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SPECIFICATION

Type:	Ni-CD Cylindrical Cell
Model No.:	IT-3000C
Prepared:	HML
Approved:	LFX
Date:	Jan 3, 2017



1. PREFACE

This specification applies to the Intec Nickel Cadmium Cylindrical batteries or battery packs. Intec reserves the right to alter the product design or amend this specification without prior notice.

2. SCOPE

This specification applies to nickel cadmium cylindrical rechargeable single cell IT-3000C. This cell is suitable for the permanent charge application at high temperature.

3. REFERENCE DOCUMENT

IEC61951 (2003) 《sealed Ni-Cd cylindrical rechargeable single cells》

4. GENERAL ELECTRICAL SPECIFICATION

	<i>SPECIFICATION</i>	<i>REMARKS</i>
Intec Cell Designation	IT-3000C	
Nominal Voltage	1.2V	
Rated Capacity	3000mAh	At 20°C
Charge Current		
Permanent	150mA	36 – 48 hrs
Standard	300mA	16 – 20 hrs
Quick	1000mA	3 – 4 hrs with end of charge detection
Discharge Current		
Maximum (Continuous) Discharge	6 A	
Maximum (Momentary) Discharge	30 A	
Internal Impedance	12 mΩ	At 1000 Hz
Operating Temperature		
Charge (standard) 0.1C	5 to 65°C	
Charge (quick)	10 to 55°C	
Storage Recommended	5 to 25°C	
Extended Storage	-20 to 60°C	Short duration (<1 month)
In discharge	-20 to 70°C	



5. GENERAL MECHANICAL SPECIFICATION

Bare cell drawing(mm)	Bare cell dimensions
	Maximum diameter(mm): 25.3 Maximum height(mm): 50.0
	Typical weight(g): 77

6. CAPACITY

6.1 IEC capacity

IEC capacity is rated as follow:

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

Charge current: $0.1\text{C}=300\text{mA}$ constant current;

Charge duration: 16 hr;

Rest: 1 to 4hr;

Discharge current: $0.2\text{C}=600\text{mA}$;

Discharge end voltage: 1.0V/cell

The discharge continues until the voltage drops to 1.0V/cell, and the duration must not less than 300 minutes. 3 Cycles are permitted. Therefore, the IEC capacity is minimum 3.0Ah.

6.2 Available capacity

The following cross table gives the minimum available capacity of IT-3000C battery under various charge and discharge condition. The temperature is $20 \pm 5^{\circ}\text{C}$, and the battery being initially fully charged.

Charge	Permanent	Normal
Rate	0.05C	0.1C
Current(mA)	150	300
Duration(hr)	>36	16
Rest after charged(hr)	0	1
Discharge*	Capacity(mAh)	Capacity(mAh)
0.2C(600mA)	2750	3060
C(3000mA)	2550	2850
2C(6000mA)	2200	2450

Discharge end voltage: 1.0V/cell.



7. CHARGE

7.1 Permanent charge

The IT-3000C can be permanently charged between 0 to 55°C with a constant current of 150mA(0.05C).

Occasional temperature(0 to 65°C) is accepted for a short duration only.

7.2 Standard charge

0.1C (300mA) for 16hr

The temperature during charge is 10 to 65°C.

8. TEMPERATURE CHARACTERISTICS

The following table gives the typical available capacity of a IT-3000C battery under the charge conditions:

- Standard Charge: C/10 for 16 hours
- Charge Temperature : +20±5°C
- Maximum rest after charge: 4 hours at temperature of discharge

Capacities (mAh) are given for a final discharge voltage of 1.0 volt / cell. Deviation depending on test conditions may be observed.

	Discharge Rate C/5=0.2C=600mA		Discharge Rate C/2=0.5C=1500mA		Discharge Rate 1C=3000mA	
TEMPERATURE OF DISCHARGE	Capacity %C		Capacity %C		Capacity %C	
+65°C	2550	85%	2400	80%	2100	70%
+45°C	2730	91%	2550	85%	2340	78%
+20°C	3060	102%	3000	100%	2850	95%
0°C	2520	84%	2250	75%	1800	60%
-20°C	2100	70%	1800	60%	1500	50%

9. CHARGE RETENTION

After 28 day storage at 20±5°C, the cells should retain typically of 70% its rated capacity.

10. STORAGE

Intec recommends to store the battery under the room temperature within a range of 5 to 25°C, and relative humidity is 65±5%. An extended storage within -20 to +60°C temperature range and 65±20% relative humidity is permitted in short period.



11. SERVICE LIFE FOR PERMANENT CHARGE APPLICATION

Battery life duration depends mainly on battery temperature and overcharge capacity.
When the capacity drops down to the 60% of its initial capacity, the battery life is end.
At following average operation conditions the battery life duration is 4 years:

- Working battery temperature : 40°C;
- Permanent charge current: 0.05C;
- Discharge current: 0.5C;
- 1~2 cycles per month.

12. PERMANENT CHARGE ENDURANCE

The permanent charge endurance test shall be performed in three steps according to the conditions specified in table 1.

It consists of:

- a charge efficiency test;
- an ageing period of six months at +70°C;

NOTE – The temperature of 70 °C is estimated to simulate four years of permanent charge operation at +55 °C. and

- a final charge efficiency test to check the cell's performance after ageing.

Prior to the test, the cell shall be discharged at 0.2C₅A at 20°C±5°C to a final voltage of 1.0 V and stored for not less than 16 h and not more than 24 h at an ambient temperature of 55°C±2°C.

The cell shall then be charged and discharged at constant currents under the conditions specified in table 1 while maintained in an ambient temperature of 55°C±2°C or 70°C±2°C respectively as appropriate.

The discharge is carried out immediately on completion of charging.

After performing the first charge efficiency test at 55 °C the cell is stored for not less than 16 h and not more than 24 h at an ambient temperature of 70°C±2°C.

During the ageing period of six months at 70 °C, precautions shall be taken to prevent the cell-case temperature from rising above +75 °C, by providing a forced air draught, if necessary*.

*NOTE – actual cell temperature, not the ambient temperature, determines cell performance.

The discharge duration of the three cycles at +70 °C shall be recorded. Leakage of electrolyte shall not occur during this test.

After completion of the ageing period, the cells shall be stored for not less than 16 h and not more than 24 h at an ambient temperature of 55°C±2°C. The three cycles at 55°C of the initial charge efficiency test are then repeated using the conditions specified in table 1. The duration of discharge shall be not less than the minimum specified in table 1.



Table 1 – permanent charge endurance

Cycle number	Ambient Temperature	Charge	Discharge	Minimum Discharge duration
1 2 3	+55°C±2°C	0.05 C ₅ A for 48 h 0.05 C ₅ A for 24 h 0.05 C ₅ A for 24 h	0.2 C ₅ A to 1.0V 0.2 C ₅ A to 1.0V 0.2 C ₅ A to 1.0V	No requirement 3 h 45 min 3 h 45 min
4 5 6	+70°C±2°C	0.05 C ₅ A for 60 days 0.05 C ₅ A for 60 days 0.05 C ₅ A for 60 days	0.2 C ₅ A to 1.0V 0.2 C ₅ A to 1.0V 0.2 C ₅ A to 1.0V	No requirement
7 8 9	+55°C±2°C	0.05 C ₅ A for 48 h 0.05 C ₅ A for 24 h 0.05 C ₅ A for 24 h	0.2 C ₅ A to 1.0V 0.2 C ₅ A to 1.0V 0.2 C ₅ A to 1.0V	No requirement 2 h 30 min 2 h 30 min

A Intec IT-3000C cell shall pass all the testing steps and with result as follows:

- Step 2: Minimum discharge duration 4 hours/2400mAh
- Step 3: Minimum discharge duration 4 hours/2400mAh
- Step 8: Minimum discharge duration 3 hours/1800mAh
- Step 9: Minimum discharge duration 3 hours/1800mAh

13. ICEL TEST PROCEDURE

- Cycle 1: at a cell temperature of 55°C, charge for 48hours at C/16 and then discharge at 0.25C. No minimum duration requirement.
- Cycle 2: at a cell temperature of 55°C, charge for 24hours at C/16 and then discharge at 0.25C. 3hours minimum duration requirement.
- Cycle 3: at a cell temperature of 55°C, charge for 24hours at C/16 and then discharge at 0.25C. 3hours minimum duration requirement.
- Raise cell temperature to 70°C then at a cell temperature of 70°C, charge for 28 days at C/16 and then discharge at 0.25C. No minimum duration requirement.
- Cycle 5: Bring cell temperature down to 55°C, then at a cell temperature of 55°C, charge for 48hours at C/16 and then discharge at 0.25C. No minimum duration requirement.
- Cycle 6: at a cell temperature of 55°C,charge for 24hours at C/16 and then discharge at 0.25C. 3 hours minimum duration requirement.
- Cycle 7: at a cell temperature of 55°C, charge of 24hours at C/16 and then discharge at 0.25C. 3hours minimum duration requirement.

A Intec IT-3000C cell shall pass the above testing with result as follows:

- At cycle 2: Minimum discharge duration 3.5hours/2620mAh.
- At cycle 3: Minimum discharge duration 3.5hours/2620mAh.
- At cycle 6: Minimum discharge duration 3hours/2250mAh.
- At cycle 7: Minimum discharge duration 3hours/2250mAh.

14. REFERENCE

Please refer to Intec's Customer Service if there is any question on using batteries.