

# Silver Oxide Battery/ LR Button Battery

Primary Battery



## SILVER OXIDE BATTERY / LR BUTTON BATTERY

### Safety Instructions

Improper handling of the battery could lead to distortion, leakage\*, overheating, or explosion, causing bodily injury or equipment trouble. Especially touch with liquid leaked out of battery could cause injury like a loss of eyesight. Please observe the following instructions to prevent accidents.

(\* Leakage is defined as the unintentional escape of a liquid from a battery.)

#### ⚠ Warnings — Handling

##### ■ Never swallow.

Always keep the battery out of the reach of infants and young children to prevent it from being swallowed. If it is swallowed, consult a physician immediately.

##### ■ Never allow liquid leaking from the battery to get in your body.

The battery contains strong alkaline liquid, which is deleterious material. If it does come in contact with your eyes, flush them immediately with plenty of water and consult a physician, because the alkaline liquid could cause becoming blind. Likewise, If the liquid gets in your mouth, rinse immediately with plenty of water and consult a physician. The alkaline liquid could also cause the skin irritation and/or chemical burns. If the liquid adheres to the skin or clothes, immediately flush it with plenty of water.

##### ■ Never short-circuit the battery.

Do not allow the positive and negative terminals to short-circuit. Never carry or store the battery with metal objects such as a necklace or a hairpin. Do not take multiple batteries out of the package and pile or mix them when storing. Otherwise, this could lead to distortion, leakage, overheating, and explosion of the battery.

##### ■ Never charge.

The battery is not designed to be charged by any other electrical source. Charging could generate gas and internal short-circuiting, leading to distortion, leakage, overheating, or explosion. It should fundamentally not be used for backup applications as this may result in it being charged.

##### ■ Never expose to open flames.

Exposing to flames could cause explosion of the battery.

##### ■ Never heat.

Heating the battery to more than 100 deg. C could increase the internal pressure, causing distortion, leakage, overheating, or explosion.

##### ■ Never disassemble or deform the battery.

Disassembly or deforming of the battery could cause the leakage, overheating, or explosion due to an internal short-circuits.

#### ⚠ Caution — Handling/Storage

##### ■ Never reverse the positive and negative terminals when mounting.

Improper mounting of the battery may lead to short-circuiting, charging or forced-discharging. This may cause distortion, leakage, overheating, or explosion.

##### ■ Never short-circuit the battery while installing into equipment.

Please be careful when installing the battery not to short-circuit it with metal portions of the equipment.

##### ■ Never weld the terminal or wire to the body of the battery directly.

The heat of welding or soldering may cause distortion, leakage, overheating, or explosion of the battery.

##### ■ Never use different batteries together.

Using different batteries together, i.e. different type or used and new or different manufacturer may cause distortion, leakage, overheating, or explosion because of the differences in battery property.

##### ■ Never leave the used battery in equipment.

Long time leaving in the equipment may generate gas leading to distortion, leakage, overheating, or explosion and the equipment may be damaged.

##### ■ Remove the battery from equipment while not in use for a long time.

Gas may be generated in the battery leading to leaking and damaging of the equipment.

■ **Never subject the battery to severe shock.**

Dropping, or throwing or stomping on the battery may cause distortion, leakage, overheating, or explosion.

■ **Use the correct battery suitable for the equipment.**

The battery may not be suitable for the specific equipment due to the using conditions or type of equipment. Please select the suitable battery according to the handling instructions of the equipment.

■ **Keep contact force more than 2N.**

The battery voltage may be lower than intended value because of poor contact condition, please keep contact force more than 2N for suitable contact.

■ **Never use or leave the battery in a hot place such as under the direct rays of the sun or in a car in hot weather.**

If you do, this may cause distortion, leakage, overheating, and explosion of the battery.

■ **Never store the battery in a hot and humid environment.**

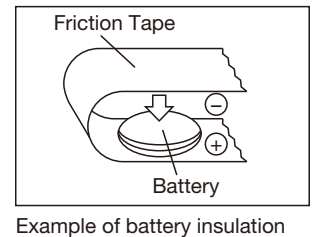
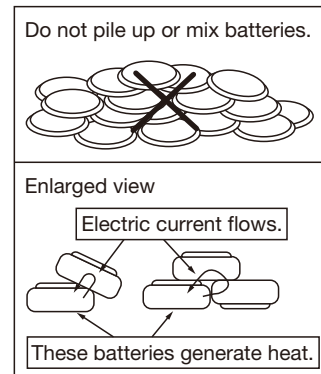
Otherwise it may cause battery performance deterioration, deformation, leakage, overheating, or explosion.

■ **Never allow the battery to come in contact with water.**

If it does, this may cause the battery to rust or lead to distortion, leakage, overheating, and explosion.

## ⚠ Caution — Disposal

The battery may be regulated by national or local regulation. Please follow the instructions of proper regulation. As electric capacity is left in a discarded battery and it comes into contact with other metals, it may lead to distortion, leakage, overheating, or explosion, so make sure to cover the (+) and (-) terminals with friction tape or some other insulator before disposal.



## Overview

Button-type silver oxide batteries are characterized by high-energy per unit volume and stable operating voltage. As a result, they are used as a power source for applications such as quartz watches, and in recent years their use has expanded to medical devices and BLE devices. Maxell is the first company in Japan to successfully market button-type silver oxide batteries and has many years of experience and know-how. Also, in consideration of the environment, all products are designed to use zero mercury. For more information, please contact Maxell.

## Features

### ■ Stable discharge characteristics

A discharge curve during discharge supplies a stable voltage until the end of the discharge life.

### ■ High-energy density

A silver oxide battery's high-energy density per unit volume provides approx. twice the amount of energy capacity as button-type alkaline batteries.

### ■ Excellent discharge load characteristics

Alkaline electrolyte is used to provide excellent discharge load characteristics. Depending on the composition of the electrolyte, two models are available; a low-drain type (SW type) for analog watches and a high-drain type (W type) for multi-function watches (which incorporate an alarm and a light), medical equipment, etc.

### ■ Superior leakage\* resistance

Featuring Maxell's original leak-resistant processing, the SR battery has excellent leakage resistance, which suppresses the electrolyte from rising up and seeping out — a basic phenomenon of alkaline electrolytes.

(\* Leakage is defined as an unintended escape of liquid from a battery.)

### ■ Taking environment in consideration

As one of its measures to reduce the environmental impact, Maxell draws upon its original technology to realize longer-lasting, superior leakage-resistant characteristics without using mercury and lead.

## Principle and Reactions

The button-type silver oxide battery uses silver oxide ( $\text{Ag}_2\text{O}$ ) as its positive active material and zinc (Zn) as its negative active material. Potassium hydroxide (KOH) (W-type) or sodium hydroxide (NaOH) (SW-type) is used as an electrolyte.

### ■ Battery reactions (Silver Oxide Battery)

Positive reaction  $\text{Ag}_2\text{O} + \text{H}_2\text{O} + 2\text{e}^- \rightarrow 2\text{Ag} + 2\text{OH}^-$

Negative reaction  $\text{Zn} + 2\text{OH}^- \rightarrow \text{ZnO} + \text{H}_2\text{O} + 2\text{e}^-$

Total reaction  $\text{Ag}_2\text{O} + \text{Zn} \rightarrow 2\text{Ag} + \text{ZnO}$

### ■ Battery reactions (LR Button Battery)

Total reaction  $2\text{MnO}_2 + \text{Zn} + \text{H}_2\text{O} \rightarrow 2\text{MnOOH} + \text{ZnO}$

## Applications

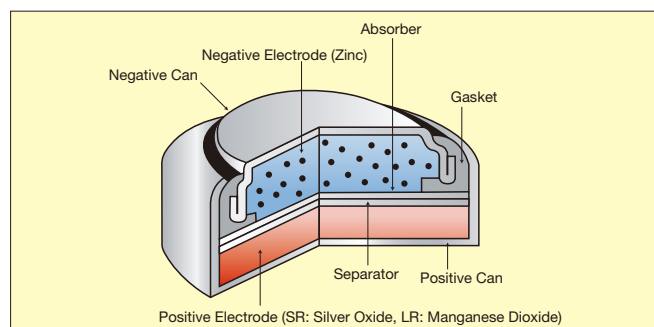
### ■ SR: Silver Oxide Battery

● Analog watches ● Digital watches ● Measuring instruments  
● Calculators ● Medical instruments ● BLE devices

### ■ LR: LR Button Battery

● Toys ● LED lights ● Crime prevention buzzers  
● Medical thermometers

## Construction



## Products

High drain type												
Model	SR44W	SR43W	SR1130W	SR1120W	SR936W	SR927W	SR920W	SR41W	SR726W	SR721W	SR626W	SR621W
Nominal Voltage (V)	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Nominal Capacity (mAh)*	165	125	79	55	75	60   57	39	39	28	25	28	18
Nominal Discharge Current (µA)	200	200	100	100	100	100	100	50	50	50	50	50
Dimensions	Diameter (mm)	11.6	11.6	11.6	11.6	9.5	9.5	9.5	7.9	7.9	7.9	6.8
	Height (mm)	5.4	4.2	3.05	2.05	3.6	2.73	2.05	3.6	2.6	2.1	2.6
Weight (g)	2.2	1.8	1.2	1.0	1.1	0.8	0.6	0.7	0.5	0.45	0.4	0.3

Low drain type												
Model	SR44SW	SR43SW	SR1136SW	SR1130SW	SR1120SW	SR1116SW	SR936SW	SR927SW	SR920SW	SR916SW	SR914SW	SR41SW
Nominal Voltage (V)	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Nominal Capacity (mAh)*	165	125	100	83	55	29	71	55   50	45   35	26.5	22	45
Nominal Discharge Current (µA)	200	100	100	100	100	50	100	100	50	50	35	50
Dimensions	Diameter (mm)	11.6	11.6	11.6	11.6	11.6	9.5	9.5	9.5	9.5	9.5	7.9
	Height (mm)	5.4	4.2	3.6	3.05	2.05	1.65	3.6	2.73	2.05	1.65	3.6
Weight (g)	2.2	1.7	1.6	1.2	1.0	0.7	1.1	0.8	0.7   0.6	0.5	0.45	0.7

Low drain type												
Model	SR731SW	SR726SW	SR721SW	SR716SW	SR712SW	SR626SW	SR621SW	SR616SW	SR527SW	SR521SW	SR516SW	SR512SW
Nominal Voltage (V)	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Nominal Capacity (mAh)*	36	33	25	23	10	30   27	23   18	16   15	17	16   13	12.5	5.5
Nominal Discharge Current (µA)	50	50	30	30	20	30	30	20	30	20	20	5
Dimensions	Diameter (mm)	7.9	7.9	7.9	7.9	6.8	6.8	6.8	5.8	5.8	5.8	5.8
	Height (mm)	3.1	2.6	2.1	1.68	1.29	2.6	2.15	1.65	2.7	2.15	1.25
Weight (g)	0.7	0.5	0.45	0.3	0.25	0.4	0.3	0.3	0.3	0.2	0.2	0.14

Low drain type		General type					
Model	SR421SW	SR416SW	SR44	SR43	SR1130	SR1120	SR41
Nominal Voltage (V)	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Nominal Capacity (mAh)*	12	8.3	165	125	79	55	39
Nominal Discharge Current (µA)	20	10	200	100	100	100	50
Dimensions	Diameter (mm)	4.8	4.8	11.6	11.6	11.6	7.9
	Height (mm)	2.15	1.65	5.4	4.2	3.05	2.05
Weight (g)	0.17	0.12	2.2	1.8	1.2	1.0	0.7

LR Button Battery					
Model	LR44	LR43	LR1130	LR1120	LR41
Nominal Voltage (V)	1.5	1.5	1.5	1.5	1.5
Nominal Capacity (mAh)*	110	75	45	55	25
Nominal Discharge Current (µA)	100	100	100	100	70
Dimensions	Diameter (mm)	11.6	11.6	11.6	7.9
	Height (mm)	5.4	4.2	3.05	2.05
Weight (g)	1.8	1.5	1.2	0.9	0.6

\* Nominal capacity indicates the duration until the voltage drops to 1.2V when discharged at a nominal discharge current at 20 deg. C.  
 • Data, dimensions and weight are reference values only. For further details, please contact your nearest Maxell office.