Lithium Batteries
Safety Precautions and Usage Guidance

Dry Batteries
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 hot water, sustained overheat, or any other liquid, or allow batteries to get wet. Water or other fluids may be incompatible, potentially resulting in heat-generation, smoke-generation, rupture, and/or fire.
2. Do not use or leave batteries near fire, stove, 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 infusion from other power sources.

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 swiftly 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 risk of over-discharging or over-charging and other abnormal chemical reactions inside the batteries when in use.
4. If an abnormal odor, 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.
5. When charging exceeds the specified replacement times, stop charging the battery as soon as possible. Failing to do so may cause over-charging or result in heat-generation, smoke-generation, rupture, and/or fire.
6. Do not open, crush, or otherwise damage a battery charger or appliance. 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.
7. Do not attach batteries to an AC socket or directly to a vehicle’s electrical outlet. The may result in electrical shock, voltage spikes, and excessive current flow without regard to whether charging, leakage, 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 where static electricity greater than 30V may damage battery safety equipment, resulting in battery leakage, 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 chargers 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 put 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 clear 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 conductors are exposed. Failure to do so may cause short-circuiting, resulting in heat-generation, fire, and/or rupture.

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

Please visit our website for the latest information: https://industrial.panasonic.com/
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 Panasonic commenced in-house dry battery production

1933 Osaka Moriguchi Factory

1934 Matsushita Electric Housewares Manufacturing Works (now Panasonic) is established

1935 National Hi-Top dry battery

1936 National Ultra NIC dry battery

1937 Coin-type Lithium battery

1938 Nickel-metal hydride battery for industrial use

1939 Cylindrical-type Lithium battery

1976 Micro battery production commenced

1983 National Ultra NIC-Top dry battery

1984 Coin-type Lithium battery

1985 Nickel-metal hydride battery

1986 Cylindrical-type Lithium battery

1987 Coin-type Lithium battery for high-temperature applications

1990 Nickel-metal hydride battery

2000 Cylindrical-type Lithium battery for industrial use

2005 Convergent lithium-ion battery

2010 Panasonic Energy Device Business Division

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 has won a stellar reputation not only as a high-performance primary power supply but also as a backup power source for applications in the automobile industry and in other various electronic devices. Our lineup covers models optimized for high capacity through to batteries engineered for stable, heavy-duty operation in high-temperature environments.

- CR Series Standard Button Top Lithium Batteries
- CR Series High-rate Discharge Lithium Batteries
- CR Series Manganese Dioxide Lithium Batteries
- CR Series Manganese Dioxide Lithium Batteries for High Temperatures

Coin-type Rechargeable Lithium Batteries

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

- HL Series Standard Rechargeable Lithium Batteries
- HL Series Manganese Rechargeable Lithium Batteries
- HL Series Manganese Silicon Rechargeable Lithium Batteries
- HL Series CobaltTitanium Rechargeable Lithium Batteries
- HL Series Manganese Titanate Rechargeable Lithium Batteries

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 shut off the gas if abnormalities are detected. Cylindrical-type Lithium offers an extended product lifespan without need of maintenance.

- CR Series Standard Button Top Lithium Batteries
- CR Series High-rate Discharge Lithium Batteries
- CR Series Manganese Dioxide Lithium Batteries (Standard Type)
- CR Series Manganese Dioxide Lithium Batteries (Long-life Type)
- MT Series Poly-carbonmonofluoride Lithium Batteries

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 selection of slimline products for pin-type devices and wearable technology such as 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 as a main power supply in smaller devices, or as a backup power supply for emergency situations.

- Infrastructural Backup
- Large-scale Infrastructure Applications
- Automatic Back-up

Dry Batteries

- Dry batteries deliver excellent all-round performance with long endurance, extended storage life, and effective leakage protection to meet our needs. Superior high reliability and stability form 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.

- Alkaline Batteries
- Carbon-zinc Batteries
- Zinc Chloride Batteries

Production Bases

Employees: 13 factories

Domestic: 1 factory
Overseas: 12 factories

Domestic: 742 people
Overseas: 6,756 people

As of March 2019.
Automotive Infrastructure

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

Batteries for Automotive 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.

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

- Batteries to Support Infrastructure
- Gas Meters / Water Meters
- Fire Alarms

We offer a range of batteries developed 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.

- 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-ion batteries
- Cylindrical-type lithium batteries
- Nickel-metal hydride batteries
- Alkaline dry batteries

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.

- Construction Machinery
- Medical Devices
- Agricultural Machinery
- Water-level Sensors
- Hearing Aids
- Stylus Pens
- Smart Glasses
- Wireless Earphones
**Lithium Battery Features**

**Primary Lithium Batteries**  
(Battery Type C: Manganese dioxide lithium battery)

- **Coin-type Lithium Batteries**
- **Cylindrical-type Lithium Batteries**
- **Pin-type Lithium-ion Batteries**

**Rechargeable Lithium Batteries**  
(Battery Type C: Lithium Cobaltite)

- **Coin-type Rechargeable Lithium Batteries**
- **Pin-type Lithium-ion Batteries**

**Pin-type Lithium-ion Battery Features**

1. **Ultra Small, Super Slim Batteries**
   - Tiny slimline batteries support sleek 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)**

- **CR2032**  
  - **Height**: 3.2 mm  
  - **Diameter**: 20 mm  
  - **R**: Round  

**Example: CR2032  
Height: 3.2 mm  
Diameter: 20 mm  
R: Round**

**Size**

**Nickel-Metal Hydride Battery Features**

**Nickel-Metal Hydride Batteries**

1. **Works in a Range of Temperatures**
   - Stable performance in harsh conditions with a wide operating temperature.

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.

<table>
<thead>
<tr>
<th>Nickel-Metal Hydride Batteries</th>
<th>Infrastructure Backup</th>
<th>Infrastructure Backup</th>
<th>Infrastructure Backup</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U</strong></td>
<td>Low-rate</td>
<td>Low-rate</td>
<td>Low-rate</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>Standard</td>
<td>Standard</td>
<td>Standard</td>
</tr>
<tr>
<td><strong>PH</strong></td>
<td>High-rate discharge</td>
<td>High-rate discharge</td>
<td>High-rate discharge</td>
</tr>
<tr>
<td><strong>V</strong></td>
<td>Large for Infrastructure Applications</td>
<td>Large for Infrastructure Applications</td>
<td>Large for Infrastructure Applications</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td>Automotive Backup</td>
<td>Automotive Backup</td>
<td>Automotive Backup</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Button Top</td>
<td>Button Top</td>
<td>Button Top</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>Standard</td>
<td>Standard</td>
<td>Standard</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>High-rate discharge</td>
<td>High-rate discharge</td>
<td>High-rate discharge</td>
</tr>
</tbody>
</table>

**Dry Battery Features**

1. **A Tradition of Quality and Reliability**
   - Panasonic continues to innovate on a foundation of almost 90 years’ experience in battery design and mass 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

**Dry Batteries**

- **Alkaline Batteries**
- **Manganese Batteries**

**Example: BK60AAAH  
Battery Type NK: Nickel-Metal Hydride**

**Example:**

- **Height**: 16.5 mm  
- **Diameter**: 10 mm  
- **P**: Pin Type

**Dry Batteries**

- **Alkaline Batteries**
- **Manganese Batteries**

**Example:**

- **Height**: 32 mm
- **Diameter**: 6 mm
- **G**: Flat Top

**Dry Batteries**

- **Alkaline Batteries**
- **Manganese Batteries**
Coin-type Lithium Batteries

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, security price tags, smart transmitter tags, etc.

### Specifications

| Model No. | Nominal voltage (V) | Nominal capacity (mAh)**1 | Continuous drain (mA) | Dimensions (mm) | Mass (g) | Operating temperature range
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>CR1025</td>
<td>3.0</td>
<td>30</td>
<td>20.0</td>
<td>Height 14.5</td>
<td>2.5</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1032</td>
<td>3.0</td>
<td>32</td>
<td>20.5</td>
<td>Height 14.5</td>
<td>2.5</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1216</td>
<td>3.0</td>
<td>55</td>
<td>16.0</td>
<td>Height 20.0</td>
<td>3.2</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR1620</td>
<td>3.0</td>
<td>75</td>
<td>12.0</td>
<td>Diameter 20.0</td>
<td>3.2</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2032</td>
<td>3.0</td>
<td>140</td>
<td>9.6</td>
<td>Height 26.0</td>
<td>6.0</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2325</td>
<td>3.0</td>
<td>50</td>
<td>6.1</td>
<td>Height 32.0</td>
<td>10.5</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2450</td>
<td>3.0</td>
<td>100</td>
<td>5.0</td>
<td>Height 40.0</td>
<td>16.5</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR2477</td>
<td>3.0</td>
<td>160</td>
<td>3.5</td>
<td>Height 54.0</td>
<td>26.5</td>
<td>-30 °C to 85 °C</td>
</tr>
<tr>
<td>CR3032</td>
<td>3.0</td>
<td>300</td>
<td>1.0</td>
<td>Height 70.0</td>
<td>56.0</td>
<td>-30 °C to 85 °C</td>
</tr>
</tbody>
</table>

**1** 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 performance 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.

### Specifications

| Model No. | Nominal voltage (V) | Nominal capacity (mAh)**2 | Continuous drain (mA) | Dimensions (mm) | Mass (g) | Operating temperature range
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BR1225A</td>
<td>3.0</td>
<td>48</td>
<td>20.0</td>
<td>Height 14.5</td>
<td>2.0</td>
<td>-40 °C to 85 °C</td>
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<tr>
<td>BR1632A</td>
<td>3.0</td>
<td>120</td>
<td>16.0</td>
<td>Height 18.0</td>
<td>3.0</td>
<td>-40 °C to 85 °C</td>
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<tr>
<td>BR2032A</td>
<td>3.0</td>
<td>200</td>
<td>12.0</td>
<td>Height 22.0</td>
<td>4.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>BR2450A</td>
<td>3.0</td>
<td>300</td>
<td>8.0</td>
<td>Height 30.0</td>
<td>6.0</td>
<td>-40 °C to 85 °C</td>
</tr>
</tbody>
</table>

**1** Tabulated type batteries only. **2** Nominal capacity shown above is based on standard drain and cutoff voltage down to 2.0 V at 20 °C.

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 Cylindrical-type Lithium is available in standard or long-life variants, the former for devices requiring sustained high-drain discharge (cameras, flashlights, and AEDs), and the latter for security devices or main/backup power in meters. BR Series, meanwhile, offers reliable performance in meters or memory-backup over very long periods.

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 (xCall systems), medical equipment (AEDs), etc.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity (mAh)*2</th>
<th>Continuous drain (mA)</th>
<th>Voltage (V)</th>
<th>Mass (g)</th>
<th>Operating temperature range**</th>
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</thead>
<tbody>
<tr>
<td>CR123A</td>
<td>3.0</td>
<td>1,300</td>
<td>70</td>
<td>3.0</td>
<td>18.5</td>
<td>-40 °C to 40 °C</td>
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<td>CR926</td>
<td>3.0</td>
<td>900</td>
<td>60</td>
<td>3.0</td>
<td>14.5</td>
<td>-40 °C to 21 °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.
- Please consult your Panasonic sales representative when anticipating usage in operating temperatures of -40 °C to 40 °C.

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.

<table>
<thead>
<tr>
<th>Model No.*1</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity (mAh)*2</th>
<th>Continuous drain (mA)</th>
<th>Voltage (V)</th>
<th>Mass (g)</th>
<th>Operating temperature range**</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR123AG</td>
<td>3.0</td>
<td>2,000</td>
<td>25</td>
<td>3.0</td>
<td>16.0</td>
<td>-40 °C to 65 °C</td>
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<tr>
<td>CR123AZ</td>
<td>3.0</td>
<td>1,950</td>
<td>25</td>
<td>3.0</td>
<td>15.5</td>
<td>-40 °C to 65 °C</td>
</tr>
</tbody>
</table>

- Provided with terminals or lead wire and connectors.
- Nominal capacity shown above is based on standard drain and cutoff voltage down to 2.0 V at 20 °C.
- Please consult your Panasonic sales representative when anticipating usage in operating temperatures of 70 °C or above.

Pin-type Lithium Batteries

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 backup (large FA equipment), automotive electronic components (security alarms), etc.

<table>
<thead>
<tr>
<th>Model No.*2</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity (mAh)*2</th>
<th>Continuous drain (mA)</th>
<th>Voltage (V)</th>
<th>Mass (g)</th>
<th>Operating temperature range**</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR1/2AA</td>
<td>3.5</td>
<td>1.200</td>
<td>1,450</td>
<td>3.0</td>
<td>41.5</td>
<td>-40 °C to 70 °C</td>
</tr>
<tr>
<td>BR2/3AA</td>
<td>3.0</td>
<td>1.400</td>
<td>1,600</td>
<td>3.0</td>
<td>41.5</td>
<td>-40 °C to 70 °C</td>
</tr>
<tr>
<td>BR2/3AG</td>
<td>2.5</td>
<td>1.700</td>
<td>1,700</td>
<td>3.0</td>
<td>41.5</td>
<td>-40 °C to 70 °C</td>
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<tr>
<td>BR-AG</td>
<td>2.5</td>
<td>1.700</td>
<td>1,700</td>
<td>3.0</td>
<td>41.5</td>
<td>-40 °C to 70 °C</td>
</tr>
</tbody>
</table>

- Provided with terminals or lead wire and connectors.
- Nominal capacity shown above is based on standard drain and cutoff voltage down to 2.0 V at 20 °C.
- Please consult your Panasonic sales representative when anticipating usage in operating temperatures of 70 °C or above.

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.

<table>
<thead>
<tr>
<th>Model No.*3</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity (mAh)*2</th>
<th>Continuous drain (mA)</th>
<th>Voltage (V)</th>
<th>Mass (g)</th>
<th>Operating temperature range**</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR1/2AA</td>
<td>3.5</td>
<td>1.200</td>
<td>1,450</td>
<td>3.0</td>
<td>41.5</td>
<td>-40 °C to 70 °C</td>
</tr>
<tr>
<td>BR2/3AA</td>
<td>3.0</td>
<td>1.400</td>
<td>1,600</td>
<td>3.0</td>
<td>41.5</td>
<td>-40 °C to 70 °C</td>
</tr>
</tbody>
</table>

- Provided with terminals or lead wire and connectors.
- Nominal capacity shown above is based on standard drain and cutoff voltage down to 2.0 V at 20 °C.
- Please consult your Panasonic sales representative when anticipating usage in operating temperatures of 70 °C or above.

The data provided in this document is for descriptive purposes only and does not imply any guarantee or warranty.
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
- Supports more than 100 complete charge-discharge cycles

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

**MS Series Manganese Silicon Rechargeable Lithium Batteries**

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

**Applications**
- Memory backup cameras, etc.

**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, RA equipment, etc.

**MT Series Manganese Titanium Rechargeable Lithium Batteries**

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

**Applications**
- Watches, etc.
### Lithium Batteries

#### Lithium Batteries with Terminals

<table>
<thead>
<tr>
<th>Tabbed Type</th>
<th>Lead Wire Type</th>
</tr>
</thead>
</table>

**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.

**Features (Example: CG-425A)**
- 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

**Applications**
- Smart glasses
- Wristband devices
- Stylus pens

**Pin-type Lithium-ion Batteries**

#### 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.

**Features**
- **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

**Applications**
- Smart glasses
- Wristband devices
- Stylus pens

**Pin-type Lithium-ion Batteries**

#### Pin-type Lithium-ion Batteries with Terminals

**Through-hole Type**

**Surface-mount Type**

**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. For the latest technical and product information, please visit our website at https://industrial.panasonic.com/ww/products/batteries/primary-batteries/lithium-batteries

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**Bluesooth® word mark is a registered trademark owned by the Bluetooth SIG, Inc.**

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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)**

- **Long 4–6-year operational life**
- **Stable performance in a wide range of temperatures**
- **Ideal substitute for nickel-cadmium batteries**

**Applications**

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

**Example discharge characteristics**

- Charge: 0.1 lt x 16 hr.
- Cutoff voltage: 1.0 V
- Discharge temperature: -20 °C to 75 °C

**Operating temperature range**

- Nominal: 23.0 +0/-1.0
- SC: 18.2 +0/-0.7

**Dimensions with stud bolts (mm)**

- Height: 159 270
- Width: 23
- Depth: 159

**Charge characteristics (Example: BK-10V10T)**

- Voltage (V): 1.0
- Discharge capacity (mAh)*1: 1200
- Discharging time (hr.): 200

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

*2 Lifespan compared to Panasonic standard-type battery life cycle (3 to 5 years) charged using intermittent charging method.

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

- **Long 8–10-year operational life**
- **Excellent recharging performance in high temperatures (up to 75 °C)**
- **High-rate discharge (3 to 5 times 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.

**Example charge characteristics**

- Charge: 0.1 lt x 10 hr.
- Cutoff voltage: 0.95 V
- Discharge temperature: 25 °C

**Operating temperature range**

- Nominal: 14.5 +0/-0.7
- SC: 17.0 +0/-0.7

**Dimensions with stud bolts (mm)**

- Height: 159
- Width: 159
- Depth: 159

---

**Infrastructure Backup (General Type)**

- **Long 4–6-year operational life**
- **Stable performance in a wide range of temperatures**
- **Ideal substitute for nickel-cadmium batteries**

**Applications**

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

**Example discharge characteristics**

- Charge: 0.1 lt x 10 hr.
- Cutoff voltage: 0.95 V
- Discharge temperature: 25 °C

**Operating temperature range**

- Nominal: 17.0 +0/-0.7
- SC: 18.2 +0/-0.7

---

**Large-type for Infrastructure Applications**

- **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.

**Example discharge characteristics**

- Charge: 0.1 lt x 10 hr.
- Cutoff voltage: 0.95 V
- Discharge temperature: 25 °C

**Operating temperature range**

- Nominal: 17.0 +0/-0.7
- SC: 18.2 +0/-0.7

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

*2 Lifespan compared to Panasonic standard-type battery life cycle (3 to 5 years) charged using intermittent charging method.

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

### Automotive Backup

**Features**
- Stable power delivery in a wide range of temperatures (-30 °C to 45 °C)
- Installable in tough environments as electrolyte solution is aqueous
- Easy charging and battery health checks

**Applications**
- TO, t-Call systems, dashboard cameras, anti-theft security systems, etc.

**Example charge characteristics**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>0 °C</th>
<th>20 °C</th>
<th>45 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>1.7</td>
<td>1.4</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>1.6</td>
<td>1.5</td>
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</table>

**Example discharge characteristics**

<table>
<thead>
<tr>
<th>Discharge Capacity (mAh)*1</th>
<th>Operating Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,100-2,200</td>
<td>-20 °C to 85 °C</td>
</tr>
<tr>
<td>700-1,580</td>
<td>0 °C to 65 °C</td>
</tr>
<tr>
<td>2,000-4,000</td>
<td>0 °C to 20 °C</td>
</tr>
</tbody>
</table>

*1 Discharge capacity after charging 0.1 It x 16 hr.
*2 Measured under conditions complying with JIS C8708 2013 (7.5.1.1). Actual capacity depends on usage conditions.  *3 AAA-size compatible. *4 AA-size compatible. Note: 1 It (A) = rated capacity (Ah)/(hr.)

### 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 charge characteristics**

<table>
<thead>
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</tbody>
</table>

*1 Discharge capacity after charging 0.1 It x 16 hr. Note: 1 It (A) = rated capacity (Ah)/(hr.)

### Button Top

**Features**
- Offers extended charge/discharge life of about 1,800 cycles
- 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>Voltage (V)</th>
<th>0 °C</th>
<th>20 °C</th>
<th>65 °C</th>
</tr>
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<tbody>
<tr>
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</tr>
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<td>2,000-4,000</td>
<td>0 °C to 20 °C</td>
</tr>
</tbody>
</table>

*1 Discharge capacity after charging 0.1 It x 16 hr.

### 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>Voltage (V)</th>
<th>0 °C</th>
<th>20 °C</th>
<th>65 °C</th>
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<td>0 °C to 20 °C</td>
</tr>
</tbody>
</table>

*1 Discharge capacity after charging 0.1 It x 16 hr. Note: 1 It (A) = rated capacity (Ah)/(hr.)

[Note: 1 It (A) = rated capacity (Ah)/(hr.). Please use appropriate voltage and temperature management to control battery temperature near the end of rapid charging.]
### 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>- DC cut-off charging method</td>
<td>- DC cut-off charging method*</td>
</tr>
<tr>
<td>Semi-constant-current charging method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermittent charging method</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Where charge-rate exceeds 0.1 It, overcharge performance and temperature rise characteristics will vary according to the battery type. Consult Panasonic before defining product specifications. If multiple cells or high-capacity cells are used, or if heat dissipation from the battery pack is poor, batteries may generate heat even at 0.1 It. If this is the case, the device's battery installation should be redesigned to facilitate heat dissipation or the charging current lowered. Design should be such that temperature rise at saturation is no higher than 50 °C.

**Note:** T: Battery surface temperature

#### Features

- **Charge level at charge control:**
  - Infrastructure backup type
  - Automotive backup type

- **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.

### 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 dioxide is used for the cathode material, zinc for the anode’s active material, and potassium-hydrate 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 mics, electric toothbrushes, wall clocks, clocks, remote controllers, etc.

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Nominal voltage (V)</th>
<th>Diameter (max.) (mm)</th>
<th>Mass (g)</th>
<th>IEC/CUL</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>R20XW</td>
<td>1.5</td>
<td>15</td>
<td>13.2</td>
<td>LR20P</td>
<td>13A,13AC</td>
</tr>
<tr>
<td>C</td>
<td>R6XW</td>
<td>1.5</td>
<td>15</td>
<td>4.4</td>
<td>LR6</td>
<td>14A,13AC</td>
</tr>
<tr>
<td>AA</td>
<td>R03XW</td>
<td>1.5</td>
<td>15</td>
<td>2.3</td>
<td>LR6P</td>
<td>15A,13AC</td>
</tr>
<tr>
<td>AAA</td>
<td>R03XW</td>
<td>1.5</td>
<td>15</td>
<td>1.1</td>
<td>LR6C</td>
<td>24A,24AC</td>
</tr>
</tbody>
</table>

### Manganese Batteries

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

<table>
<thead>
<tr>
<th>Size</th>
<th>Model No.</th>
<th>Nominal voltage (V)</th>
<th>Diameter (max.) (mm)</th>
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<td>LR6</td>
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<td>15</td>
<td>1.1</td>
<td>LR6C</td>
<td>24A,24AC</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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