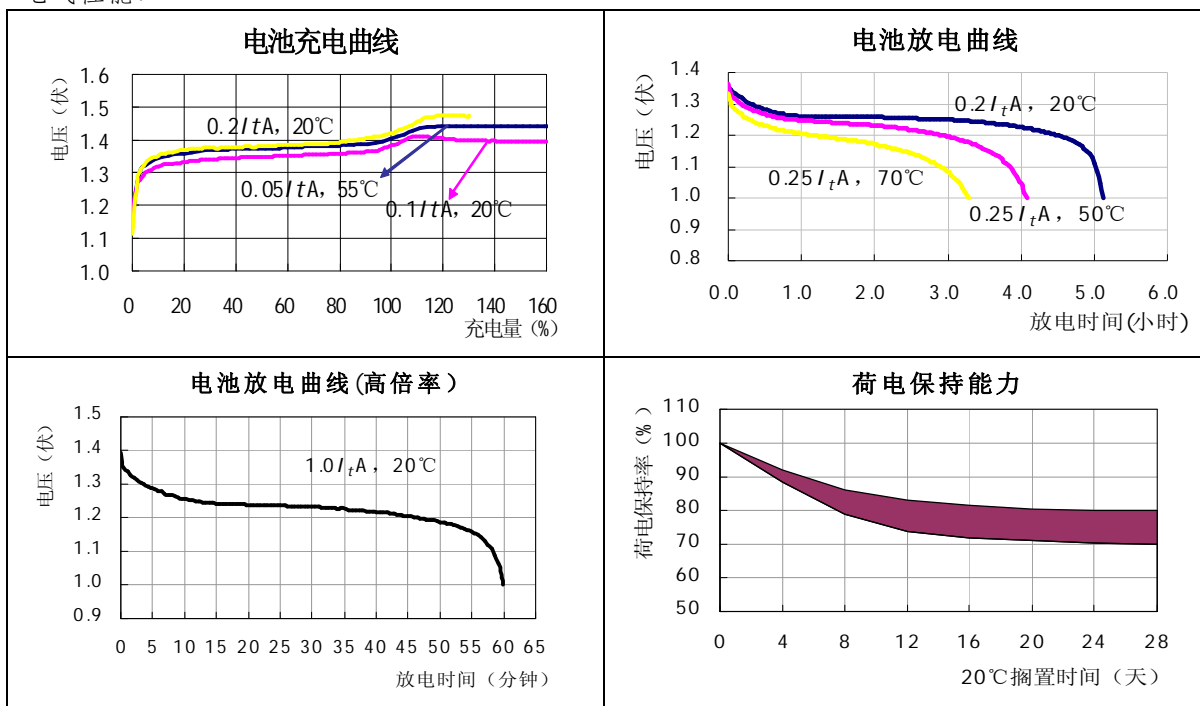
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基础数据:



标称电压		1.2V
容量对比(mAh)	0.2I _t A	1.0I _t A
	4000	3200
重量 (g)		115
内阻 (在 1000Hz 下) (充电后; mΩ)		≤ 18
充电电流	涓流	200mA
	标准	400mA
	快速	800mA
充电时间	涓流	48 小时
	标准	16 小时
	快速	6.5 小时
使用温度	充电	0~+70°C
	放电	-20~+70°C
	贮存	-30~+70°C
最高测试温度		70°C

电气性能:



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