**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.

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**DANGER: READ BEFORE USE**

1. Do not expose batteries to hot water, saltpeter, or any other liquid, or allow batteries to get wet. Built-in safety equipment may be compromised, potentially resulting in heat-generation, smoke-generation, rupture, and/or fire.
2. Do not use or leave batteries over five, or above, or under, or near, the minimum and maximum temperature limits. Cycling batteries under the minimum temperature may reduce battery performance or cause damage. Cycling batteries under the maximum temperature may cause heat-generation, rupture, and/or fire. Do not store batteries in direct sunlight, or in a hot car, or use batteries in a hightemperature environment. Using batteries in a high-temperature environment may result in electrolyte leakage, heat-generation, and/or smoke-generation. Ask your representative or dealer for more details. Charging batteries outside the designated temperature range may result in battery leakage, heat-generation, and/or rapture, or reduce battery performance and lifespan.
3. Never charge any battery type except rechargeable batteries. Ensure the device’s circuit prevents current inversion from other power source.
4. When charging batteries, use approved battery chargers only and observe battery charging conditions specified by Panasonic. When charging batteries in other charging conditions (under/over-charging, under/over-discharging, over/charge current, and/or charge current flow), abnormal chemical reaction inside batteries may occur, resulting in heat-generation, smoke-generation, rupture, and/or fire.
5. Every battery has a spontaneous oxidation potential. If a battery does not or will not function 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 backward causing an abnormal chemical reaction which may result in leakage, heat-generation, smoke-generation, rupture, and/or fire.
6. Do not attach batteries to an AC scale or directly to a vehicle’s electrical outlet. This may result in electric shock, voltage spikes, and excessive current flow within the power outlet, resulting in heat-generation, leakage, heat-generation, smoke-generation, rupture, and/or fire.
7. Using batteries for unapproved applications may affect battery performance or reduce battery life. Charge in some devices may damage batteries due to electric shock, voltage spikes, and excessive current flow within the power outlet, resulting in heat-generation, leakage, heat-generation, smoke-generation, rupture, and/or fire.
8. Do not handle batteries or heat them in high temperatures. This will melt the insulator, damaging the gas valve and other safety measures, igniting the electrolyte, resulting in heat-generation, smoke-generation, rupture, and/or fire.
9. Do not connect the positive terminal and negative terminal of a battery with any metal object. Also, do not store or carry batteries where they could contact keys, pipes, paper clips, jewelry, etc. This may cause short-circuiting and excessive current flow resulting in heat-generation, smoke-generation, rupture, and/or fire, or heat the contacted metals.
10. Do not install batteries to high impact or shock. This may result in leakage, heat-generation, smoke-generation, rupture, and/or fire. If built-in safety equipment gets damaged, batteries may charge abnormally, causing an abnormal chemical reaction inside they battery which may result in heat-generation, smoke-generation, rupture, and/or fire.
11. Do not penetrate batteries with nails, strike with a hammer, or subject the battery to high-impact. Batteries may become damaged, causing an abnormal chemical reaction inside they battery which may result in heat-generation, smoke-generation, rupture, and/or fire.
12. Do not directly solarize batteries or store batteries in a solar bath. Heat may melt the insulator of cause damage to the safety valve and related equipment, resulting in heat-generation, smoke-generation, rupture, and/or fire.
13. Never disassemble, modify, or throw batteries into the pack. Built-in safety equipment or protective mechanisms in the battery or battery pack may be compromised, potentially resulting in heat-generation, smoke-generation, rupture, and/or fire.
14. Do not store at or near the protective gas valve and other safety measures. Batteries may become damaged, causing an abnormal chemical reaction inside they battery which may result in heat-generation, smoke-generation, rupture, and/or fire.
15. Some batteries incorporate a gas-vacuuming structure to discharge internal gases. For this reason, do not insert the positive electrode.
16. Some batteries cannot be installed in hermetically sealed equipment. Doing so may cause gas buildup inside the device, which may result in rupture or explosion if ignited.

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**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 result in heat-generation, smoke-generation, rupture, and/or fire. In case of heat-generation, smoke-generation, rupture, and/or fire due to over-discharging or over-charging and other abnormal chemical reactions inside the batteries when in use.
3. Keep new batteries separate from used batteries, or mix mix batteries of different capacities, types, or brands. This may result in heat-generation, smoke-generation, rupture, and/or fire. In case of heat-generation, smoke-generation, rupture, and/or fire due to over-discharging or over-charging and other abnormal chemical reactions inside the batteries when in use.
4. To avoid abnormal heat, 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. Take extra care to prevent batteries from contacting fire or leakage of unusual material; to detect leakage, and/or fire, and/or fire due to over-discharging or over-charging and other abnormal chemical reactions inside the batteries when in use.
7. If heat-generation, rupture, and/or fire occur, immediately remove the affected area with clean water and call a doctor. Exposure to electrolyte may result in loss of eyesight. If contact occurs, do not rub the eye, but immediately wash with clean water and seek medical assistance as soon as possible.
8. Do not subject batteries to high impact or shock. This may result in leakage, heat-generation, and/or smoke-generation. Product performance and lifespan may be also be reduced.
9. Do not use batteries where static electricity greater than 100 V may damage battery safety mechanisms, resulting in battery leakage, heat-generation, smoke-generation, rupture, and/or fire.
10. Do not use any charger, device, or appliance that is not designed to be used with the specific battery. This will cause the above-mentioned effects.
11. Do not connect the positive terminal and negative terminal of a battery with any metal object. Also, do not store or carry batteries where they could contact keys, pipes, paper clips, jewelry, etc. This may cause short-circuiting and excessive current flow resulting in heat-generation, smoke-generation, rupture, and/or fire.
12. Do not put flammable substances on batteries or cover them during charging or storage. This may result in heat-generation, smoke-generation, rupture, and/or fire.
13. Do not charge batteries inside cars in hot weather. This may result in battery leakage, heat-generation, and smoke-generation. Product performance and lifespan may be also be reduced.

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**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 100 V may damage battery safety mechanisms, resulting in battery leakage, heat-generation, smoke-generation, rupture, and/or fire.
3. Keep new batteries separate from used batteries, or mix batteries of different capacities, types, or brands. This may result in heat-generation, smoke-generation, rupture, and/or fire. In case of heat-generation, smoke-generation, rupture, and/or fire due to over-discharging or over-charging and other abnormal chemical reactions inside the batteries when in use.
4. To avoid abnormal heat, 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 incinerate batteries or heat them to high temperatures. This will melt the insulator of cause damage to the safety valve and other safety measures, igniting the electrolyte, resulting in heat-generation, smoke-generation, rupture, and/or fire.
7. Secure in storage packaging so batteries inside a case do not move during transit. Failure to do so may cause damage or short circuit the internal terminals.
8. When discarding used batteries, follow all relevant government laws and regulations in your country or region.
9. 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.
10. Do not expose batteries to fresh water, seawater, beverages, or any other liquid, or allow batteries to get wet. Built-in safety equipment may be compromised, potentially resulting in heat-generation, smoke-generation, rupture, and/or fire.
11. Do not disassemble, modify, or twist batteries inside the pack. Built-in safety equipment or protective mechanisms in the battery or battery pack may be compromised, potentially resulting in heat-generation, smoke-generation, rupture, and/or fire. Failure to do so may cause the batteries to leak, generate heat, or explode.
12. Do not change the battery pack in hot weather. In high-temperature locations, a safety mechanism works to prevent danger but may impede charging or degrading the safety mechanism, resulting in heat-generation, smoke-generation, rupture, and/or fire due to charging via abnormal current flow/ original abnormal chemical reaction inside the battery.
13. Do not store 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.
14. Do not subject batteries to high impact or shock. This may result in leakage, heat-generation, and/or smoke-generation. Product performance and lifespan may be also be reduced.
15. Do not use any charger, device, or appliance that is not designed to be used with the specific battery. This will cause the above-mentioned effects.
16. Do not put flammable substances on batteries or cover them during charging or storage. This may result in heat-generation, smoke-generation, rupture, and/or fire.
17. If heat generation occurs, immediately wash with clean water and call a doctor. Exposure to electrolyte may result in loss of eyesight. If contact occurs, do not rub the eye, but immediately wash with clean water and seek medical assistance as soon as possible.

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**NOTICE:** This literature contains information on batteries made by Panasonic Corporation. The information contained within is for descriptive purposes only and is not intended to make, imply, or represent any warranty or guarantee. Panasonic Corporation reserves the right to change or modify design, appearance, and specification without prior notice. Panasonic lithium batteries comply with all relevant and applicable safety and regulatory standards for commercial sale. Panasonic cannot accept responsibility for damage or misadventure due to mishandling or misuse. Importing, exporting, shipping, or operation by the user, not supported any guarantees concerning claimed device performance except those explicitly made by Panasonic Corporation. © Copyright Panasonic Corporation, 2019.

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The contents of this catalog are valid as of December, 2021
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

1931 Matsushita Electric Factory No.3 starts in-house production of dry batteries
1933 Osaka Moriyuchi Factory
1976 Micro-battery production commences
1954 National Hi-Top dry battery
1969 National Hi-Terminal Top dry battery
1977 Coin-type battery
1983 National Ultra-NiCd battery
1989 Nickel-metal hydride battery
2000 Cylindrical-type lithium battery for industrial use
2005 PANASONIC 2005
2015 PANASONIC EVOLTA 2015

Production Bases

- Domestic: 13 factories
- Overseas: 13 factories
- Domestic: 742 people
- Overseas: 6,756 people

Product Lineup

Panasonic offers a range of energy devices to meet customers’ needs in various applications.

Coin-type Lithium Batteries

- Business 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 provide high-capacity power for a variety of high-drain devices and industrial applications, ensuring long-lasting performance.

Coin-type Rechargeable Lithium 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 select group of reliable products for pro-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.

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 batteries offer an extended product lifespan without the need for maintenance.

Dry Batteries

- Dry batteries deliver excellent all-round performance with long endurance, extended storage life, and effective leakage control. Their 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.

A timeline of Panasonic’s battery development:

- 1918 Matsushita Electric Housewares Manufacturing Works is established
- 1931 Panasonic commences dry battery production
- 1937 Development of alkaline batteries
- 1954 Development of nickel-cadmium batteries
- 1969 Development of nickel-metal hydride batteries
- 1977 Development of lithium-ion batteries
- 2000 Development of lithium-air batteries

Panasonic’s Product Lineup:

- Coin-type Lithium Batteries
- Cylindrical-type Lithium Batteries
- Nickel-Metal Hydride Batteries
- Pin-type Lithium-ion Batteries
- Dry Batteries

Panasonic’s Product Lineup includes:

- Coin-type Lithium Batteries
  - eneloop
  - EVOLTA
- Cylindrical-type Lithium Batteries
  - VL Series Vanadium Rechargeable Lithium Batteries
  - ML Series Manganese Rechargeable Lithium Batteries
  - MS Series Manganese Silicon Rechargeable Lithium Batteries
  - CTL Series Cobalt Titanium Rechargeable Lithium Batteries
  - MT Series Manganese Titanium Rechargeable Lithium Batteries
- Nickel-Metal Hydride Batteries
  - CR Series Manganese Dioxide Lithium Batteries
  - BR Series Poly-carbonmonofluoride Lithium Batteries
- Pin-type Lithium-ion Batteries
  - PANASONIC 2005
- Dry Batteries
  - Alkaline Batteries
  - Manganese Batteries
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.

**Batteries for Automotive Applications**

Remote Keyless Entry / Anti-theft Security Systems

eCall Systems (Emergency Call Systems)

Event Data Recorder (EDR)

Tire Pressure Monitoring Systems (TPMS)

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.

**Batteries to Support Infrastructure**

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.

Emergency Lights / Guide Lights

Gas Meters / Water Meters

Elevators

Fire Alarms

**Automotive**

Coin-type Lithium Batteries / Rechargeable Lithium Batteries

Nickel-Metal Hydride Batteries

**Infrastructure**

Coin-type Lithium Batteries / Rechargeable Lithium Batteries

Cylindrical-type Lithium Batteries

Nickel-Metal Hydride Batteries
Batteries for IoT/LPWA

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
- Cylinder-type Lithium Batteries
- Alkaline Dry Batteries
- Nickel Metal Hydride Batteries
- Coin-type Lithium Batteries
- Cylindrical-type Lithium 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 devices 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

Applications:

- Construction Machinery
- Medical Devices
- Agricultural Machinery
- Water-level Sensors
- Hearing Aids
- Stylus Pens
- Wireless Earphones
- Smart Glasses (Electric Photochromatic Sunglasses, Electric Bifocal Glasses, etc.)
Lithium Battery Features

(1) Wide Product Range
We provide a wide selection of different products engineered to suit a wide range of applications from primary power supply to backup power insurance in emergency situations.

(2) Proven Reliability
We possess more than 40 years’ experience in lithium battery design, manufacturing, product development, and mass production techniques with a proven track record for safety and reliability.

(3) Durable Performance in Tough Conditions
Expect dependable performance in the harshest conditions and excellent resistance to extremes in temperature—a welcome characteristic when deployed in areas that are in use over extended periods.

Primary Lithium Batteries

<table>
<thead>
<tr>
<th>Composition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coin-type Lithium Batteries</td>
<td>CR2032</td>
</tr>
<tr>
<td>Cylindrical-type Lithium Batteries</td>
<td></td>
</tr>
<tr>
<td>Pin-type Lithium-ion Batteries</td>
<td></td>
</tr>
</tbody>
</table>

Rechargeable Lithium Batteries

<table>
<thead>
<tr>
<th>Composition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coin-type Rechargeable Lithium Batteries</td>
<td></td>
</tr>
<tr>
<td>Pin-type Lithium-ion Batteries</td>
<td></td>
</tr>
</tbody>
</table>

Pin-type Lithium-ion Battery Features

(1) Ultra Small, Super Slim Batteries
Tiny diameter 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)

<table>
<thead>
<tr>
<th>Example</th>
<th>CR2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height: 3.2 mm</td>
<td>Diameter: 20 mm</td>
</tr>
<tr>
<td>R: Round</td>
<td></td>
</tr>
</tbody>
</table>

Example Pin-type Lithium-ion Battery Model-Number Composition

<table>
<thead>
<tr>
<th>Example</th>
<th>CG-320A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height: 20 mm</td>
<td>Diameter: 3 mm</td>
</tr>
</tbody>
</table>

Nickel-Metal Hydride Battery Features

(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.

Nickel-Metal Hydride Batteries

<table>
<thead>
<tr>
<th>Model-Number Composition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR Series (Manganese Dioxide Lithium Batteries)</td>
<td>CR60AA</td>
</tr>
<tr>
<td>BR Series (Poly-carbonate Lithium Batteries)</td>
<td>BR60AA</td>
</tr>
<tr>
<td>MR Series (Manganese Rechargeable Lithium Batteries)</td>
<td>MR60AA</td>
</tr>
<tr>
<td>MS Series (Manganese Silicate Rechargeable Lithium Batteries)</td>
<td>MS60AA</td>
</tr>
<tr>
<td>CTL Series (Cobalt Titanite Rechargeable Lithium Batteries)</td>
<td>CTL60AA</td>
</tr>
<tr>
<td>MT Series (Manganese Titanite Rechargeable Lithium Batteries)</td>
<td>MT60AA</td>
</tr>
</tbody>
</table>

Dry Battery Features

(1) A Tradition of Quality and Reliability
Panasonic continues to innovate on a foundation of almost 30 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

<table>
<thead>
<tr>
<th>Alkaline Batteries</th>
<th>Manganese Batteries</th>
</tr>
</thead>
</table>

Dry Batteries

<table>
<thead>
<tr>
<th>Alkaline Batteries</th>
<th>Manganese Batteries</th>
</tr>
</thead>
</table>

Alkaline Batteries

<table>
<thead>
<tr>
<th>Manganese Batteries</th>
</tr>
</thead>
</table>

Manganese Batteries

<table>
<thead>
<tr>
<th>Alkaline Batteries</th>
</tr>
</thead>
</table>
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, security price tags, smart transmitter tags, etc.

### Discharge temperature characteristics

![Discharge temperature characteristics](image)

### CR Series Manganese Dioxide Lithium Batteries for High Temperatures

### Features
- Superior discharge characteristics
- Engineered for use in equipment operating in high-temperature environments (max. 125 °C)

### Applications
- Automotive electronic components (TPMS, ETC), hot water and electricity meters, etc.

### 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 (ETO), etc.

### Discharge temperature characteristics

![Discharge temperature characteristics](image)

### BR Series Poly-carbonmonofluoride Lithium Batteries for High Temperatures

### Features
- In addition to the appeal of our BR Series coin-type lithium batteries, poly-carbonmonofluoride cells can operate in temperatures up to 125 °C

### Applications
- Automotive electronic components (TPMS, ETC), hot water and electricity meters, memory backup (hot-computers, FA equipment), etc.

### Discharge temperature characteristics

![Discharge temperature characteristics](image)
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-lock/alarms), automotive electronic components (onboard systems), medical equipment (AEDs), 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*3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR123A</td>
<td>3.0</td>
<td>1,500</td>
<td>20</td>
<td>15.0x14.5x1.8</td>
<td>11.0</td>
<td>-40 °C to 70 °C</td>
</tr>
<tr>
<td>CR2</td>
<td>3.0</td>
<td>1,550</td>
<td>30</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 70 °C</td>
</tr>
</tbody>
</table>

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)</th>
<th>Continuous drain (mA)</th>
<th>Dimensions (mm)</th>
<th>Mass (g)</th>
<th>Operating temperature range*3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-AGZ</td>
<td>3.0</td>
<td>1,000</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>CR-AG</td>
<td>3.0</td>
<td>1,000</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>CR-DGAU</td>
<td>3.0</td>
<td>1,000</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>CR-DGA</td>
<td>3.0</td>
<td>1,000</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>CR-AGZ5</td>
<td>3.0</td>
<td>1,000</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>CR-DGAU5</td>
<td>3.0</td>
<td>1,000</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
</tbody>
</table>

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.*1</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*3</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR-2/3A</td>
<td>3.0</td>
<td>1,800</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>BR-2/3AG</td>
<td>3.0</td>
<td>1,800</td>
<td>2.5</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
</tbody>
</table>

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.

<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*3</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR425</td>
<td>3.0</td>
<td>1550</td>
<td>2.0</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>BR435</td>
<td>3.0</td>
<td>1550</td>
<td>2.0</td>
<td>17.0x19.0x1.8</td>
<td>12.0</td>
<td>-40 °C to 85 °C</td>
</tr>
</tbody>
</table>

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.

### Coin-type Rechargeable Lithium Batteries

#### VL Series Vanadium Rechargeable Lithium Batteries

**Features**
- Ideal for high-discharge voltage performance

**Applications**
- Memory backup printers, composite machines, 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/write, medical equipment, RA equipment, etc.

#### CTL Series Cobalt Titanium Rechargeable Lithium Batteries

**Features**
- Rechargeable batteries with excellent charge-discharge cycle stability
- Compared to MT Series, CTL Series retains a higher voltage (2.3 V)
- Long-term reliability proved by applications in many solar watch designs

**Applications**
- Digital/solar watches, sensing devices, etc.

#### 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.

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.
Nickel-Metal Hydride Batteries

Infrastructure Backup (High-rate Discharge Type)

- Nickel-Metal Hydride Batteries charging in high temperatures is available for backup applications together with high-capacity types and more.

Example charge characteristics

Voltage (V)
- 1.8
- 1.7
- 1.6
- 1.5
- 1.4
- 1.3
- 1.2
- 1.1

Temperature (°C)
- 10
- 20
- 45
- 75

Charge: 0.1 It, \(-dV = 5\) mV

Infrastructure Backup (Long-life Type)

Features
- Long 4–6-year operational life\(^*2\)
- Excellent recharge performance in high temperatures (up to 75 °C)
- High-rate discharge (3 to 5 It discharge/20 °C)
- Great alternative to other nickel-cadmium batteries

Example charge characteristics

Voltage (V)
- 1.8
- 1.7
- 1.6
- 1.5
- 1.4
- 1.3
- 1.2
- 1.1

Temperature (°C)
- 10
- 20
- 45
- 75

Charge: 0.1 It x 16 hr.

Applications
- Emergency lights, guidance lights, LED lights, wireless base-stations, servers, exterior, ATM, POS equipment, vending machines, medical equipment, etc.

Infrastructure Backup (General Type)

Features
- Long 8–10-year operational life\(^*2\)
- Excellent recharging performance in high temperatures (up to 75 °C)
- High-rate discharge (3 to 5 It discharge/20 °C)
- Great alternative to other nickel-cadmium batteries

Applications
- Emergency lights, guidance lights, LED lights, wireless base-stations, servers, exterior, ATM, POS equipment, vending machines, medical equipment, etc.

Large-type for Infrastructure Applications

Features
- Designed for extra-large power capacity
- High-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.

Rechargeable, 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.
## 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.

### 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, call systems, dashboard cameras, anti-theft security systems, etc.

### Button Top

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

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

### 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.

### 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.
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></td>
<td></td>
</tr>
<tr>
<td>Semi-constant-current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trickle-charging method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charging circuit cost is higher but supports longer life than trickle-charging method for continuous charging for long periods.</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 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-kindling gas/oil equipment, electric toys, portable radios, flashlights, wireless micro, electric toothbrushes, wall clocks, clocks, remote controllers, etc.

**Manganese Batteries**

- **Features**
  - Manganese dioxide is used for the cathode material, 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-kindling gas/oil equipment, electric toys, portable radios, flashlights, wall clocks, clocks, remote controllers, etc.

**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 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.

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Note: Model number suffix and body color indicate battery’s characteristic ranking: NWC (black) is highest ranked; DWC (red) second; UWC (blue) third. The data provided in this document is for descriptive purposes only and does not imply any guarantee or warranty.