

DISCHARGE TYPES

We differentiate between the following types:

Constant resistance (B)

The appliance keeps its resistance constant in Ω.

Constant current (A)

The appliance keeps running on constant drain in A or mA.

Constant power (W)

As the power should remain constant, the drain in A will increase gradually during discharge as the voltage decreases.

Power (Watt) = Current (A) x Voltage (V)

In this case, the increasing internal resistance towards the end of the useful battery life will also determine the actual useful capacity of the batteries. The total capacity is of course also strongly influenced by the cut-off voltage.

The discharge (continuous or intermittent) and load (light or heavy) largely determine what performance can actually be obtained from a battery.

SHELF LIFE

The shelf life is the ability of a battery to maintain more or less the same performance over time. Alkaline batteries nowadays carry a freshness date of about 5 years from the date of production. This means that the service life on a specific discharge compared to a fresh battery of the same generation is expected to be over 70% compared to initial capacity testing. (If batteries have been stored appropriately in a controlled environment with constant temperature and humidity.)

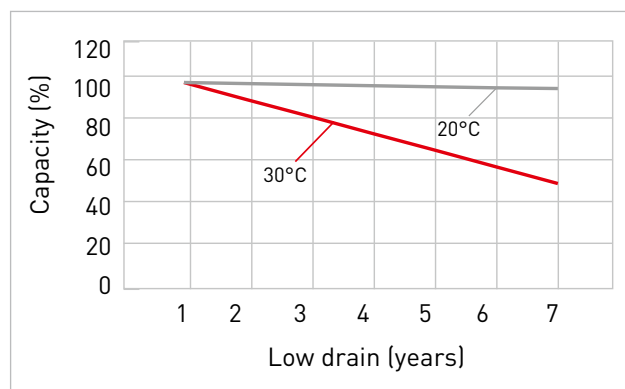
The shelf life is influenced by temperature, humidity and internal construction.

Too high temperatures should be avoided as it can influence the level of self-discharge. Alkaline cells will lose approximately 3% of their capacity per year when stored at 20°C due to slow electrochemical reactions that continually occur. At low temperature storage, the chemical activity is delayed and this will in turn decrease loss of capacity over time. Recommended storage conditions are 10°C to 25°C with not more than 65% of relative humidity as a comparison Zinc carbon cells lose on average yearly nearly 15% of capacity at room temperature.

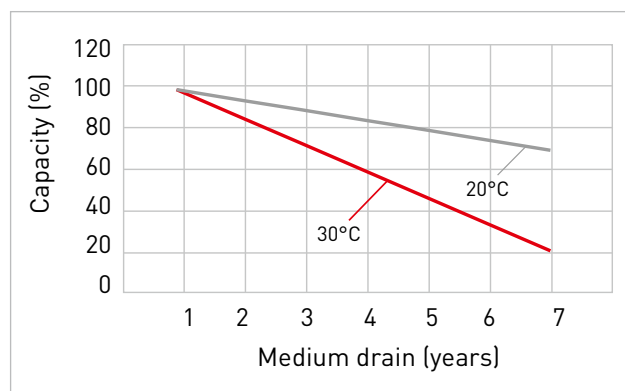
High temperature (above 30°C to 35°C) and high humidity will speed up the degradation of chemicals, which leads

to greater capacity loss in a shorter time. Poor quality internal construction might also influence the degradation of chemicals, but mainly as a potential risk for internal short circuit and leakage over time. Yet another factor – and even more unpredictable – is that the electrolyte could cause non-metallic battery parts to deteriorate over time, resulting in leakage. Though there is little chance of this happening, it is still advisable to use Alkaline batteries within the first half of their expected shelf life.

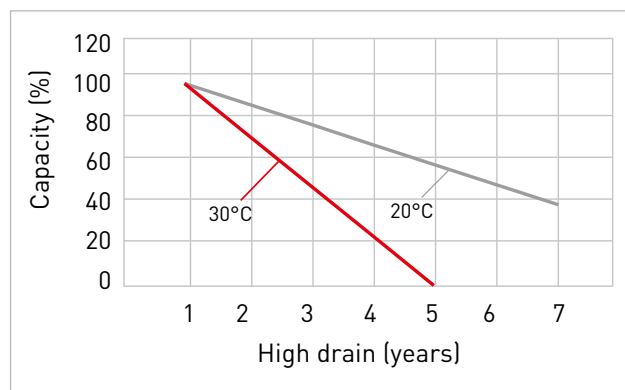
Shelf life with low drain discharge*1



Shelf life with medium drain discharge*2



Shelf life with high drain discharge*3



*1 Up to 97% of capacity remains when battery is optimal stored 20°C or lower, and used after 5 years in a low drain appliance. *2 Depending low medium to high medium drain appliances, between 90 to 50% at 20°C or 20 to 50% at 30°C, of the capacity remains in the battery when used in such an appliances after 5 years. *3 After 5 years of storage a minimum at 20°C, 40% of the batteries capacity remains when battery is stored in optimal conditions and is used in very High drain appliance.



ALKALINE

Panasonic Alkaline batteries are made from the same basic materials as Zinc-Carbon batteries, but deliver generally higher performance on all criteria. These batteries can therefore power high-performance standard applications. Our Alkaline batteries are made in Europe and fulfill the highest quality standards.

FEATURES

- Developed for high and medium drain appliances
- Continuously reliable energy provision
- Long shelf life
- Excellent leakage resistance
- Superior low temperature behavior

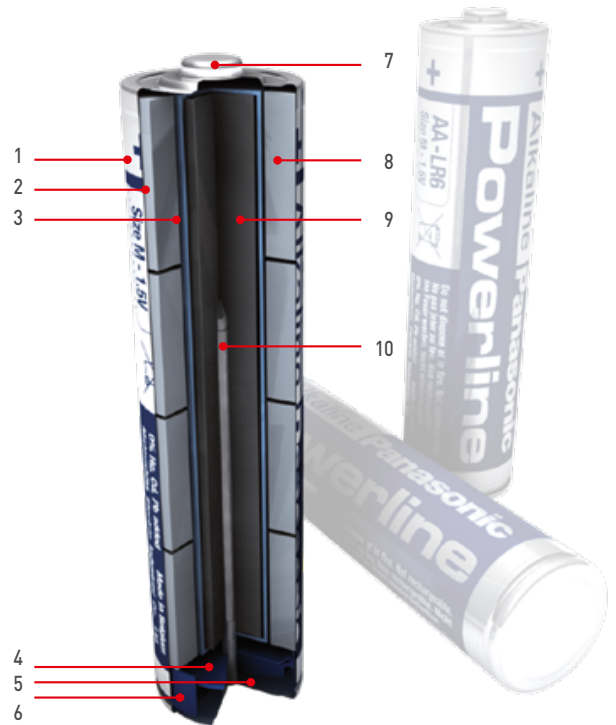
APPLICATIONS

- Smoke detectors
- Marine devices
- Medical equipment
- Scales
- Cleaning and hygiene services
- Seismic sensors
- Gas barbecue igniter
- Suitcase electronic pass, etc.

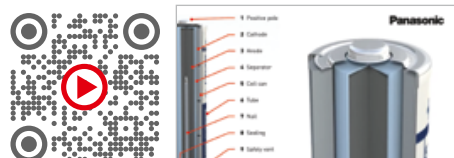
Model number	Size	Nominal voltage (V)	Diameter (mm)	Total height (mm)	Weight (g)	IEC
LR03AD	AAA	1.5	10.5	44.5	11.0	LR03
LR6AD	AA	1.5	14.5	50.5	22.0	LR6
LR14AD	C	1.5	26.2	50.0	66.0	LR14
LR20AD	D	1.5	34.2	61.5	138.0	LR20
6LR61AD	9V	9.0	26.5 x 17.5	48.5	43.0	6LR61

STRUCTURE OF ALKALINE INDUSTRIAL BATTERIES*1

- 1 Label
- 2 Cell can
- 3 Separator
- 4 Safety vent
- 5 Negative pole
- 6 Sealing
- 7 Positive pole
- 8 Cathode (Manganese-dioxide-Carbon)
- 9 Anode (Zinc-gel)
- 10 Nail



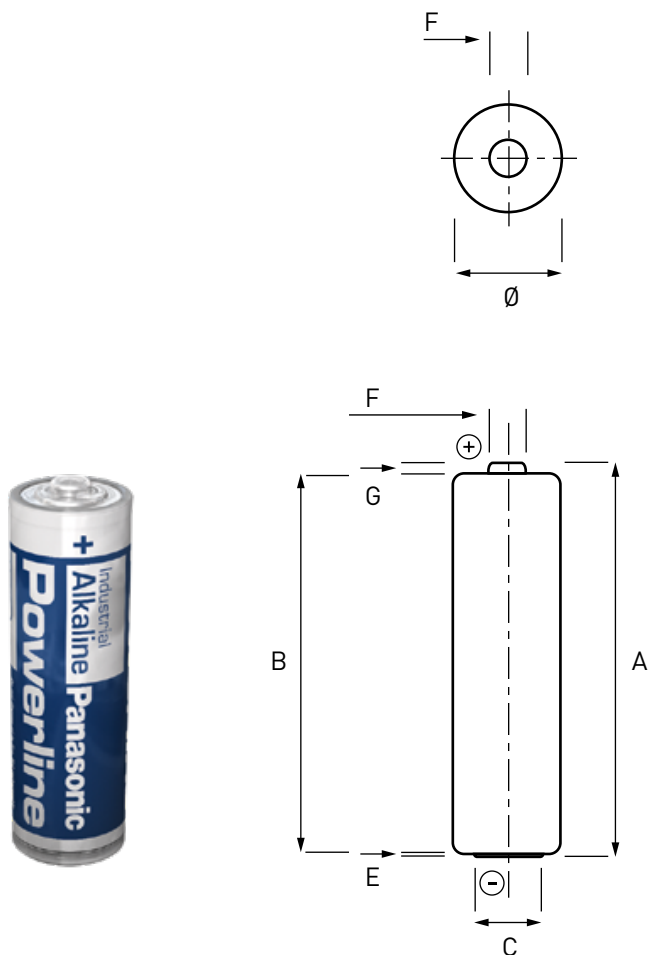
Scan QR code to view 3D animated video.



*1 The illustration shows only one example of Alkaline battery structure.

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DIMENSIONS (MM)

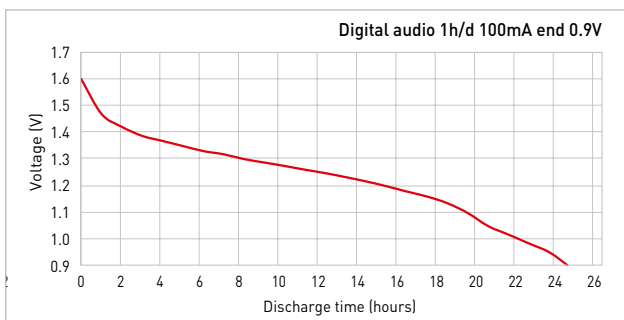
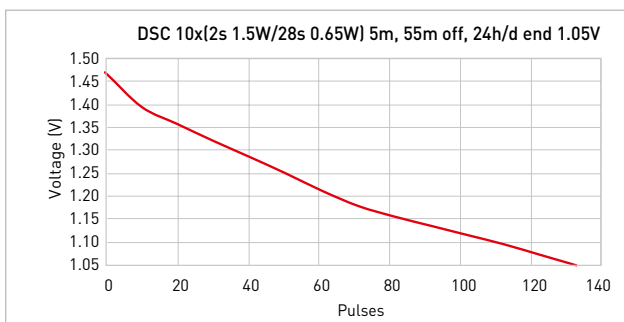
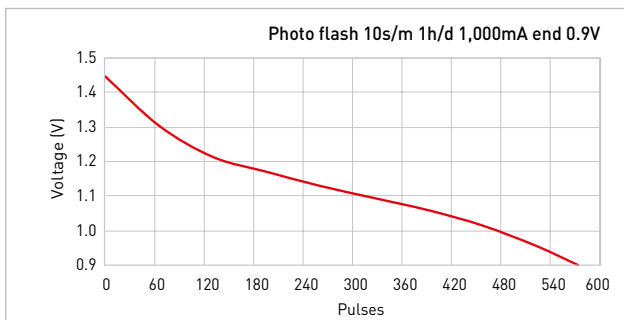
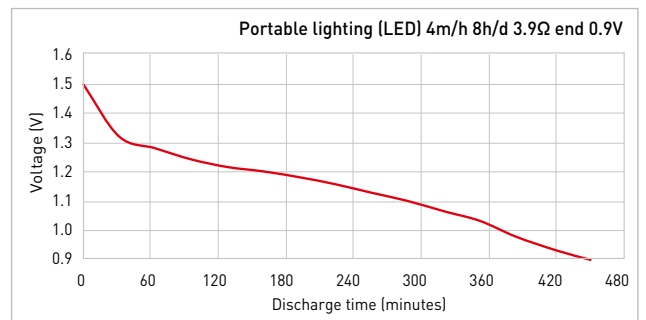
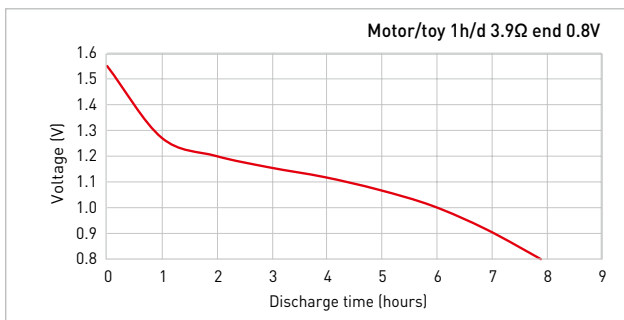
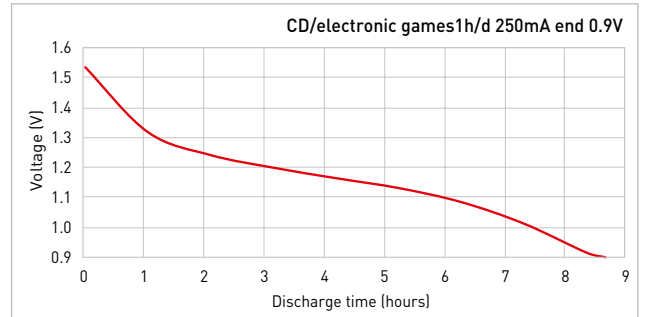
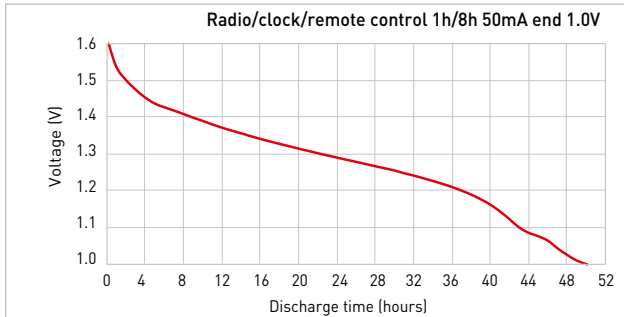


IEC dimensions	Maximum	Minimum
A	50.5	
B		49.5
C		7.0
E	0.5	
F	5.5	
G		1.0
Ø	14.5	13.7

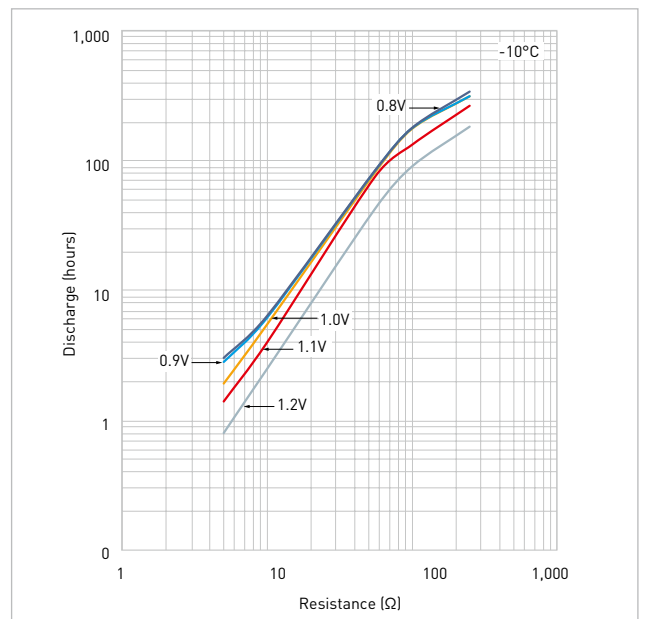
Specifications	LR6 / M / AA / AM3 / MIGNON / MN1500 / 15A / 15AC
Made in	Belgium
Type	Alkaline Foil
Nominal voltage (V)	1.5
Electrolyte	Potassium Hydroxide
Average weight (g)	22.0
Storage temp. range	+10°C [50°F] ~ +25°C [77°F]
Operating temp. range	-20°C [-4°F] ~ +55°C [131°F]
Average Impedance	+/- 105 m-Ω @ 1kHz fresh
Heavy metals	No added Mercury (Hg), Cadmium (Cd) or Lead (Pb)
Compliant to	IEC 60086-1, IEC 60086-2, IEC 60086-5 non dangerous goods regulation EU directive 2006/66/EC Nordic Ecolabel
Recommended cut off voltage	0.8V per cell (0.9V per cell for multi series usage)

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TYPICAL DISCHARGE VALUES



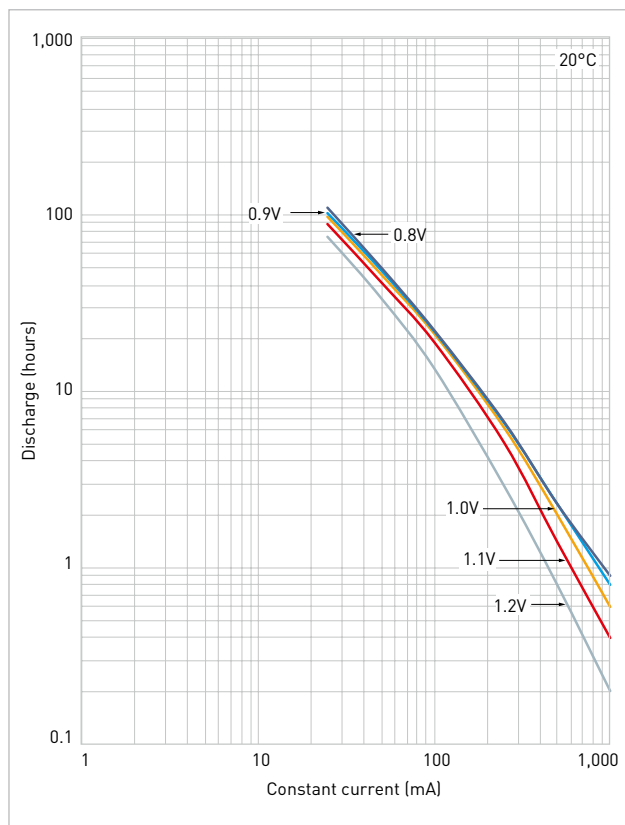
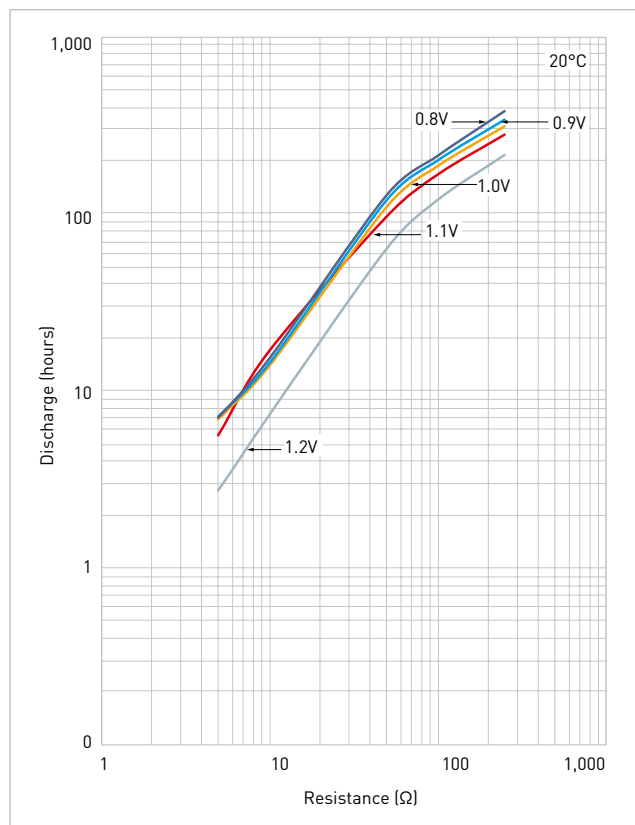
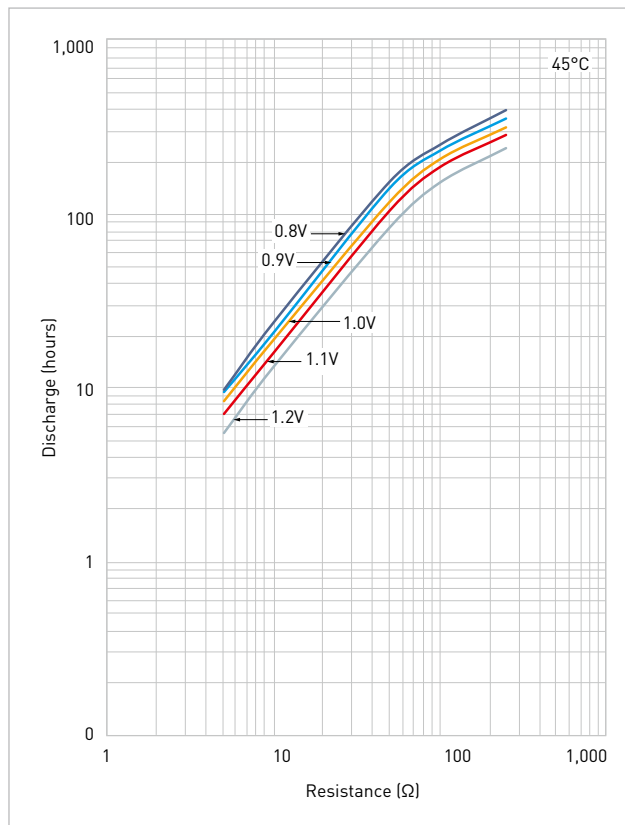
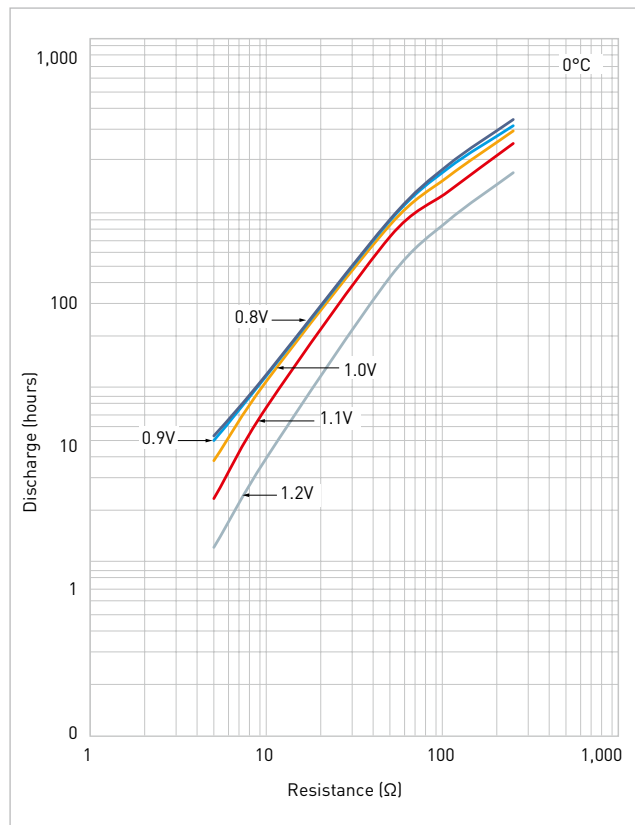
DISCHARGE TEMPERATURE CHARACTERISTICS



The information herein is believed to be correct. However no warranty is made, either expressed or implied, regarding the accuracy of the results to be obtained from the use of such information. Test results are strictly according to IEC conditions. Capacities of batteries depend on drain, temperature and cut-off voltage. Data are subject to change.

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