305 -5954

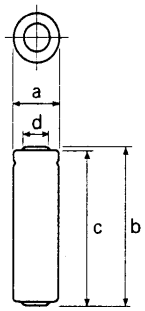
2. Ni-MH cell program and electrical characteristics Series VH...HIGH CAP

2.1 Cell types

Series VH ... HIGH CAP (0% Cd, 0% Hg, 0% Pb) Cylindrical cells

Type HIGH CAP	Order No. [1]	Nominal voltage	Typical capacity 5 h-rate	Nominal capacity 5 h-rate	Discharge current 5 h at 0.2 CA	Charge current 14 - 16 h	Size	Dimension [mm] a	b	c	d	Weight [g]
VH 550 AAA	55155 201 052	1.2 V	580 mAh	550 mAh	110 mA	55 mA	AAA	$10.5_{-0.7}$	$43.6_{-1.0}$	$43.4_{-1.0}$	$5.5_{-1.0}$	12
VH 650 L-AAA	55165 201 052	1.2 V	700 mAh	650 mAh	130 mA	65 mA	L-AAA	$10.5_{-0.7}$	$50.0_{-1.0}$	$49.6_{-1.0}$	$5.0_{-1.0}$	14
VH 1050 4/5AA	55111 201 052	1.2 V	1050 mAh	1000 mAh	200 mA	100 mA	4/5 AA	$14.5_{-0.7}$	$43.0_{-1.0}$	$42.4_{-1.0}$	$7.5_{-1.0}$	22
VH 1200 AA	55110 201 052	1.2 V	1300 mAh	1200 mAh	240 mA	120 mA	AA	$14.4_{-0.6}$	$48.95_{-0.8}$	$48.2_{-0.9}$	$7.5_{-1.0}$	26
VH 1800 4/5A	55118 201 052	1.2 V	1900 mAh	1800 mAh	360 mA	180 mA	4/5 A	$17.0_{-0.4}$	$42.8_{-0.8}$	$42.65_{-0.5}$	$7.5_{-1.0}$	32
VH 2100 A	55120 201 052	1.2 V	2200 mAh	2100 mAh	420 mA	210 mA	A	$17.0_{-0.7}$	$50.0_{-1.0}$	$49.8_{-1.0}$	$7.5_{-1.0}$	37
VH 3000 4/3A	55130 201 052	1.2 V	3050 mAh	3000 mAh	900 mA	300 mA	4/3 A	$17.0_{-0.7}$	$67.0_{-1.0}$	$66.4_{-1.0}$	$7.5_{-1.0}$	52
VH 3500 4/3A	55135 201 052	1.2 V	3500 mAh	3350 mAh	670 mA	335 mA	4/3 A	$17.0_{-0.7}$	$67.0_{-1.0}$	$66.4_{-1.0}$	$7.5_{-1.0}$	52
VH 4000 4/3A*	55140 201 052	1.2 V	4000 mAh	3800 mAh	760 mA	380 mA	4/3 A	$17.0_{-0.7}$	$67.0_{-1.0}$	$66.4_{-1.0}$	$7.5_{-1.0}$	~52

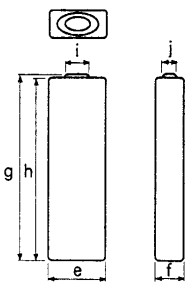
[1] cells in shrink sleeve without tags
* these types are under development, preliminary data



Prismatic cells

Type HIGH CAP	Order No. [1]	Nominal voltage	Typical capacity 5 h-rate	Nominal capacity 5 h-rate	Discharge current 5 h at 0.2 CA	Charge current 14 - 16 h	Size	Dimension [mm] e	f	h	g	i	j	Weight [g]
VH 650 F5	55055 201 052	1.2 V	670 mAh	650 mAh	130 mA	65 mA	prismatic	$14.4_{-0.6}$	$7.5_{-0.7}$	$48.3_{-0.8}$	$47.8_{-1.0}$	$5.8_{-1.0}$	$3.8_{-1.0}$	18
VH 750 F5*	55075 201 052	1.2 V	800 mAh	750 mAh	150 mA	75 mA	F 5	$14.5_{-0.7}$	$7.4_{-0.7}$	$48.2_{-1.0}$	$47.4_{-1.0}$	$5.8_{-1.0}$	$3.8_{-1.0}$	~18
VH 600 F6	55050 201 052	1.2 V	580 mAh	550 mAh	110 mA	55 mA	prismatic	$17.0_{-0.6}$	$6.3_{-0.7}$	$47.8_{-0.8}$	$47.5_{-1.0}$	$5.5_{-0.2}$	$2.7_{-0.2}$	17
VH 650 F6*	55065 201 052	1,2 V	700 mAh	650 mAh	130 mA	65 mA	F 6	$17.0_{-0.6}$	$6.3_{-0.7}$	$47.8_{-0.8}$		$5.5_{-0.2}$	$2.7_{-0.2}$	~17

[1] cells in shrink sleeve without tags
* these types are under development, preliminary data



All cells available in different battery configurations with welded tags.

2.2 Electrical characteristics

2.2.1 Charge voltage at different temperature and rate

The charge voltage is influenced by the ambient temperature and the current rate (Fig. 2.2.1 a and 2.2.1 b).

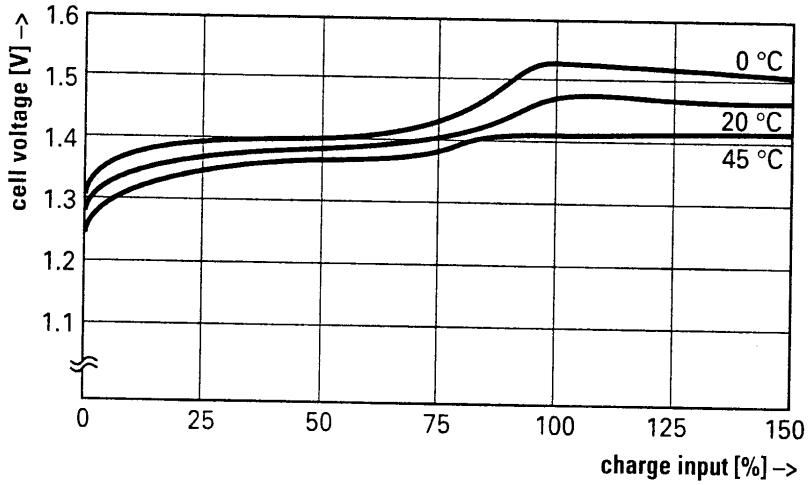


Fig. 2.2.1 a:
Cell voltage as a function of charge input at different temperatures
(Charge: 0.3 CA)

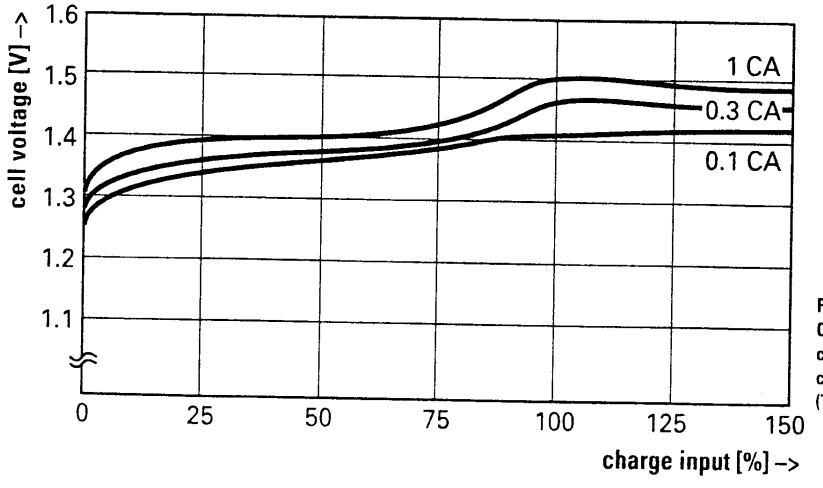


Fig. 2.2.1 b:
Cell voltage as a function of charge input at different charge rates
(Temperature: 20 °C)

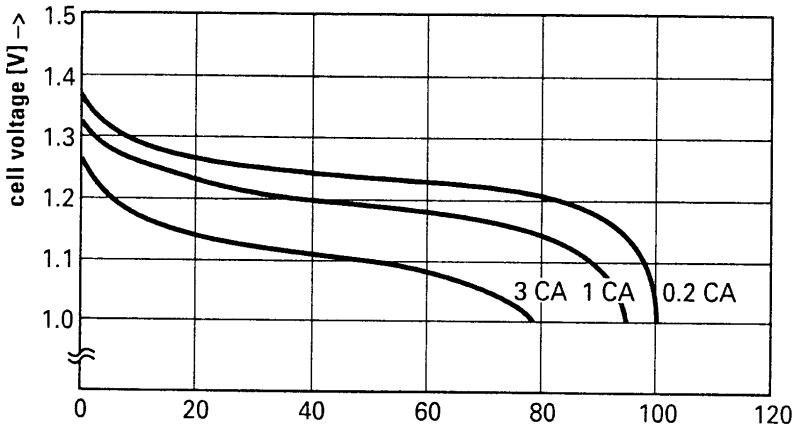


Fig. 2.2.2 a:
Cell voltage as a function of discharge capacity at different discharge current (Charge: 0.3 CA/ 5 h/ Temperature: 20 °C)

2.2.2 Voltage and capacity at different load and temperature during discharge

The capacity and the voltage level of a cell during discharge are limited by various operational parameters. The most important of these are:

- The rate of discharge
- The ambient temperature
- The end of discharge voltage

In general, the higher the discharge current, the lower the discharge voltage and the available capacity; this tendency becomes pronounced when the discharge current reaches 3 CA.

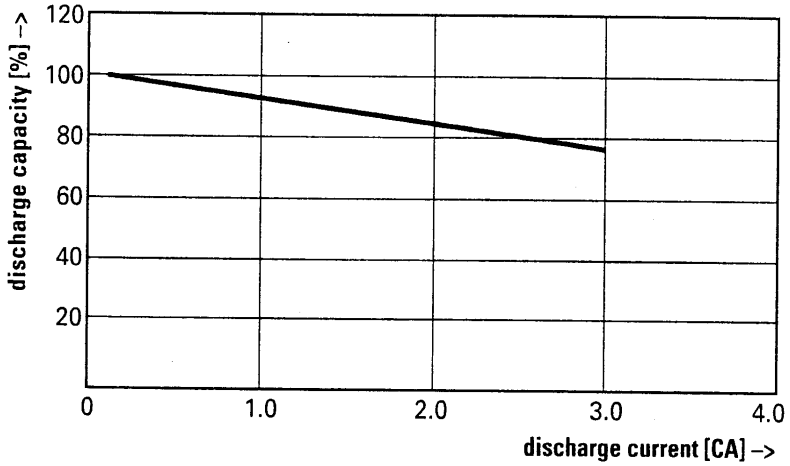


Fig. 2.2.2. b:
Discharge capacity as a function of discharge current (Charge: 0.3 CA/5 h/ Temperature: 20 °C)

Discharge, voltage and capacity are also influenced by the ambient temperature (Fig. 2.2.2 c).

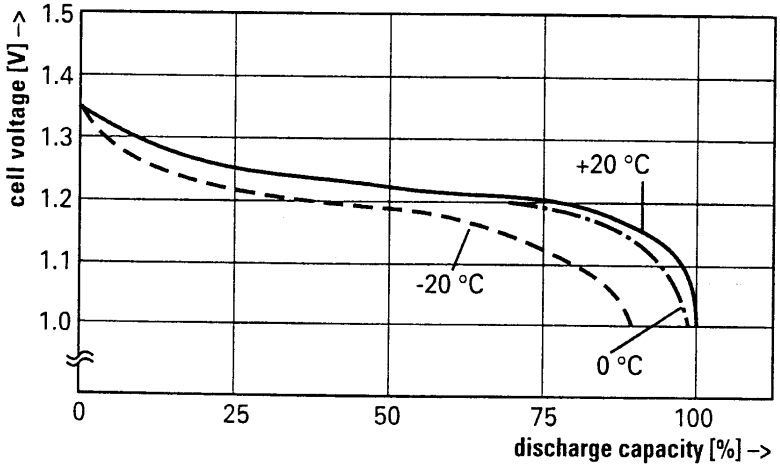


Fig. 2.2.2 c:
Cell voltage as a function of discharge capacity at different temperature (Charge: 0.3 CA/5 h/ Temperature: 20 °C) Discharge: 0,2 CA

2.3 Life expectancy

Life expectancy depends on charge and discharge conditions as well as on ambient temperature.

More than 1000 cycles can be achieved using the cycling conditions shown in Fig. 2.3 a.

The influence of ambient temperature on cycle life expectancy is demonstrated in Fig. 2.3 b.

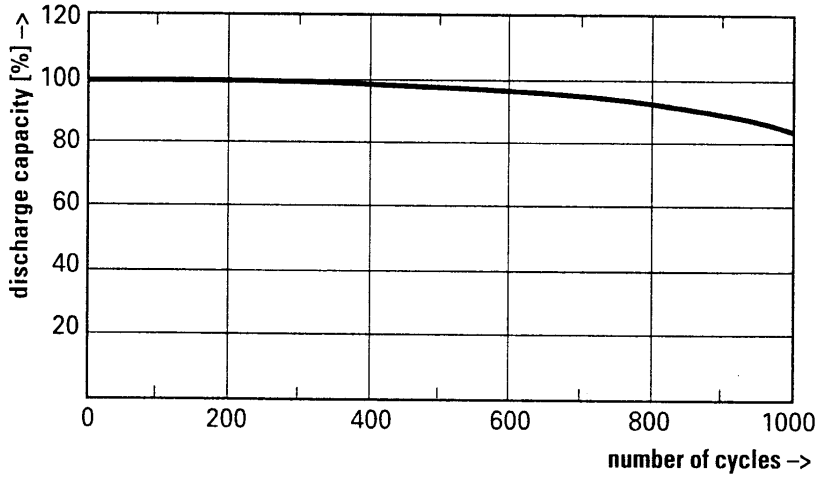


Fig. 2.3 a:
Life expectancy
(Cycle conditions:
Charge: 0.25 CA/3.2 h
Discharge: 0.25 CA/2.4 h)

Capacity measuring
(every 50th cycle)
(Charge: 0.3 CA/5 h
Discharge: 1.0 CA down to 1.0 V,
Temperature: 20 °C)

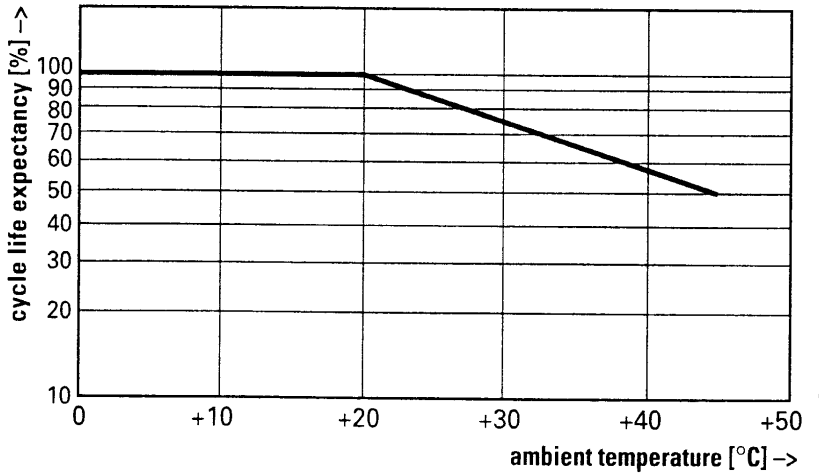


Fig. 2.3 b:
Cycle life expectancy as function of ambient temperature.

In trickle charge operation up to 6 years.