

# **Panasonic** ideas for life

## **Alkaline Industrial Batteries** Technical Handbook



International English



PIE Branch  
Hamburg

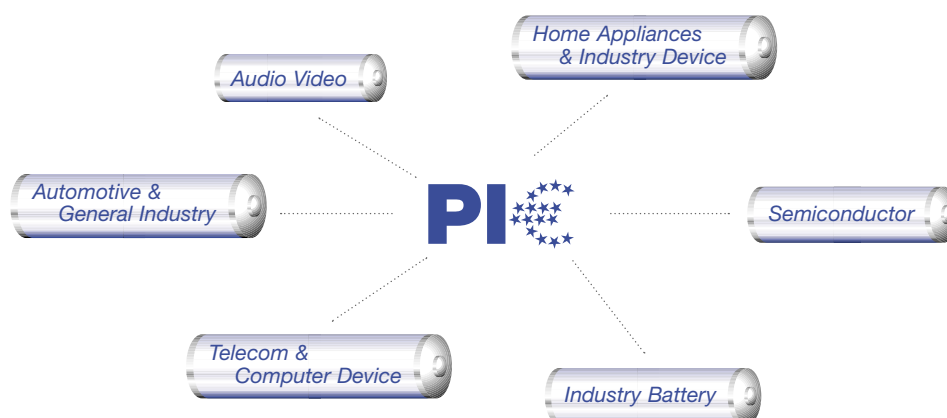
## Panasonic Industrial Europe

*Find out how we can power your business!*

Matsushita Electric Industrial Co. Ltd., founded in Osaka 1918, is one of the world's largest manufacturers of quality electronic and electrical equipment. Its subsidiary, Panasonic Industrial Europe GmbH (PIE) deals with a wide diversified range of industrial products for all European coun-

tries. This company was formed in 1998 to strengthen Panasonic's pan-European industry operation, and today is active in such different business fields as Car Electronics, Components, Consumer Batteries, OEM/Industrial Batteries etc. to satisfy its customer's needs.

### PIE Organisation



The Industry Battery Unit (IBU) is responsible for the OEM/Industrial Battery business in Europe, with sales offices strategically located throughout the continent. The head office, located in Germany (Hamburg), is responsible for Central Europe (Germany, Benelux, Swiss, Austria, Scandinavia) and Eastern Europe. The UK/Ireland (Bracknell), France (Paris), Italy (Milano) and Spain (Barcelona) are supported by local offices. In addition, we are able to offer an extensive distributor network. Based on both of these sales channels we are capable of supplying each customer's own power solution. Find out how we can power your business!

We are able to offer you a wide range of individual power solutions for portable and stationary applications. Our product range includes high reliability batteries such as Lithium-Ion, Lithium, Nickel-Metal Hydrid, Nickel-Cadmium, Valve Regulated Lead Acid, Alkaline and Zinc Carbon. Based on this battery range we can power your business in virtually all applications.

*Such as:*

- *Mobile Phones → Powertools*
- *UPS → Measuring Devices*
- *Keyless Entry → Personal Care*
- *Vacuum Cleaner*
- *RFID Tags → Price Tags*
- *Medical Equipment*
- *Electronic toll collect system*
- *Portable communication devices*
- *Communication infrastructure*

## Quality Commitment

*Panasonic Batteries – safety, long-life and power!*

Matsushita Batteries Industrial (MBI) started its production of Panasonic batteries in 1931. Today MBI is one of the most diversified global battery manufacturers with a network of 23 manufacturing companies in 15 countries. More than 18,000 employees are dedicated to the invention and development of new batteries for a new world.



When it comes to production our facilities employ leading edge manufacturing processes meeting the best quality standards. Our factories are certified to ISO standards. This means that each factory has its own quality and environmental management. The ISO 9000 and ISO 14000 series are the minimum benchmarks that ensure our excellent product reliability. In addition our VRLA batteries are for example approved to German VdS standard and U.S. UL standard.



## Index

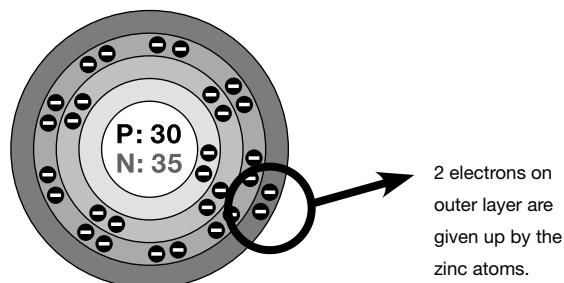
<b>1   Introduction</b>	page <b>4</b>
<b>2   Electro-chemical description</b>	page <b>5</b>
<b>3   Construction</b>	page <b>6 - 7</b>
<b>4   Performance</b>	page <b>8 - 9</b>
<b>5   Specifications</b>	page <b>10 - 14</b>
<b>6   Battery Standards</b>	page <b>15</b>
<b>7   Advice</b>	page <b>15</b>
<b>8   Product Safety Data Sheets (PSDS)</b>	page <b>16 - 17</b>
<b>9   Environment</b>	page <b>18</b>
<b>10   Panasonic Standards</b>	page <b>18</b>

## 1 | Introduction

In this booklet we will describe the alkaline manganese batteries, which are basically made from the same basic materials as normal carbon-zinc batteries, but offer higher capacity and high drain performance, longer shelf life, better leakage resistance and superior low temperature behaviour.

The cylindrical alkaline battery is composed of manganese dioxide (+), zinc powder (-) and caustic alkali (Potassium hydroxide) as electrolyte. These alkaline batteries have a higher energy output than zinc carbon batteries, a longer shelf life and better leakage resistance due to the use of purest materials to minimize self discharge. Their performance in terms of low temperature performance is much better too than zinc carbon batteries.

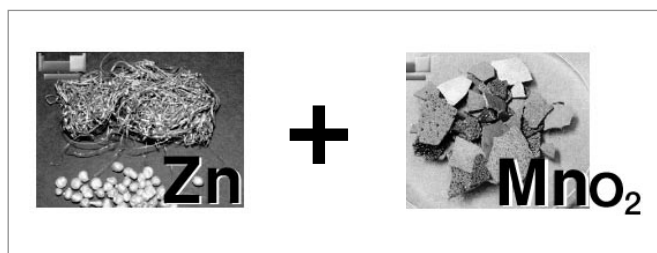
The actual electrical current is generated through an outside flow of electrons coming from the anode (zinc), passing through the attached load and flowing back into the battery at the cathode (from the can into the manganese dioxide).



## 2 | Electro-chemical description

**The negative electrode or anode** is composed of zinc powder in the shape of a mixed gel. The quality of the zinc powder and the size of the particles are carefully controlled to ensure a good and wide surface area during the chemical reaction, thus lowering the internal resistance which is important in case of high drain discharges. Because it's the zinc which is giving up electrons, thus creating a flow of electrical current, the anode is also the "capacity determining element".

**The positive electrode or cathode** is made of manganese dioxide and is produced in the shape of tablets where graphite and electrolyte (and some small quantities of other additives) are added for a better conductivity. This material is generated through an electrolytical process, ensuring the purity and richness of oxygen.



**The electrolyte** is a potassium hydroxide solution, which is alkaline (basic) and is present in the anode, cathode and separator (as all three are of porous nature) to assure high conductivity during discharge.

**The separator paper** divides the positive and negative parts of the battery to prevent internal short circuit and immediate loss of energy. The separator paper is made of a special selected material, which prevents anode particles from migrating inside the battery and causing self discharge.

**The battery can** is made of nickel plated steel and serves as holder for the battery, but also serves as cathode collector. Panasonic controls thoroughly it's own in-house produced steel cans to provide thin but strong containers for it's batteries to hold maximum volumes of active material in a safe and reliable way.

**A brass nail** connected to the bottomplate serves as anode collector. Exact size of this nail (length as well as thickness) is also important to ensure the proper functioning and reliability of the battery.

**A moulded nylon seal** connected to the brass nail serves as a seal with an integrated safety venting mechanism. This vent assures the safe and controlled release of any excessive gas which could be generated by improper use of the battery (e.g. short circuiting, over heating, throwing in a fire, over charging or incorrect insertion polarity wise). Once the vent has opened, it will not close again and besides the escaping gas there is always the risk that a certain volume of the electrolyte will leak as well.

**A non-conductive label** provides the opportunity of cosmetic design on the batteries. The label also functions as an isolator between the large positive area of the steelcan and the negative area of the bottom plate to avoid external short circuit.

### 3 | Construction

1/5

#### Assembling LR6

##### Battery assembling

1. Separator and bottom insulator insert
2. Electrolyte pouring
3. Gelled-anode (negative pole) pouring
4. Collector insert and can curling

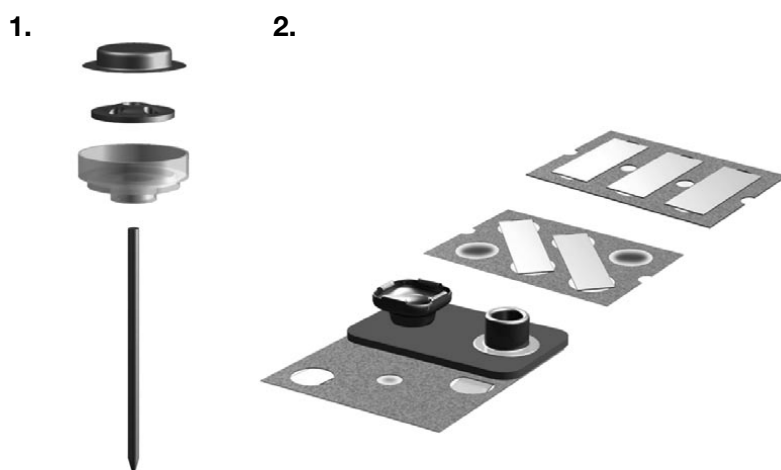


2/5

#### Parts

##### Assembling battery components

1. Collector unit
  - Bottomplate
  - Washer
  - PY seal
  - Nail
2. Contactstrips 6LR61
  - Lead A
  - Lead B
  - Snap 6LR61

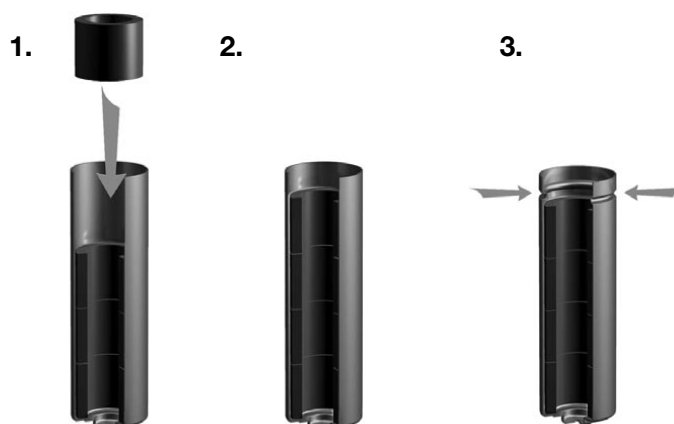


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#### Cathode Unit LR6


##### Mixtablets (+) pressing

1. Mangesdioxide-carbon tablet pressing (positive pole)
2. Tablet inserting and pressing
3. Can grooving

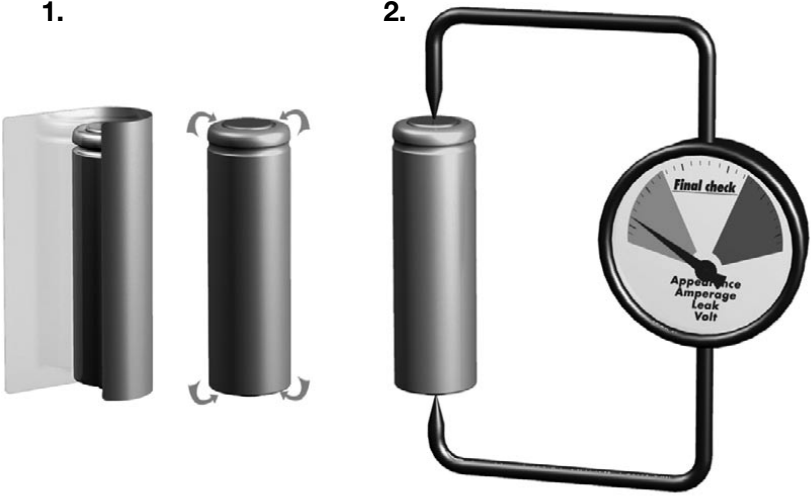


### 3 | Construction

4/5

Can Production Procedure				
<p>Steel can production</p> <ol style="list-style-type: none"> <li>1. Cup making</li> <li>2. Can drawing</li> <li>3. Can trimming</li> <li>4. Washing and carbon coating</li> </ol>	1.	2.	3.	4.
				

4/5

Finishing LR6		
<p>Battery finishing</p> <ol style="list-style-type: none"> <li>1. Labeling</li> <li>2. Final check on volt, amperage, leakage and appearance</li> </ol>	1.	2.
		

## 4 | Performance

### A. Voltage and capacity

Voltage of alkaline batteries usually ranges between 1.55 and 1.65 Volts (open circuit voltage (OCV)), whereas 1.5 is considered to be the nominal voltage. The speed of voltage drop during use is determined by the type of appliance and the load (drain) which is put onto the battery.

Measuring the OCV of a battery is giving only a very rough and highly inefficient idea of battery capacity and/or freshness. The CCV (closed circuit voltage) where for a few seconds a load (depending on battery size) is put on the battery is giving a much better view on the status of the measured battery. (If the voltage is still close to 1.5 the battery is still in relatively fresh condition, if the voltage is closer to 1.0 V, the battery is almost at the end of its useful life.)

Every kind of appliance needs a minimum voltage to operate and the level at which the appliance will stop is usually referred to as the “cut off voltage”. Even if several batteries are needed to operate an appliance, for battery test purposes the cut off voltage will be translated as cut off voltage per cell. *(example: a portable CD player which uses 2 cells and needs min. 2 volts to operate, so we will say the cut off voltage is 1.0 V per cell)*

**The capacity of a battery** is usually expressed in mAh (milli Ampere hour), whereas the actual drain in combination with the cut off voltage will determine the capacity in mAh for each individual use or appliance. It is not as simple as giving only 1 figure to know the actual capacity and/or behaviour of a battery for different ways of discharge. In order to have a clear view on battery capacity, one should give specific parameters at which the batteries can be tested or have a wider range of different discharge conditions to view the behaviour of battery performance.

Maximum battery capacity is limited by the weight and volume of the two main raw materials: zinc and manganese dioxide. Therefore an LR20 battery will last much longer than an LR6 battery just because there is much more active material inside.

Some batteries, like the 9 volt alkaline battery, are designed with 6 cylindrical batteries in series and are spotwelded together in order to assure a reliable performance during discharge.

**Temperature** is also important to determine the capacity and performance of a battery. Alkaline batteries are best suited to be used in temperature ranges from -10 °C to +45 °C. In some cases the batteries can be reliable to deliver small currents at lower or higher temperatures as well, but this should be suspect to individual and careful testing. At higher temperatures the internal resistance of the battery will increase at a lesser speed, which will provide a better high drain performance.

### B. Discharge types

As different ways of discharge we mainly consider:

#### Constant resistance (B)

The appliance keeps its resistance constant in Ohm

#### Constant current (A)

The appliance keeps running on constant drain in A or mA

#### Constant Power (W)

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

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

For this kind of discharge the increasing internal resistance towards the end of useful battery life will also largely determine the actual useful capacity of the batteries. Total capacity will of course also be strongly influenced by the cut off voltage.

The various discharge ways (continuous or intermittent) and loads (light or heavy) determine in a large way the actual performance one can draw out of a battery.



## 4 | Performance

### C. Shelf life

Shelf life is the ability of batteries to keep more or less the same performance over a certain period in time. Alkaline batteries nowadays carry a freshness date of about 5 years from the moment of production. This means that service life on a specific discharge compared to a fresh battery of the same generation is expected to be over 70% versus initial capacity testing. *(if the necessary precautions have been taken in order to store the batteries in an acceptable and controlled environment with regard to constant temperature and humidity)*

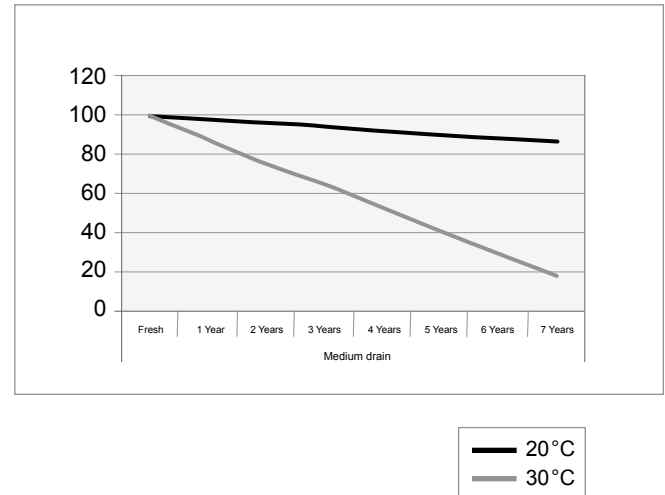
The shelf life will be influenced by temperature, humidity and internal construction:

High temperature & high humidity will speed up the degradation of chemicals which will lead to greater capacity loss at shorter time.

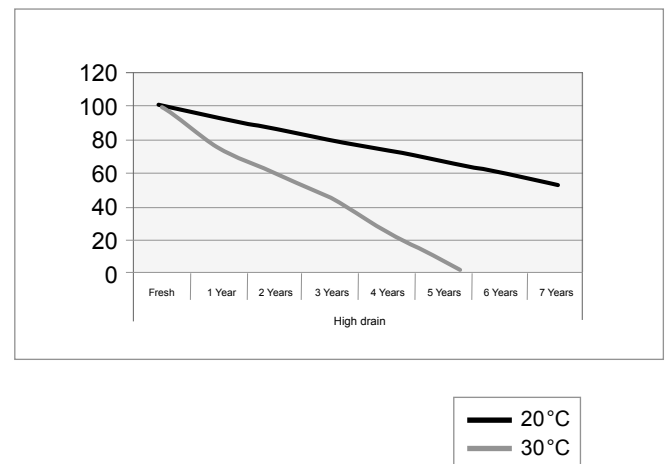
Poor quality internal construction might also influence the degradation of chemicals, but mainly as a potential risk for internal short circuit and leakage over time.

Another, yet more unpredictable factor is the way in which the electrolyte might cause to deteriorate over time the non-metallic parts inside the battery and result in leakage. Though, there is a very little chance of this happening, it is always recommended to use up alkaline batteries within the first half of the expected shelf life.

Capacity loss estimation at low-medium drain



Capacity loss estimation at high drain



## 5 | Specifications

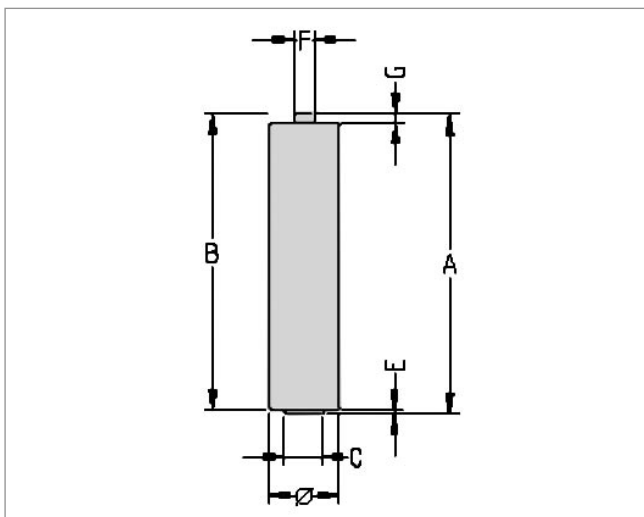
### A. LR03 Powerline

#### 1. Battery Identification

<b>Name:</b>	S / LR03 / AM4 / AAA / MN2400
<b>Type:</b>	alkaline/ foil
<b>Nominal Voltage:</b>	1.5 V
<b>Electrolyte:</b>	KOH (potassium hydroxide)
<b>Average Weight:</b>	10.8 g

Manufactured by PBBE

#### 2. Battery Dimensions



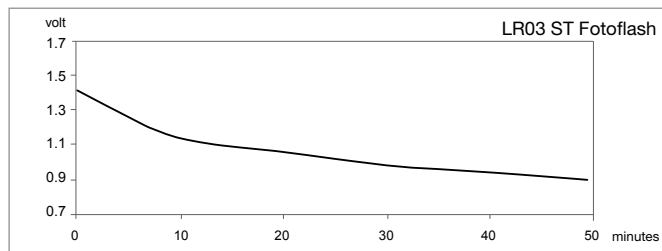
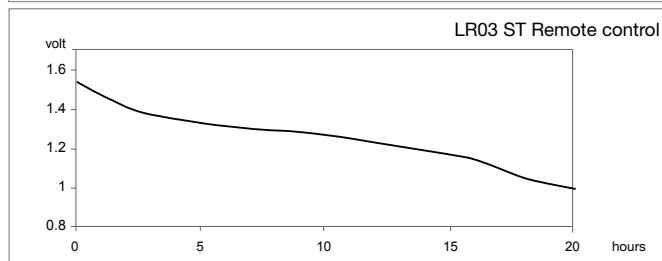
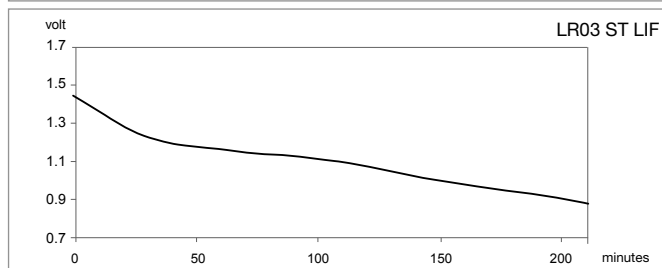
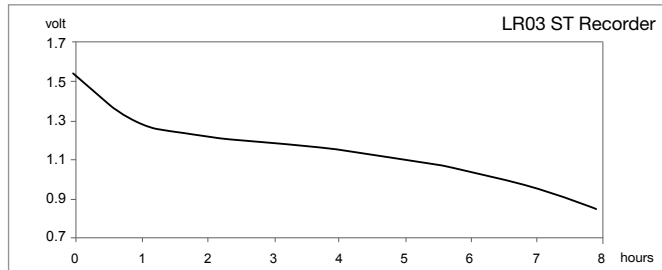
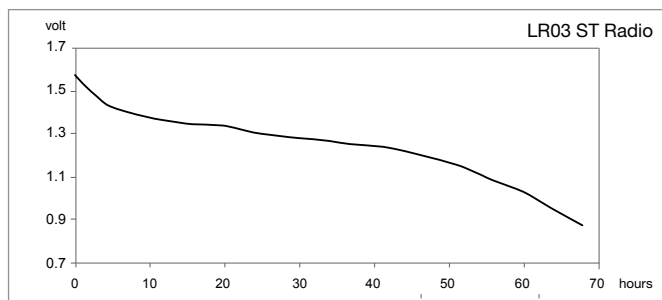
Dimension (mm)	Max	Min	Typical
A	44.5		44.25
B		43.3	43.85
C		4.3	6.0
E	0.5		0.5
F	3.8		3.3
G		0.8	1.2
ø	10.5	9.5	10.35

#### 3. Battery Performance

TEST	DRAIN	DAILY PERIOD	END POINT	TYPICAL	MIN AVG
<b>Radio</b>	75 ohm	4 h	0.9 V	64 h	60.6 h
<b>Recorder</b>	10 ohm	1 h	0.9 V	7.5 h	6.4 h
<b>LIF*</b>	5.1 ohm	4 min/h-8 h/d	0.9 V	205 min	170 min
<b>Remote Control</b>	24 ohm	15 s/min-8 h/d	1 V	18 h	17.1 h
<b>Fotoflash</b>	600 mA	10 s/min-1 h/d	0.9 V	270 pulses	206 pulses

\* Low Intensity

#### 4. Discharge Curves



#### 5. Product Safety Data Sheet

Item	Material	% (Weight)
Total Weight		10.8 g
Cathode	MnO <sub>2</sub> /C	42 %
Anode	Zn/KOH	23 %
Separator	Paper	1 %
Current Collector	Brass	2 %
Electrolyte	KOH/H <sub>2</sub> O	6 %
Steel Can	Ni plated steel	21 %
Bottomplate	Ni plated steel	1 %
Washer	Steel, zinc	2 %
Label	PVC	2 %

No Mercury (Hg), Cadmium (Cd) or Lead (Pb) are used in the battery.

## 5 | Specifications

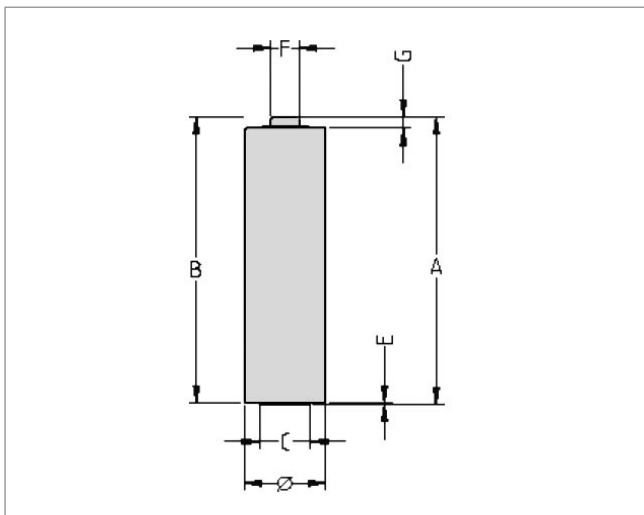
### B. LR6 Powerline

#### 1. Battery Identification

<b>Name:</b>	M / LR6 / AM3 / AA / MN1500
<b>Type:</b>	alkaline/ foil
<b>Nominal Voltage:</b>	1.5 V
<b>Electrolyte:</b>	KOH (potassium hydroxide)
<b>Average Weight:</b>	22.7 g

Manufactured by PBBE

#### 2. Battery Dimensions

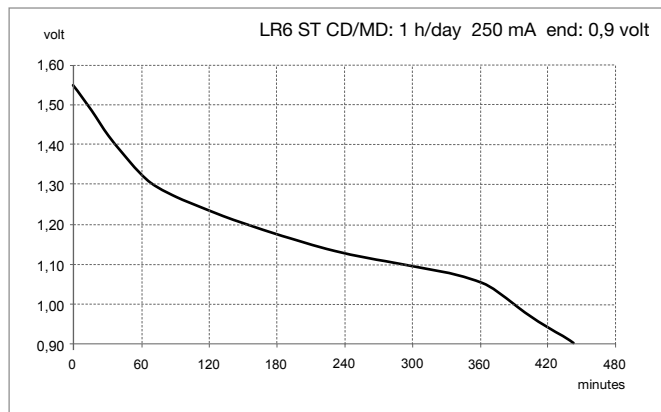
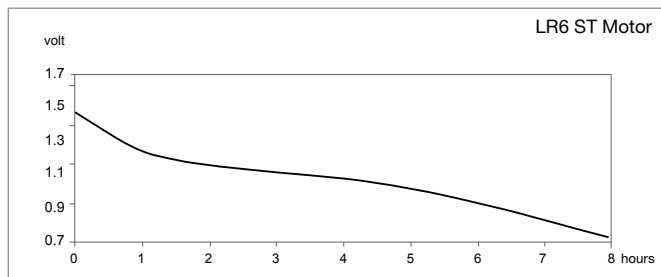
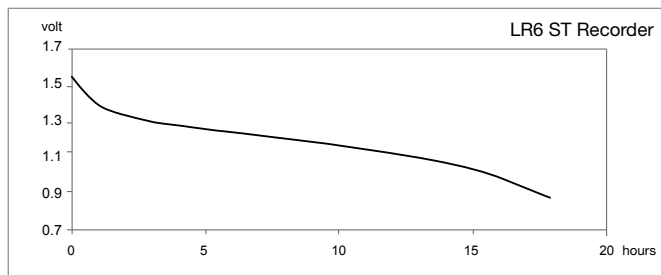
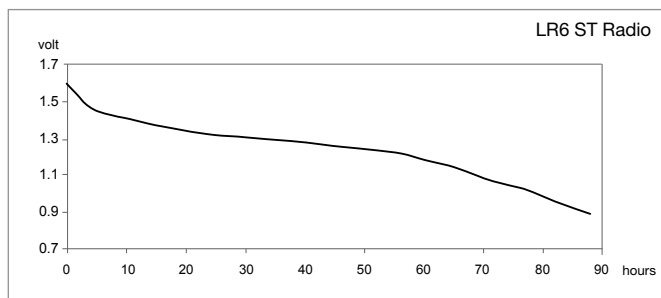


Dimension (mm)	Max	Min	Typical
A	50.5		50.05
B		49.2	49.75
C		7.0	8.70
E	0.5		0.30
F	5.5		5.00
G		1.0	1.60
Ø	14.5	13.5	14.10

#### 3. Battery Performance

TEST	DRAIN	DAILY PERIOD	END POINT	TYPICAL	MIN AVG
<b>Radio</b>	43 ohm	4 h	0.9 V	86 h	76.7 h
<b>Recorder</b>	10 ohm	1 h	0.9 V	17.5 h	15.2 h
<b>Motor</b>	3.9 ohm	1 h	0.8 V	6.9 h	5.5 h
<b>Remote Control</b>	24 ohm	15s/min - 8 h/d	1 V	42 h	38.9 h
<b>Fotoflash</b>	1 A	10s/min - 1h/d	0.9 V	330 pulses	215 pulses
<b>CD / MD</b>	250 mA	1 h	0.9 V	7.3 h	5.8 h

#### 4. Discharge Curves



#### 5. Product Safety Data Sheet

Item	Material	% (Weight)
Total Weight		22.7 g
Cathode	MnO <sub>2</sub> /C	45 %
Anode	Zn/KOH	24 %
Separator	Paper	1 %
Current Collector	Brass	2 %
Electrolyte	KOH/H <sub>2</sub> O	6 %
Steel Can	Ni plated steel	17 %
Bottomplate	Ni plated steel	1 %
Washer	Steel, zinc	2 %
Label	PVC	2 %

No Mercury (Hg), Cadmium (Cd) or Lead (Pb) are used in the battery.

## 5 | Specifications

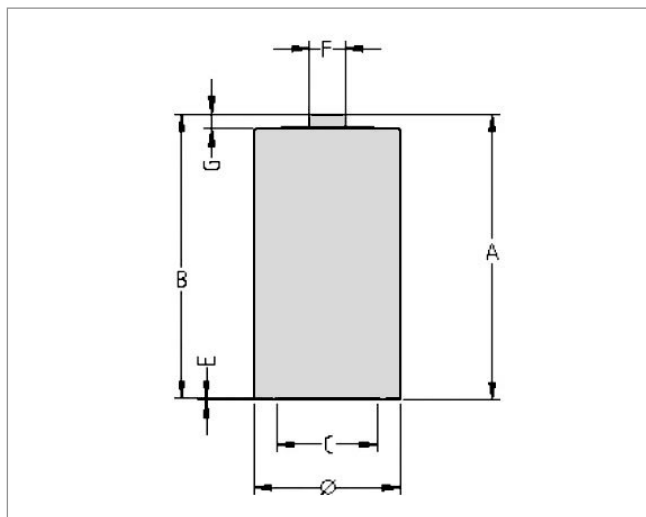
### C. LR14 Powerline

#### 1. Battery Identification

<b>Name:</b>	L / LR14 / AM2 / C / MN 1400
<b>Type:</b>	alkaline/ foil
<b>Nominal Voltage:</b>	1.5 V
<b>Electrolyte:</b>	KOH (potassium hydroxide)
<b>Average Weight:</b>	63.3 g

Manufactured by PBBE

#### 2. Battery Dimensions



Dimension (mm)	Max.	Min.	Typical
A	50.0		49.6
B		48.6	49.3
C		13.0	17.4
E	0.9		0.3
F	7.5		6.3
G		1.5	2.2
Ø	26.2	24.9	25.4

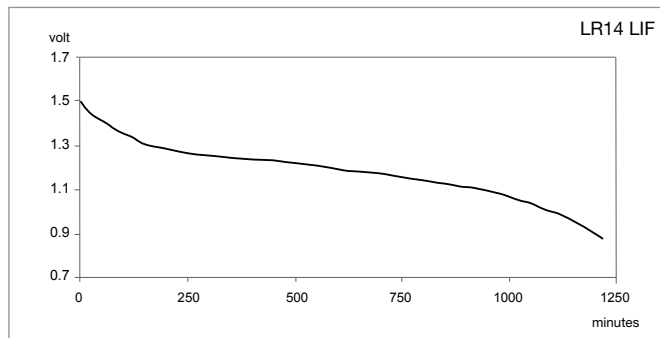
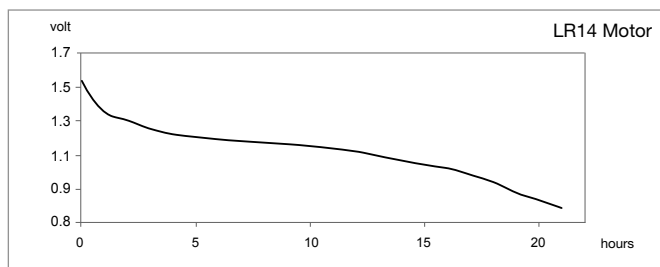
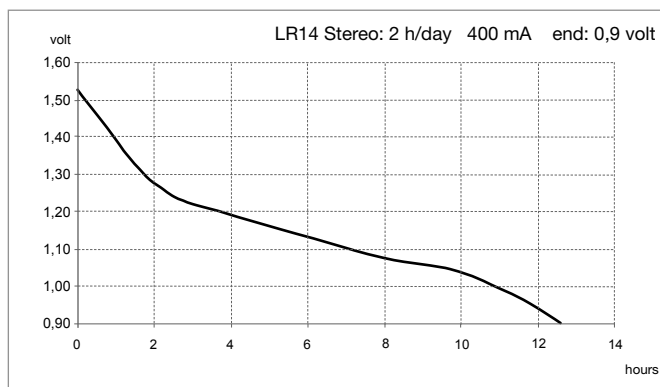
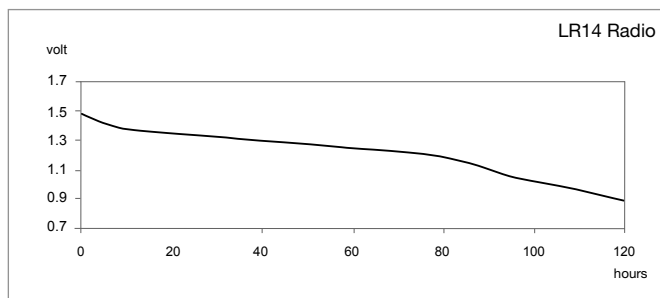
#### 3. Battery Performance

TEST	DRAIN	DAILY PERIOD	END POINT	TYPICAL	MIN AVG
<b>Radio</b>	20 ohm	4 h	0.9 V	115 h	105 h
<b>Stereo</b>	400 mA	2 h	0.9 V	11.7 h	9.2 h
<b>Motor</b>	3.9 ohm	1 h	0.8 V	20.5 h	17.8 h
<b>LIF*</b>	3.9 ohm	4 min/h - 8 h/d	0.9 V	1215 min	1088 min

\* Low Intensity

Typical Discharge Values

#### 4. Discharge Curves



#### 5. Product Safety Data Sheet

Item	Material	% (Weight)
Total Weight		63.3 g
Cathode	MnO <sub>2</sub> /C	45 %
Anode	Zn/KOH	25 %
Separator	Paper	1 %
Current Collector	Brass	2 %
Electrolyte	KOH/H <sub>2</sub> O	6 %
Steel Can	Ni plated steel	15 %
Bottomplate	Ni plated steel	3 %
Label	PVC	2 %

No Mercury (Hg), Cadmium (Cd) or Lead (Pb) are used in the battery.

## 5 | Specifications

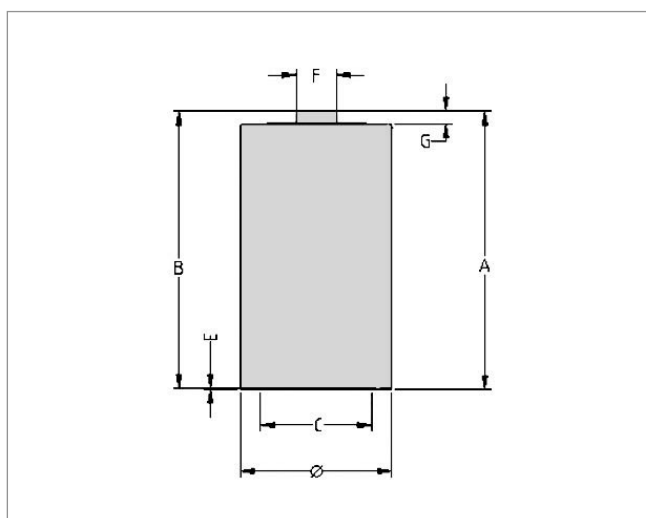
### D. LR20 Powerline

#### 1. Battery Identification

<b>Name:</b>	XL / LR20 / AM1 / D / MN 1300
<b>Type:</b>	alkaline / foil
<b>Nominal Voltage:</b>	1.5 V
<b>Electrolyte:</b>	KOH (potassium hydroxide)
<b>Average Weight:</b>	137.7 g

Manufactured by PBBE

#### 2. Battery Dimensions



Dimension (mm)	Max.	Min.	Typical
A	61.5		60.6
B		59.5	60.3
C		18.0	24.2
E	1.0		0.3
F	9.5		8.7
G		1.5	2.5
Ø	34.2	32.3	33.0

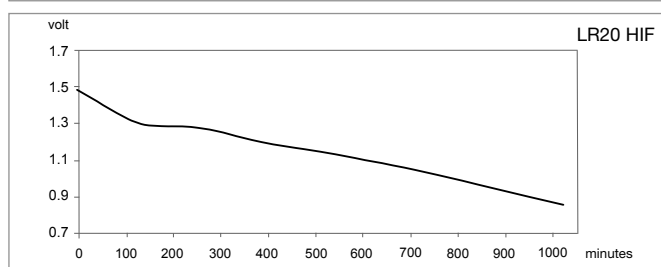
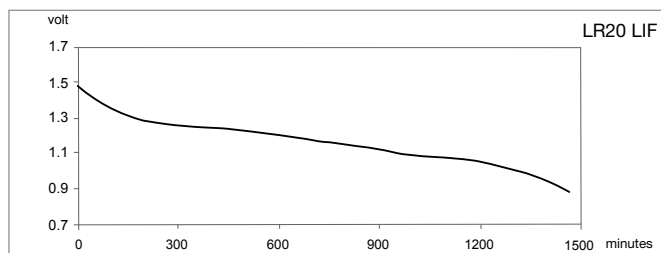
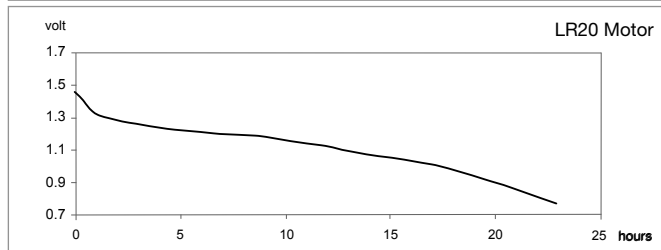
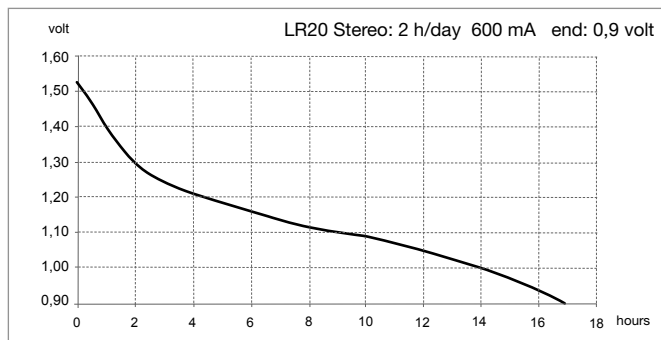
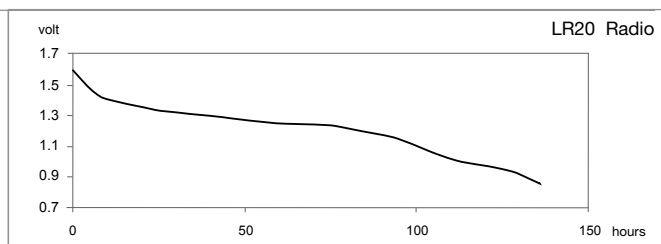
#### 3. Battery Performance

TEST	DRAIN	DAILY PERIOD	END POINT	TYPICAL	MIN AVG
<b>Radio</b>	10 ohm	4 h	0.9 V	120 h	101 h
<b>Stereo</b>	600 mA	2 h	0.9 V	16.3 h	12.5 h
<b>Motor</b>	2.2 ohm	1 h	0.8 V	23.0 h	19.9 h
<b>LIF*</b>	2.2 ohm	4 min/h - 8 h/d	0.9 V	1450 min	1291 min
<b>HIF**</b>	1.5 ohm	4 min/15min - 8 h/d	0.9 V	920 min	770 min

\* Low Intensity \*\* High Intensity

Typical Discharge Values

#### 4. Discharge Curves



#### 5. Product Safety Data Sheet

Item	Material	% (Weight)
Total Weight		135.8 g
Cathode	MnO <sub>2</sub> /C	49 %
Anode	Zn/KOH	27 %
Separator	Paper	1 %
Current Collector	Brass	1 %
Electrolyte	KOH/H <sub>2</sub> O	7 %
Steel Can	Ni plated steel	11 %
Bottomplate	Ni plated steel	2 %
Label	PVC	2 %

No Mercury (Hg), Cadmium (Cd) or Lead (Pb) are used in the battery.

## 5 | Specifications

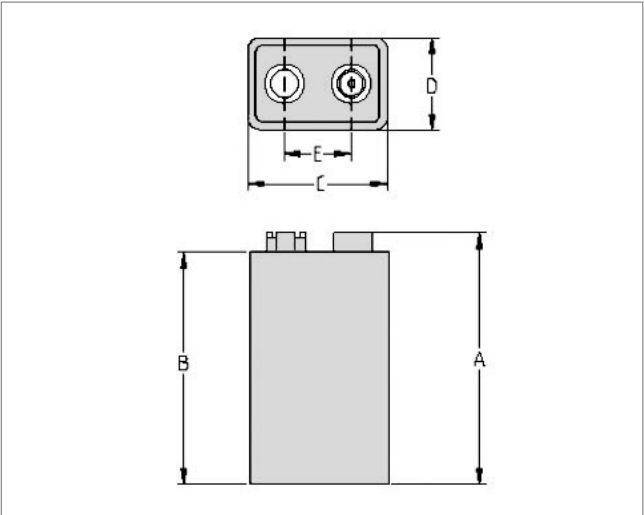
### E. 6LR61 Powerline

#### 1. Battery Identification

<b>Name:</b>	9 V / 6LR61/ 6AM6/ MN 1604
<b>Type:</b>	alkaline / metal jacket
<b>Nominal Voltage:</b>	9 V
<b>Electrolyte:</b>	KOH (potassium hydroxide)
<b>Average Weight:</b>	46 g

*Manufactured by PBBE*

#### 2. Battery Dimensions



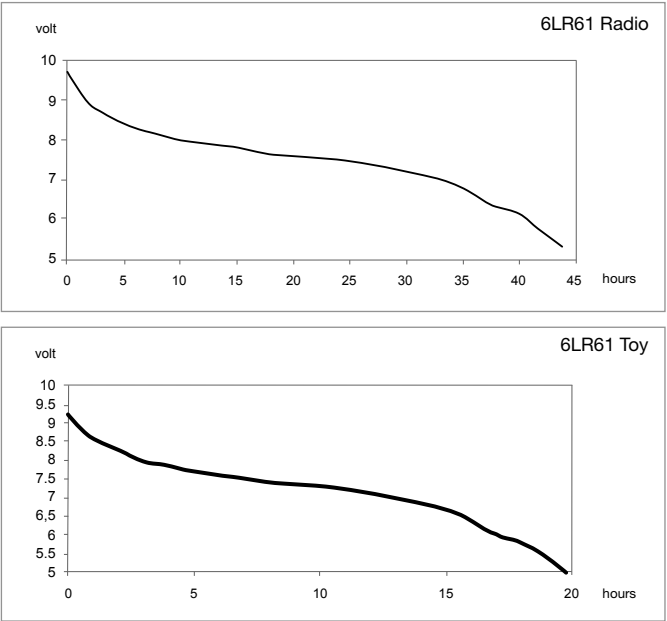
Dimensions (mm)	Max.	Min.	Typical
A	48.5	46.5	48.0
B	46.4		44.2
C	26.5	24.5	25.6
D	17.5	15.0	16.5
E	13.0	12.45	12.7

#### 3. Battery Performance

TEST	DRAIN	DAILY PERIOD	END POINT	RESULT	MIN AVG
<b>Radio</b>	620 ohm	2 h	5.4 V	43.5 h	38.6 h
<b>Toy / Motor</b>	270 ohm	1 h	5.4 V	19 h	17.1 h
<b>Smoke detector (2)</b>	620 ohm	1 sec/h	7.5 V	80 days	66.8 days
	43 k ohm	24 h/d			

*Typical Discharge Values*

#### 4. Discharge Curves



#### 5. Product Safety Data Sheet

Item	Material	% (Weight)
Total Weight		46 g
Cathode	MnO <sub>2</sub> /C	34 %
Anode	Zn/KOH	16 %
Separator / Connection paper	Paper	1 %
Current Collector	Brass	4 %
Electrolyte	KOH/H <sub>2</sub> O	6 %
Steel Can / Leed / Terminals	Ni plated steel	17 %
Bottomplate / Metal Jacket	Tin plated steel	16 %
Label / Terminal base / Insulation sleeve	PVC	2 %
Spacer	Cardboard	1 %

*No Mercury (Hg), Cadmium (Cd) or Lead (Pb) are used in the battery.*

## 6 | Battery Standards

**A.** The denomination of the battery and the corresponding max. sizes used to be decided by different organisations like the ANSI (American National Standards Institute) or the JIS (Japan Industrial Standard) but are now concentrated in the IEC (International Electrotechnical Commission) standards.

IEC	LR20	LR14	LR6	LR03	6LR61
ANSI	D	C	AA	AAA	9 V
JIS	AM-1	AM-2	AM-3	AM-4	6AM-6

With regard to the sizes, the manufacturers should make sure that the dimensions of the different batteries stay within the limits of the specified size indications of the IEC. In some cases these limits are rather wide, which can lead to non-conformity between certain devices and certain battery brands. (depending if the manufacturer of the device used an actual battery – and which brand – or based himself on the IEC standards). Also the voltage of a single alkaline battery is regulated by IEC to be in between 1.58 and 1.65V (OCV).

It is recommended to provide battery space & contacts in a way that any IEC compliant battery can be used.

**B.** The IEC is also providing standard test criteria in order to have a global platform for all manufacturers to compare their products. The actual tests and test methods are periodically discussed with all manufacturers represented on the IEC committee in order to review the criteria based on new appliances or new technologies.

## 7 | Advice

### Storage conditions

Alkaline batteries are best stored between +10 °C and +20 °C in order to obtain maximum shelf life. Storage at lower temperatures will not harm the performance, but the battery should slowly be brought to ambient temperature for optimal performance. Storage at high temperatures (> 25 °C) can lead to accelerated deterioration of the chemicals inside the battery and eventually to leakage.

### Charging of alkaline batteries

Alkaline batteries are not designed to be recharged in any way. Any attempt to charge the alkaline batteries (on purpose or by accident) can deviate the normal chemical process, causing excessive gassing and even overheating and leakage. Wrong insertion & reversing polarities can also charge batteries, as well as mixing different brands, chemistries or using old and new batteries together!!

### Battery usage and handling

Avoid having batteries inside certain appliances over long periods (several months) without using or checking the appliance regularly. Many appliances, even when turned off, still discharge the batteries with a small leak current and this might lead to an overdischarge situation.

Overdischarge (< 0.6 Volt / cell) can lead to gas generation and increase the volume of the manganese dioxide mass. These 2 effects combined can lead to internal pressure and result in vented batteries and leakage.

To avoid overdischarge:

- As an appliance manufacturer, make sure your technical design does not allow overdischarge of the batteries.
- As a user of electrical appliances, remove the batteries if you do not intend to use the appliances for long periods unless you check them regularly.

When changing the batteries, always change all of them at the same time. Do not mix brands or chemistries and be careful to respect polarities when inserting the new batteries!!

## 8 | Product Safety Data Sheets

### 1. Identification

<b>Product name</b>	Powerline - alkaline primary battery
<b>Type</b>	LR20A, LR14A, LR6A, LR03A, 6LR61A
<b>Manufacturer's name</b>	Panasonic Battery Belgium N.V. (PBBE)
<b>Address</b>	Havenlaan 6, B-3980 Tessenderlo Belgium

### 2. Ingredients

Ingredient name	Cas#	%
1. Manganese dioxide	1313-13-9	25~45
2. Zinc	7440-66-6	10~20
3. Potassium hydroxide	1310-58-3	3~9
4. Zinc oxide	1314-13-2	0~1
5. Graphite	7782-42-5	1~4
6. Steel	7439-89-6	10~30

### 3. Hazard identification

<b>Critical hazards for human beings:</b>	If battery starts leaking, exposure to caustic ingredients is possible
<b>Critical hazards to environment:</b>	Not applicable
<b>Useful info:</b>	Keep away from children

### 4. First aid measures

Avoid skin and eye contact to avoid irritation and/or caustic burns/injury.  
 If leakage from battery contacts skin or eyes, flush immediately with copious quantity of water.  
 If problems arise, contact a physician for medical attention (especially in case of eyes!).  
 Ingestion is unlikely due to size of batteries, but in case it happens, a physician should be contacted at once to avoid damage to intestines caused by the unnatural object.

### 5. Fire fighting methods

<b>Flash point (Method used)</b>	Not applicable
<b>Flammable limits</b>	LEL: not applicable UEL: not applicable
<b>Extinguishing media</b>	Dry powder, carbon dioxide, foam, dry sand
<b>Special fire fighting procedures</b>	Fire fighters should wear self-contained breathing apparatus when any fire.
<b>Unusual fire and explosion hazards</b>	Cells exposed to excessive heat, may cause electrolyte leakage or explosion

### 6. Accidental release measures

Personal: Safety officers should be notified in case of large spills. Caustic Potassium Hydroxide may come out from leaking batteries. Avoid contact to skin and/or eyes. Increase ventilation. Personnel cleaning up should wear appropriate protective clothing and gloves.

### 7. Handling and storage

Do not disassemble, try to charge or throw in fire.  
 Do not short circuit or install with reverse polarity.  
 Do not mix different battery systems, brands, or old and new batteries.  
 Do not remove battery label and do not carry them loose in pocket.  
 Store at dry places and at room temperature.



## 8 | Product Safety Data Sheets

### 8. Exposure controls and personal protection

<b>Respiratory protection (specific type)</b>	Self-contained breathing apparatus as any fire situation
<b>Ventilation &gt; Local exhaust</b>	Not applicable
<b>Ventilation &gt; Mechanical (general)</b>	Not applicable
<b>Ventilation &gt; Specific</b>	Not applicable
<b>Ventilation &gt; Others</b>	Not applicable
<b>Protective gloves</b>	Not applicable
<b>Eye protection</b>	Not applicable
<b>Other protective clothing or equipment</b>	Not applicable

### 9. Physical and chemical characteristics

<b>Boiling point</b>	Not applicable
<b>Vapor pressure (mm Hg)</b>	Not applicable
<b>Vapor density</b>	Not applicable
<b>Specific gravity</b>	Not applicable
<b>Melting point</b>	Not applicable
<b>Evaporation rate (Butyl acetate =1)</b>	Not applicable
<b>Solubility in water</b>	Not applicable
<b>Appearance</b>	Encased cylindrical or rectangular shape

### 10. Stability and reactivity

<b>Stability</b>	Stable
<b>Incompatibility (materials to avoid)</b>	Not applicable
<b>Hazardous decomposition of BY-products</b>	Oxides or fumes of Mn, Zn
<b>Hazardous polymerization</b>	Will not occur

### 11. Toxicological information

Not applicable to batteries as such: for detailed info on ingredients check nr. 2

### 12. Ecological info

Not available

### 13. Disposal considerations

Batteries should be disposed of in accordance to local regulations. In case of doubt, contact your local Panasonic office to ask information.  
Avoid heating/burning in order to avoid explosion at exposure to excessive temperatures.

### 14. Transport info

These are „Batteries dry“ and are not considered to be a „hazardous material“ per U.S. DOT (department of transportation regulations) or a „dangerous goods“ per IATA (International Air Transport Association Regulations)

### 15. Regulatory info

<b>EC labeling</b>	none
<b>Risk Phrase</b>	none
<b>Safety Phrase</b>	none

## 9 | Environment

Fully aware that humankind has a special responsibility to respect and preserve the delicate balance of nature, we at Panasonic acknowledge our obligation to maintain and nurture the ecology of this planet. Accordingly, we pledge ourselves to the prudent, sustainable use of the Earth's resources and the protection of the natural environment while we strive to fulfill our corporate mission of contributing to enhanced prosperity for all. At Matsushita Battery Industrial Co., Ltd. by regarding "working in harmony with the global environment" as a key management issue, each employee will be encouraged to voluntarily promote environmental preservation activities in all business areas.

### **Environmental policy Panasonic Battery Belgium**

The policy of our company is to contribute to customers worldwide with our products, with our high-quality and highly reliable technology.

- Establish environmental management systems and pursue environmental preservation activities.
- Correctly understand the impact that company activities have on the environment and pursue unremitting environmental preservation activities which our technology and finances allow.
- Pursue external auditing of our operation based on a ISO 14000 environmental management system.
- Where applicable take action for resource and energy conservation, recycling and waste reduction
- By offering environmental education and training to all employees, raise their awareness about environmental preservation

## 10 | Panasonic Standards

### **ISO standards**

PBBE produces LR20, LR14, LR6, LR03 and 6LR61 in Belgium and has following ISO certificates:

ISO 9001-2000

ISO 14001

### **IEC standards**

Our batteries comply with following international standards:

IEC 60086-1 / IEC60086-2 / IEC60086-5

ANSI C18.1M



# Panasonic ideas for life

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### Notice to Readers

It is the responsibility of each user to ensure that every battery application is adequately designed safe and compatible with all conditions encountered during use, and in conformance with existing standards and requirements.

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