Specification for

VHD

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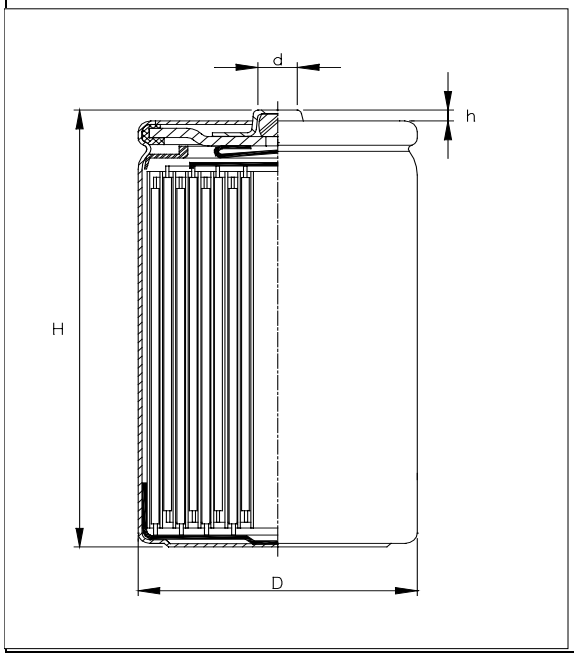
1 Scope

This specification applies to a Nickel-Metal Hydride cylindrical rechargeable single cell which SAFT designation is VHD. This cell has been especially designed for power or energy OEM application, such as Electric Bike, Professional video market, mobility, home appliances (vacuum cleaner,…), ...

2 General electrical cell specification

Item	Specification	Units	Notes
SAFT cell designation	VH D		
IEC cell designation	HR 33/62		
Nominal voltage	1.2	Volt	
Typical IEC capacity	8500	mAh	see § 4.1
Minimim IEC capacity	8000	mAh	see § 4.1
Typical Power capacity	7850	mAh	see § 4.2 (20 Amp)
Minimim Power capacity	7500	mAh	see § 4.2 (20 Amp)
Typical impedance	4	mOhms	at 1000 Hz (AC)
Charge current			
Standard	850	mA	
Quick*	2000-2500	mA	*charge termination dT/dt
Fast*	3500-5000	mA	recommended.
Trickle**	80-400	mA	** after main charge in pack for balancing
Charge duration			
Standard	16	hours	
Quick	4h-5h	hours	
Fast	2h-3h	hours	
Peak voltage in charge			at 20° ± 5°C
Standard	1.40 / 1.45	Volt	
Fast	1.50 / 1.55	Volt	
Maximum continuous discharge current	40	A	6.5C
Temperature range			
In Slow charge	-5 / +40	°C	
In Fast charge	-5 / +35	°C	
in discharge	+0 / +40	°C	
Recommended storage	+5 / +25	°C	
Extended storage	-20 / +40	°C	less than 1 month

3 General mechanical cell specification

Bare Cell drawing	Bare Cell dimensions (mm)
	Diameter : D = 32,15 +- 0,10 Height : H = 58,0 +- 0,4
	Positive Contact Flat area Diameter : d = 5,6 minimum Overstep : h = 1,4 +- 0,4

4 Capacity

4.1 IEC capacity

IEC Capacity is defined as follows :

- ➔ Temperature : +20° ± 2°C
- ➔ Charge current : 850 mA constant current (C/10)
- ➔ Charge duration : 16hours
- ➔ Period of rest : 1 hour
- ➔ Discharge current : 1700 mA constant current (C/5)

Typical capacity : 8500 mAh
Minimum capacity : 8000 mAh

4.2 Capacity in power application

Capacity in power application is defined as follows :

- ➔ Temperature : +20° ± 2°C
- ➔ Charge current : 4250mAh constant current (C/2)
- ➔ Charge duration : 2 h 24 min
- ➔ Period of rest : No rest
- ➔ Discharge current : 20 A constant current (2.5C)
- ➔ End of discharge : 0.8Volt

Typical capacity : 7850 mAh
Minimum capacity : 7500 mAh

4.3 Capacity for various discharge rate

The following table gives **minimum** available capacities and **typical** half-discharge voltage of fully charged VHD cell under various discharge currents at +20°C ± 5°C. Deviation depending on test conditions may be observed.

Discharge Rate	**Current** (A)	**End of discharge voltage** (V/cell)	**Capacity** (mAh)	**Half discharge voltage** (V/cell)
C/5	1.6	1.0	8000	1.24
C	8	1.0	7500	1.19
2.5 C	20	0.8	7500	1.13
3.75 C	30	0.8	7500	1.08
5 C	40	0.8	7500	1.03

5 Overcharge

The VHDcell is not designed to be permanently overcharged, nevertheless it can withstand an overcharge at 0.1C rate for one week at +20°C without damage.

6 Charge retention (self-discharge)

After a 28 days storage at +20° ± 5°C, the VH D cell shall retain typically 80% (minimum 70%) of its initial capacity, the cell being initially fully charged.

After 7 days storage at +40° ± 5°, the VH D cell shall retain typically 80% (minimum 70%) of its initial capacity, the cell being initially fully charged.

In both cases, the VH D cell shall recover full capacity after a complete cycle.

7 Storage

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

- After 1 month storage , the VHD shall recover 100% of its minimum capacity (after a complete cycle).
- • After a long period of storage (up 4 months), in order to reach the optimal performance, it is recommended to cycle the cell/battery at least 5 cycles (C/2 charge and discharge at C).

An extended storage within -20°/+40°C temperature range and 65 ± 20% relative humidity is permitted no more than one month.

- After 1 month storage at 40°C, the VH D shall recover 95% of its minimum capacity (after a complete cycle).

8 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 VH D cell are listed below :

Temperature : +20°±5°C Capacity measured at 1,0 volt/cell	**Expected Cycle Life (Number of cycles)**
(Delta T / Delta t) charge C/2 / Discharge C/2	500
(Delta T / Delta t) charge C/2 / Discharge C	500

9 Battery assembly

In case of battery assembly, please note following rules and recommendations before proceeding to production :

9.1 Rules

- ➔ Use components adapted to high temperature : cell sleeve, battery case, insulations, glue, etc.
- ➔ Mount thermal breaker or/and a fuse in the battery.
- ➔ Adopt appropriate charging system for Ni-MH batteries.
- ➔ In case of

9.2 Recommendations

- ➔ Educate your personal about handling and production procedure when mounting Ni-MH batteries.
- ➔ In case of high discharge drain , use pure nickel as tags between cells.

9.3 Battery performances

Battery performances could vary from single cell to pack assembly.
The parameters with an impact on pack cell performances are:

- ➔ number of cells,
- ➔ design of the pack
- ➔ charging mode, current and cut-off,
- ➔ temperature during charge
- ➔ discharge rate

It is particularly notable for the life duration criteria.