



SPECIFICATION FOR VRE AA 700

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1/ SCOPE

This specification applies to a Nickel-Cadmium cylindrical rechargeable single cell which ARTS Energy designation is VRE AA 700. This cell has been designed for cycling applications requiring a high capacity after standard or quick charge.

In term of technology, the cell is built with :

- Sintered positive electrode
- Plastic bonded negative electrode (PBE)
- All external metallic components are nickel plated steel

2/ GENERAL ELECTRICAL CHARACTERISTICS

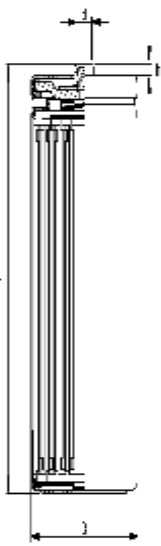
All the rated figures are based on fresh single cells performances. Tests carried out according International standard IEC 61951-1.

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ITEM	SPECIFICATION	UNITS	NOTES
MAIN CHARACTERISTICS			
Cell designation	VRE AA 700		
IEC cell designation	KRMR 15/49		
Nominal voltage	1.2	Volt	
Minimum IEC capacity	700	mAh	As per IEC 61951-1
Typical capacity*	780	mAh	*After charge 16h at C/10 and discharge at C/5
Typical impedance	16	mOhm	At 1000 Hz
CHARGE CURRENT			
Fast	Up to 700	mA	Charge termination required
Standard	70	mA	Timer required
Trickle	17.5-35	mA	
CHARGE DURATION			
Fast	75	minutes	Charge termination required
Standard	16	hours	Timer required
DISCHARGE CURRENT			
Maximum continuous current	2.1	A	max end of discharge voltage 0.8V/cell
Charge Retention 28 days at 20°C±2°C	>65	%	Storage in fully charged state discharged at C/5
TEMPERATURE RANGE			
In charge	0/+40	°C	
In discharge			
3C max	+10/+60	°C	
1C max	-20/+60	°C	
C/3 max	-30/+60	°C	
C/5 max	-40/+60	°C	
In storage			See § 7
Recommended	+5/+25	°C	
Low limit range	-40 to +5	°C	Shorter than 1 month
High limit range	+25 to +60	°C	Shorter than 1 month
TYPICAL WEIGHT	21	g	

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3/ GENERAL MECHANICAL CELL SPECIFICATION
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BARE CELL DRAWING	BARE CELL DIMENSIONS (mm)
	<p>Diameter: $D = 13.9 \pm 0.10$</p> <p>Height: $H = 48.9 \pm 0.3$</p> <p>Positive contact</p> <p>Flat area diameter: $d = 4 \pm 0.2$</p> <p>Overstep: $h = 0.8 \pm 0.2$</p>



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4/ CAPACITY

IEC Capacity is defined as required in IEC 61951-1 (§4.1;4.2;6.1)

- Temperature : $+20^{\circ} \pm 5^{\circ}\text{C}$
- Charge current : 70 mA constant current (C/10)
- Charge duration : 16 hours
- Period of rest : 1 hour
- Discharge current : 140 mA constant current (C/5)

Minimum capacity : 700 mAh

5 cycles are allowed to get the specified value.

5/ CHARGE RECOMMENDATIONS

- Fast charge

A VREAA 700 can be fast charged within 75 minutes maximum with an adapted end of charge detection and cut-off system.

Negative Delta V is a recommended method at -10/15mV per cell.

This system must be inhibited during the starting of charge (1 to 2minutes) to prevent too early detection.

The Temperature change (dT/dt) can be used as cut-off system for fast charge.

The fast charge is stopped when the slope of the curve « temperature variation versus time », reaches a value depending on the battery configuration and experimentally determined.



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A trickle charge may complete the main fast charge to balance the battery and to maintain a full availability of its capacity.

In case of pulsed charge at rate $< 50\text{Hz}$, it is mandatory to avoid rest period $> 1\text{s}$.

- Standard

With standard charge rate (C/10) a timer is recommended to stop the charge.

Below 0°C , charge voltage must be limited to 1.60V/ cell.

A trickle charge in the range of C/40 to C/20 can be used to maintain the cell or battery pack in a fully charged state, in such cases C/40 is the minimum current recommended.

6/ CYCLE LIFE

The cycle life of a rechargeable battery depends on various parameters such as charge rate, discharge rate, depth of discharge, overcharge, temperature, period of rest between charge and discharge and so on.

The rechargeable battery reaches its end of life when its capacity is 70% of the average capacity obtained in the first 10 cycles.

Typical values for a VRE AA 700 cell are listed below :

TEMPERATURE: $+20^{\circ}$ \pm 5°C CAPACITY MEASURED AT 1,0 VOLT/CELL	EXPECTED CYCLE LIFE (NUMBER OF CYCLES)
C/3 to C/2 charge; discharge C/5 to C C charge; discharge C	> 500 > 500



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7/ CELL AND BATTERY MANAGEMENT

- Overcharge :

Repeated overcharge out of the specification could cause leakage and deteriorates cell performances.

- Over discharge :

A deep discharge or “over discharge “damages the cell performance so it is recommended to manage the discharge with appropriate cut-off systems, and to avoid letting the cell / battery connected to the equipment for a long period (> 1month). In addition, during the beginning of the first charge following over discharge, the voltage can exceed the maximum allowed value.

- Storage :

- Normal conditions:

ARTS Energy recommends to store the cell/battery within the temperature range +5° to +25°C in a 65 ± 5% relative humidity atmosphere and to avoid to store a cell discharged

- Long term storage (up 6 months):

After long term storage in open circuit, up 5 IEC cycles are allowed to recover the initial performance of a VRE AA 700 (see section 4). In addition, during the beginning of the first charge following long term storage, the voltage can exceed the maximum allowed value



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- Service life :

Normally, if cell/battery is used under proper conditions as described above, the VRE AA 700 cell/battery battery should last 2 years (or 500 cycles). Failure in charging, discharging, storage or temperature range can reduce the service life and damage the cell performances.

- Battery assembly :

Consult ARTS Energy for advice in pack assembly and charge and discharge management. The way of using the battery must strictly be in accordance with ARTS Energy technical recommendations, to obtain the performances announced by ARTS Energy.



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8/ SPECIFICATION APPROVALS

TECHNICAL MANAGER:

S.Blanchin

A handwritten signature in blue ink, appearing to read "S. Blanchin", with a large, sweeping flourish underneath.

MARKETING & BUSINESS DEVELOPMENT MANAGER:

S.Sénarich

A handwritten signature in blue ink, appearing to read "S. Sénarich", with a long horizontal line extending to the right.

QUALITY DIRECTOR:

F.Zaninotto

A handwritten signature in blue ink, appearing to read "F. Zaninotto", with a large, sweeping flourish underneath.