Safety Precautions and Usage Guidance

Some batteries contain flammable substance which, if misused or mishandled, may result in electrolyte leakage, deformation, heat-generation, rupture, and/or fire. Please be sure to observe the following safety precautions.

**DANGER: READ BEFORE USE**

1. Do not expose batteries to flood water, seawater, rain, or any other liquid, or allow batteries to get wet. Wet-in safety equipment may be compromised, potentially resulting in heat-generation, smoke-generation, rupture, and/or fire.
2. Do not use or store batteries over fires, stoves, or other high-temperature objects over 80 °C or over. If the plastic separator gets damaged due to heat exposure, short-circuiting inside batteries may cause heat-generation, smoke-generation, rupture, and/or fire.
3. Never charge any battery type except rechargeable batteries. Ensure the device’s circuit design prevents current inversion from other power sources.
4. When charging batteries, use approved battery chargers only and observe battery-charging usage conditions specified by Panasonic. When charging batteries or other charging conditions (undercharged temperatures, undesignated voltage, current, or modified chargers), over-charging, charging with abnormal current flow, or abnormal chemical reaction inside batteries may occur, resulting in heat-generation, smoke-generation, rupture, and/or fire.
5. Every battery has a predetermined polarity. If a battery does not fit comfortably in a battery charger or appliance, do not insert the battery by force. Instead, check the battery’s polarity. In case of reverse connections, batteries may charge backwards causing an abnormal chemical reaction which may result in leakage, heat-generation, smoke-generation, rupture, and/or fire.

**WARNING**

1. To avoid accidental ingestion of small batteries, keep devices and batteries out of reach of children. If swallowed, seek emergency medical care immediately.
2. Do not place batteries in microwave ovens, high-pressure containers, or induction cookers. This may suddenly heat batteries or compromise their seal, resulting in heat-generation, smoke-generation, rupture, and/or fire.
3. Keep new batteries separate from used batteries, and never mix batteries of different capacities, types, or brands. This may result in heat-generation, smoke-generation, rupture, and/or the due to over-discharging or over-charging and other abnormal chemical reactions inside the batteries when in use.
4. If an abnormal odor, temperature, discoloration, deformation, or other unusual symptoms is detected when using, charging, or storing batteries, take them out of the device or charger and do not use them. Using them as-is may result in heat-generation, smoke-generation, rupture, and/or fire.

**CAUTION**

1. Do not place batteries in direct sunlight, use, or store batteries inside cars in hot weather. This may result in battery leakage, heat-generation, and/or smoke-generation. Product performance and lifespan may be also be reduced.
2. Do not use batteries when static electricity greater than 100 V may damage battery safety, mechanism, resulting in heat-generation, smoke-generation, rupture, and/or fire.
3. Regarding temperature range when charging batteries, contact your Panasonic sales representative or dealer for more details. Charging batteries outside the designated temperature range may result in battery leakage, heat-generation, smoke-generation, rupture, and/or reduce battery performance and lifespan.
4. Be sure to read instruction manual before use. Keep it in a safe place and refer to it when needed.
5. Carefully read the instruction manual(s) of the dedicated changer to learn how to properly and safely charge batteries.
6. If you notice oxidation, abnormal color, excessive heat, or other unusual symptoms when using batteries for the first time after purchasing, do not use them and return them to point of purchase.
7. When batteries are likely to be used by small children, caregivers should provide advice on safe usage based on the user manual and provide adequate supervision to ensure the batteries are properly used.
8. Do not place flammable substances on batteries or cover them during charging or discharging. This may result in heat-generation, smoke-generation, rupture, and/or fire.
9. If leaked electrolyte ever contacts skin or clothes, immediately wash the affected area with clean water. Failure to do so may result in rash or other skin conditions.
10. Secure the battery terminals with adhesive tape or similar when wire leads or other metal terminals are exposed. Failure to do so may cause short-circuiting, resulting in heat-generation, fire, and/or rupture.

**Industrial Solutions Company**

Panasonic Corporation
1-1, Matsushita-cho, Moriguchi, Osaka 570-8511, Japan

https://industrial.panasonic.com/

The contents of this catalog are valid as of September, 2020

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Panasonic Energy Device Business Division

Panasonic commenced in-house dry battery production in 1931. For almost 90 years, we’ve developed countless batteries and overcome the challenges of mass-production to deliver a cumulative total of over 200 billion units to more than 120 countries. Panasonic batteries play a vital role in the automotive industry, where our products contribute to on-road safety, in commercial infrastructure where 5G/LPWA wireless networks are deployed, and in IoT-based medical equipment. We will continue creating high quality batteries that support healthy society while contributing to the growth of our customers’ businesses.

History of Energy Device Business Division

1918
Matsushita Electric Housewares Manufacturing Works is established

1931
Matsushita Electric Factory No.3 starts in-house production of dry batteries

1933
Osaka Moriguchi Factory

1974
Micro battery production commences

1937
National Hyper dry battery

1949
National Hi-Top dry battery

1954
Panasonic commence in-house production of dry battery

1956
National NEO Hi-Top dry battery

1957
Coin-type lithium battery

1963
National Ultra NiCd battery

1969
Coin-type lithium battery

1974
National Hi-Top dry battery

1976
Coin-type lithium battery for industrial use

1980
Panasonic’s coin-type lithium-ion series comprises rechargeable batteries suitable for tiny appliances such as hearing aids, wireless earphones, and insulin pens. They are not only small and light, but also deliver high reliability and strong performance from a robust construction designed for use in high-drain application such as an electronic ink display for smart glasses.

Product Lineup

Coin-type Lithium Batteries

- Businesses and end-users depend on Panasonic coin-type lithium batteries to work reliably behind the scenes under the most challenging conditions. Coin-type lithium batteries are designed for long-life stability. These robust cells make ideal memory-backup power supplies for industrial devices, medical equipment, and wireless communications devices, or as energy storage devices for solar power systems.

- Panasonic’s coin-type lithium-ion series comprises rechargeable batteries suitable for tiny appliances such as hearing aids, wireless earphones, and insulin pens. They are not only small and light, but also deliver high reliability and strong performance from a robust construction designed for use in high-drain application such as an electronic ink display for smart glasses.

Cylindrical-type Lithium Batteries

- With strong durability and reliability, Panasonic cylindrical lithium batteries make ideal power sources for meters such as intelligent gas meters, which automatically shutoff the gas if abnormalities are detected. Cylindrical-type Lithium offers an extended product lifespan without need of maintenance.

Coin-type Rechargeable Lithium Batteries

- Coin-type rechargeable batteries are designed for long-life stability. These robust cells make ideal memory-backup power supplies for industrial devices, medical equipment, and wireless communications devices, or as energy storage devices for solar power systems.

Pin-type Lithium-ion Batteries

- Panasonic’s pin-type lithium-ion series comprises rechargeable batteries suitable for tiny appliances such as hearing aids, wireless earphones, and insulin pens. They are not only small and light, but also deliver high reliability and strong performance from a robust construction designed for use in high-drain application such as an electronic ink display for smart glasses.

Nickel-Metal Hydride Batteries

- Nickel-metal hydride batteries are eco-friendly rechargeable cells designed to maintain long-life performance in the most demanding environments. This battery type plays an important role in industrial and commercial applications with versatility to serve in many power supply in smaller devices, or as a backup power supply for emergency situations.

Dry Batteries

- Dry batteries deliver excellent all-round performance with long endurance, extended storage life, and effective leakage protection to meet your needs. Support high reliability and stability from a family of products to suit a wide variety of devices, from high-capacity batteries for high-drain devices to low-capacity designs for low-current applications.
Panasonic batteries for automotive applications, such as anti-theft security systems and eCall systems (emergency call systems), can be counted on to function reliably in emergencies. They are safe, long-lasting, and ideally suited to automotive backup applications.

Panasonic batteries for infrastructure support where they serve as main power sources in smaller devices or as emergency backup supplies. They are engineered to sustain long-life performance in the toughest environments. Infrastructure-type batteries contribute to a comfortable, safe, and secure society by supplying requisite electricity in a way that protects people and the environment.

Remote Keyless Entry / Anti-theft Security Systems
eCall Systems (Emergency Call Systems)
Event Data Recorder (EDR)
Tire Pressure Monitoring Systems (TPMS)

Emergency Lights / Guide Lights
Gas Meters / Water Meters
Fire Alarms

Batteries for Automotive Applications

Batteries to Support Infrastructure

• Coin-type Lithium Batteries / Rechargeable Lithium Batteries
• Nickel-Metal Hydride Batteries

• Coin-type Lithium Batteries / Rechargeable Lithium Batteries
• Cylindrical-type Lithium Batteries
• Nickel-Metal Hydride Batteries
IoT devices connected to LPWA networks enable data communication over long distances with minimal power consumption and are usually installed in difficult-to-access locations, meaning cell replacement should be infrequent. Batteries for IoT / LPWA applications must therefore possess outstanding endurance. Panasonic offers a variety of long-lasting battery types designed for stable discharge over long periods.

- Pin-type Lithium Batteries
- Cylindrical-type Lithium Batteries
- Nickel Metal Hydride Batteries
- Alkaline Dry Batteries

Batteries for Wearables and Small Medical Devices

Pin-type lithium-ion batteries are perfectly adapted power-sources for small portable devices. The super-small slimline batteries not only enable more compact, stylish device design, but also deliver high output, excellent levels of safety, and extended reliability. They are used in wearable technology and in small medical appliances such as hearing aids. Panasonic pin-type lithium-ion batteries play an important role in product development and are already expanding application possibilities in these markets.

- Pin-type Lithium-ion Batteries
Lithium Battery Features

(1) Wide Product Range
We offer a wide selection of different products engineered to suit almost any need.

(2) Proven Reliability
Our lithium batteries have more than 30 years of experience in the marketplace.

(3) Durable Performance in Tough Conditions
Expect dependable performance in the harshest conditions and excellent service life.

Primary Lithium Batteries (Non-chargeable)

- Coin-type Lithium Batteries
  - CR Series (Manganese Dioxide Lithium Batteries)
  - BR Series (Poly-carbonmonofluoride Lithium Batteries)

- Cylindrical-type Lithium Batteries
  - CR Series (Manganese Dioxide Lithium Batteries)
  - BR Series (Poly-carbonmonofluoride Lithium Batteries)

- Pin-type Lithium-ion Batteries
  - CR Series (Manganese Dioxide Lithium Batteries)
  - BR Series (Poly-carbonmonofluoride Lithium Batteries)

Rechargeable Lithium Batteries

- Coin-type Rechargeable Lithium Batteries
  - CR Series (Manganese Dioxide Lithium Batteries)
  - BR Series (Poly-carbonmonofluoride Lithium Batteries)

Pin-type Lithium-ion Battery Features

(1) Ultra Small, Super Slim Batteries
Tiny cylindrical batteries support stylish device design with high power output.

(2) High Safety and Reliability
High-strength stainless exterior case enhances safety and reliability.

(3) Supports Rapid Charging
Faster recharge times make portable devices easier to use.

Example Lithium Battery Model-Number Composition (Coin Type)

- Example: CR2032
  - Height: 3.2 mm
  - Diameter: 20 mm
  - Battery Type C: Manganese dioxide lithium battery

Nickel-Metal Hydride Battery Features

(1) Works in a Range of Temperatures
Stable performance in harsh conditions with a wide operating temperature range.

(2) Eco-friendly Power
Reusable designs limit wastage for reduced environmental impact.

(3) Ideal Replacement for Nickel-Cadmium Batteries
A longer-lasting alternative to nickel-cadmium batteries.

Nickel-Metal Hydride Batteries

- CR Series (Manganese Dioxide Lithium Batteries)
- BR Series (Poly-carbonmonofluoride Lithium Batteries)

Dry Battery Features

(1) A Tradition of Quality and Reliability
Panasonic continues to innovate on a foundation of almost 90 years of experience in battery design and production on a global scale.

(2) Excellent Reliability in Various Devices
High- to low-rate discharge recommended for use in a wide variety of devices.

(3) Designed for Global Users
Our exclusive industrial batteries are labeled in English, Japanese, and Chinese.

Dry Batteries
- Alkaline Batteries
- Manganese Batteries
Panasonic Coin-type Lithium is renowned for stellar performance in small electric appliances and for flexible implementation in memory-backup applications in temperatures as high as 125 °C. Select from a CR or BR chemistries, a choice of sizes, and a range of capacities up to 1,000 mAh.

### CR Series Manganese Dioxide Lithium Batteries

#### Features
- Offers high-rate pulse discharge
- Available in a range of compact sizes and capacities, from thin-type to high-capacity models
- Excellent low-temperature performance enhanced by manganese-dioxide positive pole

#### Applications
- Remote keyless entry, card remote controls, memory backup, smart price tags, smart transmitters, etc.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity (mAh)</th>
<th>Continuous drain (mA)</th>
<th>Dimensions (mm)</th>
<th>Mass (g)</th>
<th>Operating temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR1025</td>
<td>3V</td>
<td>30</td>
<td>0.1</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1016</td>
<td>3V</td>
<td>25</td>
<td>0.1</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1220</td>
<td>3V</td>
<td>35</td>
<td>0.2</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1216</td>
<td>3V</td>
<td>55</td>
<td>0.2</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1620</td>
<td>3V</td>
<td>75</td>
<td>0.2</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1616</td>
<td>3V</td>
<td>140</td>
<td>0.2</td>
<td></td>
<td>1.6</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2025</td>
<td>3V</td>
<td>90</td>
<td>0.2</td>
<td></td>
<td>1.6</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2032</td>
<td>3V</td>
<td>110</td>
<td>0.2</td>
<td></td>
<td>2.0</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2033</td>
<td>3V</td>
<td>220</td>
<td>0.2</td>
<td></td>
<td>3.0</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2034</td>
<td>3V</td>
<td>350</td>
<td>0.2</td>
<td></td>
<td>5.4</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2041</td>
<td>3V</td>
<td>100</td>
<td>0.2</td>
<td></td>
<td>1.2</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2045</td>
<td>3V</td>
<td>820</td>
<td>0.2</td>
<td></td>
<td>5.0</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2077</td>
<td>3V</td>
<td>1,800</td>
<td>0.2</td>
<td></td>
<td>7.7</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2032</td>
<td>3V</td>
<td>300</td>
<td>0.2</td>
<td></td>
<td>3.2</td>
<td>-30 °C to 85 °C</td>
</tr>
</tbody>
</table>

* Nominal capacity shown above is based on standard drain and cutoff voltage down to 2.0 V at 20 °C.

### BR Series Poly-carbonmonofluoride Lithium Batteries

#### Features
- BR Series batteries developed with exclusive Panasonic technology
- Exhibits stable performances after long periods in storage due to low self-discharge characteristics
- Primarily used for memory-backup power in low-drain applications

#### Applications
- Commercial equipment (communication/measurement devices), electricity meters, memory backup (security cameras, security sensors), automotive electronic components (ETC), etc.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity (mAh)</th>
<th>Continuous drain (mA)</th>
<th>Dimensions (mm)</th>
<th>Mass (g)</th>
<th>Operating temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR1225A</td>
<td>3V</td>
<td>30</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
<tr>
<td>BR1225A</td>
<td>3V</td>
<td>40</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
<tr>
<td>BR1225A</td>
<td>3V</td>
<td>70</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
<tr>
<td>BR2032</td>
<td>3V</td>
<td>200</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
<tr>
<td>BR2032</td>
<td>3V</td>
<td>260</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
<tr>
<td>BR2032</td>
<td>3V</td>
<td>230</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
<tr>
<td>BR2032</td>
<td>3V</td>
<td>255</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
<tr>
<td>BR2032</td>
<td>3V</td>
<td>300</td>
<td>0.03</td>
<td></td>
<td>0.6</td>
<td>-30 °C to 80 °C</td>
</tr>
</tbody>
</table>

* Nominal capacity shown above is based on standard drain and cutoff voltage down to 2.0 V at 20 °C.

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Cylindrical-type Lithium Batteries

CR Series Manganese Dioxide Lithium Batteries (Standard Type)

Features
- Offers super high-rate discharge with ample power and extended life when used in cameras, lights, etc.
- Also available in the consumer marketplace

Applications
- Lights, security devices (electronic door locks, fire alarms), automotive electronic components (V2I systems), medical equipment (AEDs), etc.

CR Series Manganese Dioxide Lithium Batteries (Long-life Type)

Features
- Long-life batteries exhibiting excellent discharge stability for long-term use
- The superior choice for in-vehicle apparatus with compact design and outstanding discharge performance at very low temperatures

Applications
- Security devices (electronic door locks, fire alarms), automotive electronic components (tracking systems, security alarms), meters (gas, water, electricity), medical equipment (AEDs), etc.

Pin-type Lithium Batteries

BR Series Poly-carbonmonofluoride Lithium Batteries

Features
- Panasonic original battery design
- Tiny device that can generate continuous power for LED lights, etc.

Applications
- Electrical fishing-float lights, small transmitters, etc.

BR Series Poly-carbonmonofluoride Lithium Batteries

Features
- Uncommonly long storage-life to suit metering devices and memory-backup

Applications
- Commercial equipment (communication/measurement devices), meters (gas, water, electricity, hot water), memory back-up (large KA equipment), automotive electronic components (security alarms), etc.
Coin-type rechargeable lithium is intended for applications where battery replacement is inconvenient, or the device’s construction renders replacement impractical. These batteries are ideal for memory backup or solar watches.

**VL Series Vanadium Rechargeable Lithium Batteries**

**Features**
- Retains high-discharge voltage performance

**Applications**
Memory backup printers, composite machines, medical equipment, FA equipment, remote keyless entry, fire alarms, etc.

**Example discharge characteristics**

**MS Series Manganese Silicon Rechargeable Lithium Batteries**

**Features**
- Supports more than 100 complete charge-discharge cycles

**Applications**
Memory backup cameras, etc.

**Example discharge characteristics**

---

**ML Series Manganese Rechargeable Lithium Batteries**

**Features**
- Ideal for long-term memory backup with extra-high capacity

**Applications**
Memory backup drive recorders, PCs, communication/radio, medical equipment, FA equipment, etc.

**Discharge characteristics (Example: ML621)**

**MT Series Manganese Titanium Rechargeable Lithium Batteries**

**Features**
- High-current 1.5 V lithium rechargeable battery with sustained discharge endurance

**Applications**
Watches, etc.
**Pin-type Lithium-ion Batteries**

This battery type is ideal for wearable devices and other nominal-drain applications. Our range delivers safe, stable output in a small, slim form.

### Features
- Small, slim battery design enables high output in smaller, more stylish products
- High-strength stainless casing boosts safety and reliability
- Rapid charging improves usability of portable devices

### Applications
Hearing aids, small medical devices, wireless earphones, stylus pens, smart glasses, wristband devices, etc.

---

**3C rapid charge characteristics**

Charges to more than 80% capacity in 20 minutes.

**Super-small and slim high-output battery for stylish devices**
Tiny, vibration-resistant form factor lets designers make their products smaller, lighter; and more stylish with power to support Bluetooth® Low Energy and other functions that demand strong discharge stability.

**High-strength stainless case, high safety, high reliability**
No swelling, no leaks, no explosions, no fire. Certified to IEC62133/UL1642 standards (mass-produced models only)

* Panasonic testing

**Rapid charging makes everyday devices user-friendly**
3C charging achieves 80% capacity in 20 minutes (CG-425A/420A only)

---

**Note:** Panasonic lithium batteries are available in a selection of terminal shapes to meet your needs in a variety of applications. Typical types are shown above.

*1 Tabbed-type batteries only. *2 Mass production from April, 2020.

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For more information, please visit: [https://industrial.panasonic.com/ww/products/batteries/secondary-batteries/pin-li-ion](https://industrial.panasonic.com/ww/products/batteries/secondary-batteries/pin-li-ion)
Reusable, eco-friendly nickel-metal hydride batteries are widely used to support infrastructure. A long-lasting variant with efficient charging in high temperatures is available for backup applications together with high-capacity types and more.

### Infrastructure Backup (Long-life Type)

**Features**
- Long 8–10-year operational life\(^*\)
- Excellent recharging performance in high temperatures (up to 75 °C)
- High-rate discharge (3 to 5 lt discharge/20 °C)
- Great alternative to other nickel-cadmium batteries

**Applications**
- Emergency lights, guidance lights, LED lights, wireless base-stations, servers, elevators, ATMs, POS equipment, vending machines, medical equipment, etc.

### Infrastructure Backup (High-rate Discharge Type)

**Features**
- Long 4–6-year operational life\(^*\)
- High-rate discharge (5 lt discharge/30 °C)
- Ideal substitute for nickel-cadmium batteries

**Applications**
- Elevators, automated guided vehicles, UPS systems, POS equipment, ATMs, streetlights, rail vehicles, etc.

### Large-type for Infrastructure Applications

**Features**
- Designed for extra-large power capacity
- Highly efficient power supply even in low temperatures
- 5-stage LED indicates remaining battery life (BK-10V10T)

**Applications**
- Automated guided vehicles, rail vehicles, wireless base-stations, UPS systems, etc.

---

**Note:**
1. Lt (A) = rated capacity (Ah)/(hr.)
2. Data provided in this document is for descriptive purposes only and does not imply any guarantee or warranty.
Nickel-Metal Hydride Batteries

Panasonic nickel-metal hydride batteries provide for safety and longevity in automotive backup applications as well as devices that suit button-top and high-rate-discharge battery types.

W Automotive Backup

Features
- Stable power delivery in a wide range of temperatures (-30 °C to 65 °C)
- Installable in tough environments as electrolyte solution is aqueous
- Easy charging and battery health checks

Applications
- TO, golf carts, dashboard cameras, anti-theft security systems, etc.

Example charge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Voltage (V)</th>
<th>Discharge capacity (mAh)*1</th>
<th>Temperature (°C)</th>
<th>Cutoff voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>BK80AAA</td>
<td>1.8</td>
<td>1,800</td>
<td>-20 °C to 45 °C</td>
<td>4.2V</td>
</tr>
<tr>
<td>AA</td>
<td>BK200A</td>
<td>1.8</td>
<td>2,000</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

Example discharge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Voltage (V)</th>
<th>Discharge capacity (mAh)*1</th>
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<td>BK200A</td>
<td>1.8</td>
<td>2,000</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

N Standard

Features
- Secure and safe performance with proven reliability
- Offers a wide range of models to suit various applications

Applications
- Radios, intercommunication systems, cordless phones, medical equipment, etc.

Example discharge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Voltage (V)</th>
<th>Discharge capacity (mAh)*1</th>
<th>Temperature (°C)</th>
<th>Cutoff voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>BK50AAA</td>
<td>1.8</td>
<td>500</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
<tr>
<td>AA</td>
<td>BK100A</td>
<td>1.8</td>
<td>1,000</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

Example charge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Voltage (V)</th>
<th>Discharge capacity (mAh)*1</th>
<th>Temperature (°C)</th>
<th>Cutoff voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>BK50AAA</td>
<td>1.8</td>
<td>500</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
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<td>1.8</td>
<td>1,000</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

B Button Top

Features
- Offers extended charge/discharge life of about 1,800 cycles4
- Low self-discharge and long storage life
- Excellent temperature resistance especially in freezing conditions

Applications
- Electric toothbrushes, electric shavers, remote controllers, etc.

Example charge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Voltage (V)</th>
<th>Discharge capacity (mAh)*1</th>
<th>Temperature (°C)</th>
<th>Cutoff voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>BK80AAA</td>
<td>1.8</td>
<td>800</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
<tr>
<td>AA</td>
<td>BK200A</td>
<td>1.8</td>
<td>1,200</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

Example discharge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Voltage (V)</th>
<th>Discharge capacity (mAh)*1</th>
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<td>800</td>
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<td>4.2V</td>
</tr>
<tr>
<td>AA</td>
<td>BK200A</td>
<td>1.8</td>
<td>1,200</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

P High-rate Discharge

Features
- Excellent high-current discharge characteristics
- Rapid charging capability

Applications
- Power tools, cordless cleaners, electric toys (e.g. radio-controlled cars), etc.

Example charge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Voltage (V)</th>
<th>Discharge capacity (mAh)*1</th>
<th>Temperature (°C)</th>
<th>Cutoff voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>BK90SC</td>
<td>1.2</td>
<td>900</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

Example discharge characteristics

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
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<tr>
<td>S</td>
<td>BK90SC</td>
<td>1.2</td>
<td>900</td>
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Example discharge characteristics

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<td>BK90SC</td>
<td>1.2</td>
<td>900</td>
<td>0 °C to 45 °C</td>
<td>4.2V</td>
</tr>
</tbody>
</table>

Note: 1 lt (A) = rated capacity (Ah)/(hr.)

*1 0.2 lt discharge capacity after charging at 0.1 lt for 16 hours.

Note: 1 lt (A) = rated capacity (Ah)/(hr.)

*2 Temperature range where 0.5 to 1 lt rapid charge is enabled.

*3 Temperature range where 0.1 lt charge is enabled.

*4 Temperature range where 0.2 lt discharge is enabled.

*5 Temperature range where 1 lt discharge is enabled.

Note: 1 lt (A) = rated capacity (Ah)/(hr.)

Please use appropriate voltage and temperature management to control battery temperature near the end of rapid charging.

The data provided in this document is for descriptive purposes only and does not imply any guarantee or warranty.
Nickel-Metal Hydride Batteries

### General Comparison of Various Charging

<table>
<thead>
<tr>
<th>Charge system</th>
<th>Cycle (repetitive) use</th>
<th>Standby (backup) use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cycle (repetitive) use</td>
<td>Standby (backup) use</td>
</tr>
<tr>
<td></td>
<td>CV charging method</td>
<td>Simple and affordable</td>
</tr>
<tr>
<td></td>
<td>ΔV cutoff charging method</td>
<td>Simple and affordable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Dry Batteries

Our industrial dry-battery range features user-friendly labeling in English, Japanese, and Chinese language. These OEM dry batteries are engineered with high quality and easy usability in mind.

#### Alkaline Batteries

- **Features**
  - Manganese oxide is used for the cathode material, zinc for the anode’s active material, and potassium-hydride for the electrolyte solution.
  - An ideal choice for a variety of applications thanks to compatibility with manganese dry batteries.

- **Applications**
  - Self-kindled gas/oil equipment, electric toys, portable radios, flashlights, wireless mice, electric toothbrushes, wall clocks, clocks, remote controllers, etc.

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Nominal voltage (V)</th>
<th>Dimensions (max.) [mm]</th>
<th>Mass (g)</th>
<th>ECRUS</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Height</td>
<td>Diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>LR620W</td>
<td>1.5</td>
<td>24.2</td>
<td>14.5</td>
<td>133</td>
<td>LR60</td>
</tr>
<tr>
<td>C</td>
<td>LR620W</td>
<td>1.5</td>
<td>26.0</td>
<td>14.5</td>
<td>64</td>
<td>LR60</td>
</tr>
<tr>
<td>AA</td>
<td>LR620W</td>
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<td>10.5</td>
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<td>LR60</td>
</tr>
<tr>
<td>AAA</td>
<td>LR620W</td>
<td>1.5</td>
<td>10.5</td>
<td>6.5</td>
<td>11</td>
<td>LR30</td>
</tr>
</tbody>
</table>

#### Manganese Batteries

- **Features**
  - Manganese oxide is used for cathode materials, zinc for the anode’s active material, and solutions including zinc chloride as the electrolyte.
  - Used for general electronic device applications such as gas igniters.

- **Applications**
  - Self-kindled gas/oil equipment, electric toys, portable radios, flashlights, wall clocks, clocks, remote controllers, etc.

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Nominal voltage (V)</th>
<th>Dimensions (max.) [mm]</th>
<th>Mass (g)</th>
<th>ECRUS</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Height</td>
<td>Diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>R03WC</td>
<td>1.5</td>
<td>34.2</td>
<td>17</td>
<td>95</td>
<td>R03W</td>
</tr>
<tr>
<td>C</td>
<td>R03WC</td>
<td>1.5</td>
<td>26.2</td>
<td>17</td>
<td>47</td>
<td>R03W</td>
</tr>
<tr>
<td>AA</td>
<td>R03WC</td>
<td>1.5</td>
<td>14.5</td>
<td>10</td>
<td>17</td>
<td>R03W</td>
</tr>
<tr>
<td>AAA</td>
<td>R03WC</td>
<td>1.5</td>
<td>10.5</td>
<td>6.5</td>
<td>49</td>
<td>R03W</td>
</tr>
</tbody>
</table>

Note: Model number suffix and body color indicate battery’s characteristic ranking: NWC (black) is highest ranked; DWC (red) second; UWC (blue) third.

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**Batteries**

- **Battery Pack**
  - Many of our industrial batteries are sold in packs. When battery packs are installed, the battery type, number of cells, pack shape, and constituent parts are determined by the application. Considerations include voltage and current; charging specifications; available space; and usage conditions. We design and manufacture to the most common industrial applications to best meet customer needs while maintaining safety, quality, and reliability as our central focus.

- **Reliable Battery Packs for Automotive Applications**
  - Compared to the consumer market, a higher standard of quality and reliability is expected in industrial battery applications, particularly where batteries are intended for vehicles where harsh vibration and high temperature fluctuations are commonplace. To ensure quality and reliability in this environment, Panasonic selects components for battery packs with utmost care and applies stringent controls for structural assembly and battery production. Suitability for automotive use is evidenced by PPAP (Production Part Approval Process) certification and IATF16949 compliance.