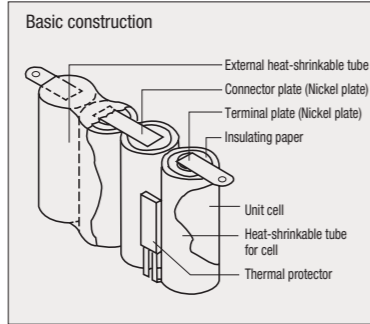


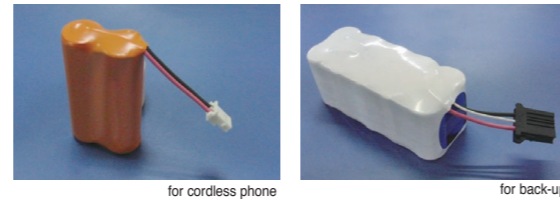
Battery pack

Most batteries are used in the form of battery packs and installed in devices. When the battery pack is used, the type of battery, number of cells, shape of the pack, constituent parts of the pack, etc. are determined by the ratings (voltage, load current) of the device, charge specifications, space available in the battery compartment, use conditions, etc. At Panasonic, we are designing and manufacturing battery packs by taking the safety and reliability of the batteries into consideration.



It is recommended that a thermistor for temperature detection, and a thermal protector or PTC element for protection from temperature rises and external short-circuiting, are installed in a nickel-metal hydride battery pack. Also, safety protection circuits are required for safety purposes.

ex) Standard battery pack



for cordless phone

for back-up

General comparison of various charging

* It [A] = Rated capacity [Ah]/1 [h]

Charge system	Cycle (repetitive) use				Standby (backup) use			
	-ΔV cut-off charging method	dT/dt cut-off charging method*1	Step charging method	Timer-controlled charging method*2	Semi-constant-current charging method*3	Trickle charging method	Intermittent charging method	Pulse charging method
<Operation overview> V _b : Battery voltage I _{ch} : Charge current T: Battery surface temperature CV: Constant voltage								
Features	Most common rapid charging method	The charging circuit costs slightly more than the others but can prevent overcharge, offering a longer cycle life than the -ΔV cut-off charging method.	Ultra-rapid charging method	• Charge reliability has been improved by the addition of a charge timer. • The charging circuit is relatively simple and low-cost.	The charging circuit is simple and low-cost.	• The charging circuit is simple and low-cost. • Applicable to devices to be charged continuously for a long period of time.	The charging circuit costs slightly more than the others, but enables a longer service life than the trickle charging method.	The charging circuit costs slightly more than the others, but enables a longer service life than the pulse charging method.
Charge time	1 to 2 hours	1 to 2 hours	Up to 1 hour	6 to 8 hours	15 hours	30 hours or longer	15 hours or longer	—
Charge current	0.5 to 1 It	0.5 to 1 It	Max. 5.0 It	0.2 It	Max. 0.1 It	—	0.1 to 0.5 It	Max. 1.0 It
Trickle charge current	1/30 to 1/20 It	1/30 to 1/20 It	—	1/30 to 1/20 It	—	1/30 to 1/20 It	—	—
Charge level at charge control	Approx. 110 to 120%	Approx. 100 to 110%	Approx. 100%	Approx. 120%	—	—	Approx. 120%	—
backup	○	○	—	○	○	○	○	○
Button top	◎	○	—	—	—	—	○	○
Standard	◎	◎	—	—	—	—	○	○
High capacity	○	◎	○	—	—	—	○	○
Automotive back up	—	—	—	—	—	—	○	—

◎ Recommended charging method: Enables Panasonic batteries to display full performance. ○ Acceptable charging method: Usable depending on the use conditions of the equipment.
 *1 It is necessary to adopt a battery pack construction that allows the temperature detection element (sensor) to reliably detect the battery temperature.
 *2 This method is not appropriate for applications in which the timer is frequently reset (charge is restarted).
 • If frequent resetting of the timer is required, or if a charge rate higher than 0.2 It is adopted for equipment reasons (for example, timer-controlled charge at 0.3 It), it is necessary to combine this method with temperature control.
 • Please note that the overcharge performance will vary according to the battery type.
 *3 Please note that, if a charge rate higher than 0.1 It is adopted for reason of equipment, the overcharge performance and temperature rise characteristics will vary according to the battery type. Consult Panasonic before defining the specifications.
 • If a large number of battery cells are used, or if batteries having a high rated capacity are used, or if the heat dissipation of the battery pack is poor, the batteries may generate heat even when charged at 0.1 It. In such cases, it is necessary to re-design the battery pack for better heat dissipation or to lower the charge current. Design the battery pack so that the battery temperature rise at saturation is not higher than 50 °C.

Safety precautions

Nickel metal hydride batteries	
	<ul style="list-style-type: none"> Mishandling the battery may bring generate a short circuit, cause its insulation to melt, or cause damage to its safety valve or safety mechanism, which may in turn cause the battery to leak, generate heat, or explode. Be sure to follow the instructions listed below when using the battery: <ul style="list-style-type: none"> -Do not place the battery in fire or heat up the battery. -Never insert the battery with its positive and negative poles reversed. -The battery has a predetermined polarity. If, when setting the battery in a battery charger or appliance, it cannot readily be fitted, do not insert the battery by force, instead, check the battery's polarity. -Do not connect the battery to a power receptacle or directly to a car's cigarette lighter. -Do not connect the positive terminal and the negative terminal of the battery to each other with any metal object such as a wire. Do not carry or store the batteries together with necklaces or other metal objects. -Do not disassemble or modify the battery. -Do not solder any objects directly onto the battery. -When charging the battery, use the specified battery charger or observe the battery charging conditions specified by Panasonic. -The battery incorporates a gas-venting structure to discharge internal gases. For this reason, do not deform the positive electrode. • Never install the battery into hermetically sealed equipment. The battery may generate gas depending on circumstances, which may result in rupture, or explosion caused by ignition. • The battery contains an alkaline electrolyte. This electrolyte may result in the loss of eyesight if it comes into contact with an eye. In such cases, do not rub the eye, but immediately wash the eye with clean water and then consult a doctor.
	<ul style="list-style-type: none"> When electrolyte leakage, discoloration, deformation, or other unusual symptom is detected on the battery, do not use it. Do not expose the battery to water or salt water, or allow the battery to get wet. Doing so may cause the battery to generate heat or rust. Do not peel off or scratch the outer covering tube of the battery. Doing so can easily cause the battery to generate a short circuit, which may in turn cause the battery to leak, generate heat, or explode. When a battery charge exceeds the specified charge time, stop charging the battery. If charged beyond the specified charge time, the battery will become overcharged, which may cause the battery to leak or generate heat. The battery contains an alkaline electrolyte. When this electrolyte contacts the skin or clothes, immediately wash them with clean water. Otherwise, the skin or clothes may be damaged. Store the batteries in a location out of reach of infants. If an infant should swallow a battery, consult a doctor immediately.

Please see the latest information on our web site
<https://industrial.panasonic.com>

Notice to readers

It is the responsibility of each user to ensure that every battery application is adequately designed safe and compatible with all conditions encountered during use, and in conformance with existing standards and requirements.
 This literature contains information concerning cells and batteries manufactured by Panasonic Corporation
 This information is generally descriptive only and is not intended to make or imply any representation, guarantee or warranty with respect to any cells and batteries.
 Cell and battery designs are subject to modification without notice.

Panasonic Corporation
 Automotive & Industrial Systems Company
 Energy Device Business Division
 The contents of this catalog are valid as of May, 2018.

General description

Adaptable to compact sizes and high capacities according to applications

Nickel metal hydride batteries can offer well-balanced factors including high capacity, and high cost performance, and are most suitable for mobile equipment, video equipment, acoustic equipment, electrically-powered equipment, and other applications. The battery is also applicable to various backup devices such as UPS, enabling the devices to achieve savings in space and weight.



Features

- Available in five types adapted to applications.
 - Back up type
 - High temperature & long life type
 - High rate discharge & high temperature type
 - High temperature & long life type (New back up type)
 - Button top type (Dry cell compatible)
 - Standard type
 - High rate discharge & rapid charge type
 - Infrastructure type
 - Automotive back up type
- Capable of rapid charging
- High safety and reliability
- Environmentally Friendly

Applications

	Type					
	High temperature & long life	High rate discharge & high temperature	Button top	Standard	High rate discharge	Infrastructure
Features						
High rate discharge		●			●	●
Rapid charge*1	●	●	●	●	●	●
Super rapid charge*2		●			●	●
High temperature charge(60~75°C)*3	●	●				●
Long Life	●	●				●
Applications						
Infrastructure						
Elevator	●	●				●
UPS	●	●				●
Railroad						●
ATM	●	●				●
Vending machine	●	●				●
Robot	●	●				●
Wireless base station	●	●				●
Industrials						
Emergency lights, Guidance lights	●	●				●
Street light	●	●				●
Solar system	●	●				●
Emergency light for construction work	●	●				●
Power tool					●	
Torch Light					●	
Transceiver				●		
Ocean buoy	●	●				●
POS	●	●				●
Healthcare/medical						
AED	●	●				●
Artificial dialysis machine	●	●				●
Healthcare/medical						
Sphygmomanometer	●					●
Portable electrocardio graph	●					●
Medical equipment	●	●				●
Electric toothbrush	●					●
Electric shaver	●					●
Facial massager	●					●
Home appliances						
Home Controller	●	●				
Smart House sensor	●			●	●	
Intercom	●			●	●	
Fire alarm	●			●	●	●
Skylight	●	●				
Cordless cleaner						●
Electric fan	●					●
AV/PC						
Digital camera				●		
Remote controller				●		
Equipment using dry batteries				●		
Electric toys				●		
Cordless phone				●	●	
Automotive						
ECU	●					
E-Call	●					
Vehicle tracking device	●					
Trunk Light	●			●		

*1 1-2 hours(dT/dt value) *2 Charge time within 1 hour (Step control charge system) Note: For charge specification, please consult Panasonic.
 *3 Standard model (0 °C to 45 °C) *4 Approx. 2000 cycles (under Panasonic recommended charge/discharge condition)
 NiMH types according to applications above are only a guideline. Please consult Panasonic for more details you need.
 We are now developing higher performance products (charge-discharge temperature range: -20 °C to 75 °C, life expectancy: 10 years) for high temperature & long life type and high rate discharge & high temperature type.

Back-up type

A design that achieves long life for back-up (Good for Emergency-use)

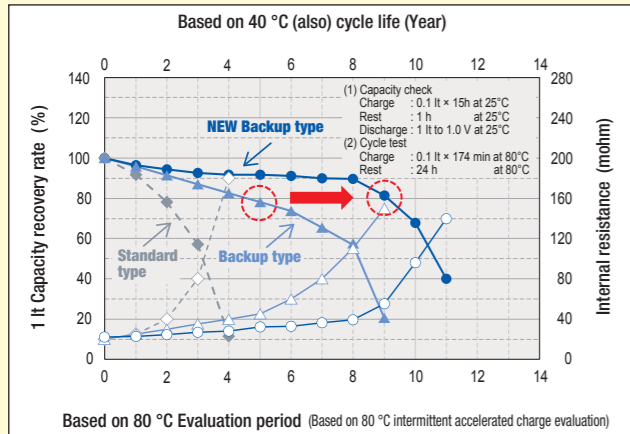
- Features**
- Best suited to a wide variety of equipment.
 - Small size, light weight and downsizing possible.
 - Energy saving, Long life.
 - Capable of delivering excellent charge characteristics at high temperature (75 °C).

Long life (Trickle charging)

Backup type 4 to 6 years → Expected life About double → NEW Backup type 8 to 10 years

※ Life expectancy based on our comparison data

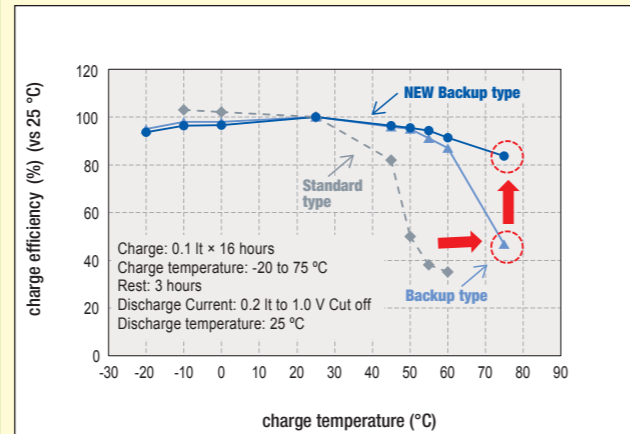
■ Life estimated by evaluating accelerated life. (Life characteristics by accelerated test)



Capable of delivering excellent charge characteristics at high temperature (60 °C)

Standard type 46% → About 1.8 times → Backup type 84%

■ Charge characteristics



High temperature & long life type

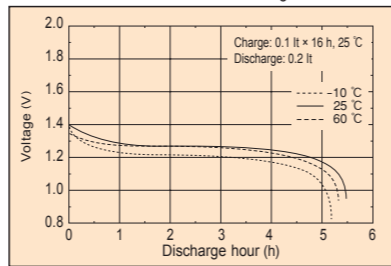
Most suitable for guide lamps, emergency lamps, other nickel cadmium battery substitutions. This type has a long-life and is capable of delivering excellent charge characteristics at high temperature (60 °C).

- Application: Emergency light, Guidance light, Led light, Information equipment FTTX (HUB.ONRU), Back up base station, Security, Emergency light/Guidance light, Two way radio, Server, Memory backup, Automated Teller Machine (ATM), Point Of Sales system (POS), Vending machine, Medical equipment, other

Size	Model Number	Nominal Voltage(V)	Discharge Capacity (mAh)*1		Dimensions with tube (min)		Approx Weight (g)	Temperature range	
			Rated (min)	Average	Diameter	Height		Charge	Discharge
AAA	BK60AAAH	1.2	500	550	10.5 +0/-0.7	44.5 +0/-1.5	13	-10 °C to 60 °C	-10 °C to 60 °C
AA	BK70AAH		700	750	14.5 +0/-0.7	49.0 +0/-1.5	18		
AA	BK110AAH		1,100	1,180	14.5 +0/-0.7	50.5 +0/-1.0	26		
AA	BK150AAH		1,450	1,530	14.5 +0/-0.7	50.5 +0/-1.0	26		
4/5A	BK160AH		1,600	1,720	17.0 +0/-0.7	43.0 +0/-1.5	29		
A	BK210AH		1,900	2,050	17.0 +0/-0.7	50.0 +0/-2.0	36		
Lfat/A	BK370AH		3,500	3,700	18.2 +0/-0.7	67.5 +0/-1.5	60		

*1 0.2 It discharge capacity after charging at 0.1 It for 16 hours 1t (A) = rated capacity (Ah) / 1(h)

Discharge characteristics



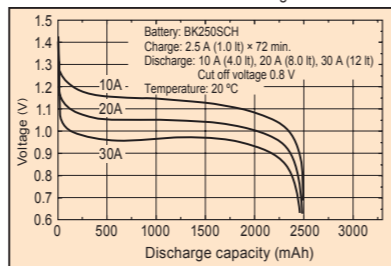
High rate discharge & high temperature type

This type has a long-life and is capable of delivering excellent large current discharge characteristics at high temperature (60 °C).

- Application: Power: Elevator, Automated Guided Vehicle (AGV), Back up: UPS / RAID, Point Of Sales system (POS).
Other: Streetlight, Vending machine, High capacity backup system, Solar power window shutter.

Size	Model Number	Nominal Voltage(V)	Discharge Capacity (mAh)*1		Dimensions with tube (min)		Approx Weight (g)	Temperature range	
			Rated (min)	Average	Diameter	Height		Charge	Discharge
SC	BK250SCH	1.2	2,500	2,650	23.0 +0/-1.0	43.0 +0/-1.5	55	-10 °C to 60 °C	-10 °C to 60 °C
C	BK310CH		3,100	3,300	25.8 +0/-1.0	50.0 +0/-2.0	80		
Lfat/A	BK330APH		3,200	3,300	18.2 +0/-0.7	67.5 +0/-1.5	60		

Discharge characteristics



High temperature & long life type (New Backup type)

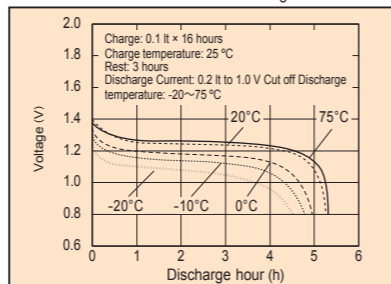
Excellent charging and discharging performance in different environments (-20 to 75) !

- Application: Motive power, Elevator, Streetlight, Vending machine, High capacity backup system, Solar power window shutter.

Size	Model Number	Nominal Voltage(V)	Discharge Capacity (mAh)*1		Dimensions with tube (min)		Approx Weight (g)	Temperature range	
			Rated (min)	Average	Diameter	Height		Charge	Discharge
NEW AA	BK120AAHU	1.2	1,200	1,280	14.5 +0/-0.7	50.5 +0/-1.0	24	-20 °C to 75 °C	-20 °C to 75 °C
NEW C	BK310CHU		3,100	3,300	25.8 +0/-1.0	50.0 +0/-2.0	80		
NEW F	BK1100FHU		11,000	12,000	33.0 +0/-1.0	91.0 +0/-2.5	250		

NEW New Model

Discharge characteristics



Button top type

A battery that is compatible with dry batteries and can be used many times. Friendly to the environment.

- Features**
- Offers long charge/discharge cycle life, about 1800 times! *2
 - High capacity level and low self-discharge (still have 90 % capacity after storage for 1 year) ! *3
 - Offers excellent temperature characteristics especially in low temperature!

- Application: Digital still camera, Electronic flash (strobe), Toothbrush, Shaver, Cellular phone charger, Electronic dictionary, Electronic game, Radio control car, IC recorder, Cordless mouse, Wireless headset, Medical equipment (Sphygmomanometer, Electronic frequency machine, Refractometer), Portable radios, Toy, Flash light, Remote control, Two way radio, other

Size	Model Number	Nominal Voltage (V)	Discharge Capacity (mAh)*1		Dimensions with tube (min)		Approx Weight (g)	Temperature range	
			Rated (min)	Average	Diameter	Height		Charge	Discharge
AAA	BK65AAAB	1.2	650	700	10.5 +0/-0.7	44.5 +0/-1.0	12	0 °C to 45 °C	-10 °C to 65 °C
	BK80AAAB		750	780					
AA	BK110AAB		1,000	1,050	14.5 +0/-0.7	50.5 +0/-1.0	20		
	BK200AAB		1,900	2,000					

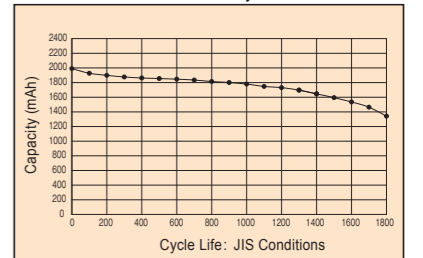
*2. Measured under conditions - JIS C8708 2013 (7.5.1.1) (real capacity also depends on actual conditions).

*3. Measured below 20 °C after cells are charged to full capacity (please don't expose batteries to high temperature and high humidity, also remember to charge battery once a year even you don't use them).

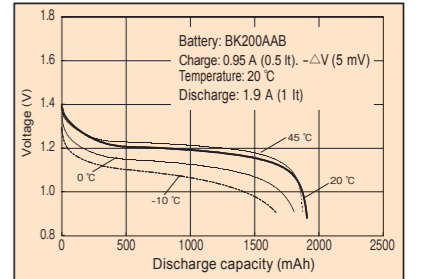
*4. AAA size compatible.

*5. AA size compatible.

Cycle Life characteristics



Discharge characteristics



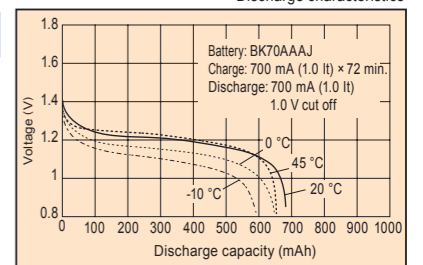
Standard type

Excellent cost performance, High-capacity and rapid charge-capable.

- Application: Small consumer electronic, Two way radio, Measuring instrument, Medical equipment, other

Size	Model Number	Nominal Voltage (V)	Discharge Capacity (mAh)*1		Dimensions with tube (min)		Approx Weight (g)	Temperature range	
			Rated (min)	Average	Diameter	Height		Charge	Discharge
AAA	BK65AAAK	1.2	650	700	10.5 +0/-0.7	44.5 +0/-1.5	12	0 °C to 45 °C	-10 °C to 65 °C
AAA	BK70AAAJ		700	730					
LAAA	BK90AAA		830	880	14.5 +0/-0.7	50.5 +0/-1.5	15		
AA	BK70AA		700	780					
AA	BK110AAO		1,100	1,180	14.5 +0/-0.7	50.5 +0/-1.5	26		
4/5AA	BK120AA		1,150	1,220					
AA	BK150AA		1,500	1,580	17.0 +0/-0.7	50.0 +0/-2.0	38		
AA	BK200AAP		1,900	2,000					
4/5A	BK200A		2,000	2,040	18.2 +0/-0.7	67.5 +0/-1.5	60		
A	BK210A		2,100	2,200					
A	BK250A	2,450	2,600	18.2 +0/-0.7	67.5 +0/-1.5	60			
LA	BK380A	3,700	3,800						
Lfat/A	BK450A	4,200	4,500						

Discharge characteristics



High rate discharge & rapid charge type

Excellent large current discharge characteristics and rapid charge-capable.

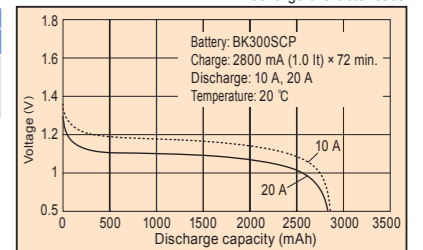
- Application: Power tool, E-Bike, Cordless cleaners, Electric toys (Radio control car, other).

Size	Model Number	Nominal Voltage (V)	Discharge Capacity (mAh)*1		Dimensions with tube (min)		Approx Weight (g)	Temperature range	
			Rated (min)	Average	Diameter	Height		Charge	Discharge
4/5SC	BK200SCP	1.2	1,900	2,100	23.0 +0/-1.0	43.0 +0/-1.5	42	0 °C to 45 °C	-10 °C to 65 °C
SC	BK260SCP		2,450	2,700					
SC	BK300SCP		2,800	3,050	57				

It is necessary to control battery temperature near the end of rapid charging. Therefore, please use appropriate voltage and temperature management.

- Caution: 1. The battery performance and cycle life greatly vary depending on how the battery is used.
2. In order to ensure battery safety, please contact Panasonic for charge and discharge specifications, equipment's construction, warning labels and other details when designing battery-powered equipment.
3. For some batteries, cells are not available on an individual basis.
4. The data in this document are for descriptive purposes only and not intended to make or imply any guarantee or warranty.

Discharge characteristics



Automotive back up type

Excellent in balance of performance and suitable for automotive application.

- Features**
- Working effectively over wide temperature range (-40°C to 85°C) !
 - Able to be installed in harsh environment because the electrolyte of the cell does not burn due to aqueous solution!
 - Easy to control charging and self-check!

*Please consult Panasonic for more above details.

- Application: E-CALL (Emergency call), Drive recorder, Anti-theft alarm, other

Size	Model Number	Nominal Voltage (V)	Discharge Capacity (mAh)*1		Dimensions with tube (min)		Approx Weight (g)	Temperature range	
			Rated (min)	Average	Diameter	Height		Charge	Discharge
AAA	BK60AAAW	1.2	500	550	10.5 +0/-0.7	44.5 +0/-1.5	13	-20 to 75°C*6	-20 to 85°C*9
AA	BK120AAW		1,200	1,280					

*6. Charge current: 0.5It to 1It *7. Charge current: 0.1It *8. Discharge current: 0.2It *9. Discharge current: 1It

Discharge characteristics

