Silver Oxide Battery
Product Catalogue

Seiko Instruments Inc.
Precautions for Your Safety

For using SII Silver Oxide batteries, please follow the following precautions.

**WARNING!**
- Do not heat, disassemble nor dispose of in fire. Doing so damages the insulation materials and may cause fire, heat generation, leakage or bursting.
- Do not short. If the (+) and (-) come into contact with metal materials, short-circuit occurs. As a result, fire, heat generation, leakage or bursting may occur.
- Keep batteries out of children’s reach. It is dangerous that children swallow the battery. When you design mechanical hardware around the battery, please fix the battery firmly in order to prevent children from removing it. When you store the batteries, please keep the batteries out of children’s reach.
- If a battery is swallowed, consult a physician immediately.

**CAUTION!**
- Do not reverse placement of (+) and (-).
- Do not solder directly to the battery.
- Do not use new and used batteries together. Do not use different types of batteries together.
- Do not charge.
- Do not use nor leave the batteries in direct sunlight nor in high-temperature areas.
- Keep batteries away from direct sunlight, high temperature and humidity.
- Avoid letting battery contact water.
- Make sure to insert batteries without having (+) and (-) come in contact with metal parts of equipment.
- Read the equipment instruction manual and precautions carefully before using. Some usage or types of equipment do not suit the specifications or performance of these batteries.
- Remove batteries from the equipment, if finished using. Do not leave batteries connecting with equipment after using.
- In case of disposal, insulate between (+) and (-) of battery by an insulating material.

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All data, dimensions, characteristics and values shown in this catalogue are for reference only. Please contact your local Seiko Instruments Representative for current detailed specifications.

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Silver Oxide Batteries have large energy per unit volume that enables them to supply stable voltage for a long period. They have been widely used in quartz watches, which require high quality power source.

Seiko Instruments Inc. (SII) applied precision process technology cultivated by watch manufacturing to its production of silver oxide battery, and started production in 1975.

Silver oxide battery had needed a small amount of mercury in order to prevent performance degradation and leakage. While environmental concern grew as an issue worldwide, SII started the research of mercury-free battery in 1991. In 2005, SII finally succeeded in developing mercury-free silver oxide battery that has equal or better characteristics than the conventional silver oxide battery. The key technologies are SII’s unique precise sealing technology, high-corrosion resistance zinc alloy, and addition of a high performance inhibitor in the electrolyte.
Silver Oxide Battery

FEATURES

• Excellent discharge characteristics
  Operating voltage is very stable until the end of discharge.

• Excellent leakage resistance
  Excellent leakage resistance is achieved by our newly developed crimping structure and by our new high-performance manufacturing machinery.

• High quality
  SEIZAIKEN batteries are manufactured in a high-tech clean room environment in a newly constructed factory. This facility was specially designed for the manufacturing of ultra precision electronic devices and incorporates all new equipment. Within the clean room environment, SII has eliminated contamination allowing us to ensure consistent quality.

• Made In Japan
  All the processes, such as parts selection, production, inspection, are done in Japan. SEIZAIKEN battery, made by a watch maker, is well suitable to watch application.

APPLICATIONS

• Watch
• Calculator
• Digital Thermometer
• Information Devices
• Personal Healthcare Devices
• Electric Games

STRUCTURE

CHEMICAL REACTIONS

Positive electrode : Silver oxide
Negative electrode : Zinc
Electrolyte : Alkaline aqueous solution

Sodium hydroxide (NaOH) ....... Low Drain Battery
Potassium hydroxide (KOH) ...... High Drain Battery

Reaction in Positive side:
\[ \text{Ag}_2\text{O} + \text{H}_2\text{O} + 2e^- \rightarrow 2\text{Ag} + 2\text{OH}^- \]

Reaction in Negative side:
\[ \text{Zn} + 2\text{OH}^- \rightarrow \text{ZnO} + \text{H}_2\text{O} + 2e^- \]

Total reaction:
\[ \text{Ag}_2\text{O} + \text{Zn} \rightarrow 2\text{Ag} + \text{ZnO} \]
### Low Drain Battery

<table>
<thead>
<tr>
<th>Model</th>
<th>Characteristics (RT)</th>
<th>Dimensions</th>
<th>C.C.V. ¹*</th>
</tr>
</thead>
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<tr>
<td>JIS code</td>
<td>IEC code</td>
<td>Nominal Voltage (V)</td>
<td>Standard Capacity (mAh)</td>
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</tbody>
</table>

¹* The standard capacity is calculated by the measurement result of discharging time with the standard discharge current to the voltage 1.2V.

### High Drain Battery

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<td>Nominal Voltage (V)</td>
<td>Standard Capacity (mAh)</td>
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<tr>
<td>SR626W</td>
<td>376</td>
<td>1.55</td>
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<tr>
<td>SR721W</td>
<td>361</td>
<td>1.55</td>
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<tr>
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<tr>
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<td>389</td>
<td>1.55</td>
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<tr>
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<td>386</td>
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<tr>
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<td>357</td>
<td>1.55</td>
<td>160</td>
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</table>

¹* The standard capacity is calculated by the measurement result of discharging time with the standard discharge current to the voltage 1.2V.

³* C.C.V.: Closed Circuit Voltage / High Drain 2sec 7.8msac Pulse
Silver Oxide Battery

For applications besides watch

SEIZAIKEN Batteries are useful for not only watches but also any applications. Please let us know your specification-request.

Fax Sheet

Micro-Energy Division  Sales Sec.  +81-43-211-8034  Battery Sales Person

Application:
Estimated life span:
Requested discharge capacity:
Requested voltage:
Consumption current:
Cut-off voltage:
Temperature, humidity:

Your contact information

Name:
Section:
Company name:
email address:
Phone number:
Fax number:

TS Lithium Rechargeable Battery  <For Solar Watches>  1.5V Type

TS920E / TS621E (Under Development)

We have 1.5V type Lithium rechargeable batteries for solar watches. Please contact us.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal Voltage (V)</th>
<th>Charge Voltage(^3) (V)</th>
<th>Nominal Capacity (Voltage Range V) (mAh)</th>
<th>Internal Impedance(^1) (Ω)</th>
<th>Standard Charge/Discharge Current (mA)</th>
<th>Cycle Life(^2) (Time)</th>
<th>Diameter (mm)</th>
<th>Height (mm)</th>
<th>Weight (g)</th>
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</thead>
<tbody>
<tr>
<td>TS920E</td>
<td>1.5</td>
<td>1.6 to 3.0</td>
<td>5.5 (2.3 to 1.0)</td>
<td>20</td>
<td>0.05</td>
<td>1000 (20% D.O.D.) 100 (100% D.O.D.)</td>
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<td>TS621E (Under development)</td>
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<td></td>
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</tr>
</tbody>
</table>

*1. Value measured using an AC (Alternating Current) method in the fully charged state.
*2. Counts of charge and discharge repetition that maintains about 50% of the minimum guaranteed capacity.
*3. A constant voltage charge is recommended, but due to a limit in the charge current, it is necessary to insert a resistor to regulate the charge current. Please contact us for further details.

TS Lithium Rechargeable Batteries are not reflowable. Please mount them on PCB by hand soldering.
Seiko Instruments Inc., Micro-Energy Division is located in Ayashi, a city with beautiful nature, in Miyagi Prefecture. Our aim is to provide customer satisfaction and harmony with the environment through all our products, from Micro battery to other electronic products, and sales activities.

1. We adhere firmly to laws, regulations and customers’ specified requirements.
2. We aim to prevent pollution, to reduce CO₂, and to conserve biodiversity.
3. We set goals, take actions, conduct regular reviews, and improve the system and performance continuously.
4. We contribute to the society by supporting green procurement, developing green products, and promoting green life activity.
5. We adhere to regulations and recommendations regarding Chemical substance content in our products and will promote reduction and replacement.
6. We vigorously educate ourselves and try to engage voluntarily in green life activity.

Based on the above policy, the following six environmental approaches are now being implemented throughout Micro-Energy Division.

1. Enrich the line up of Eco-Products
   - We introduced the SII Green Product Label System which is equivalent to the ISO 14021 Type II environmental label.
   - At the end of FY2006, 100% of our products are certified as SII Green Products. In addition, 38 products are certified as SII “High Grade” Green Products.

2. Reduction of Greenhouse Gas
   - We practice various CO₂ reduction measures like using Eco-machinery. Since 1997, we have successfully reduced a total of 54,100 tons of CO₂. We believe our efforts contribute to the prevention of global warming.

3. 3R Promotion Activity
   - We have promoted the “reduce and reuse” activities and also promoted recycling at the end of the production process. With these activities, we achieved “Zero-emission” in 2004. We have reduced the non-recyclable wastes to less than 1 ton - less than 1% of our 1997 results.

4. Biodiversity Conservation
   - We endeavor to deepen our understanding on the relevancy between biodiversity and our business activities, and to contribute to the conservation of biodiversity by participating local community activities.

5. Green Purchasing
   - We adhere to a green purchasing campaign through the purchase of ingredients, manufacturing materials, and other necessary products, whenever appropriate.

6. Green Life
   - With the participation of all of Micro-Energy Division members, we deploy a clean-up and beautification campaign in all areas surrounding our factory once a year. In addition, we participate in the clean up activity at Hirose River once a year.

7. Conflict Minerals
   - Recognizing the international importance of conflict minerals issue, we prohibit the use of such minerals.
Micro-Energy Division who manufactures the products described in this catalog holds the ISO 9001 quality management system certificate, and the ISO 14001 environmental management systems certificate.

Seiko Instruments Inc.
Micro-Energy Division
1-8, Nakase, Mihama-ku, Chiba-shi, Chiba 261-8507, Japan
Telephone:+81-43-211-1735  Facsimile:+81-43-211-8034

Seiko Instruments (H.K.) Ltd.
4-5/F, Wyler Centre 2, 200 Tai Lin Pai Rd.,
Kwai Chung, N.T., Kowloon, Hong Kong
Telephone:  +852-2494-5111
Facsimile:  +852-2480-5479
Email:sales@sih.com.hk
http://www.sih.com.hk

Seiko Instruments (Shanghai) Inc.
Room 2701-2703, 27th Floor,
Shanghai Plaza,
138 Mid Huaihai Rd.,
Shanghai 200021, China
Telephone:  +86-21-6375-6611
Facsimile:  +86-21-6375-6727

Seiko Instruments Taiwan Inc.
12F, No.101, Sec.2, Nanking E. Rd.,
Taipei 104, Taiwan, R.O.C.
Telephone:  +886-2-2563-5001
Facsimile:  +886-2-2563-5880
Email:public@siitaiwan.com
http://www.sii.com.tw

Seiko Instruments GmbH
Siemenstrasse 9
D-63263 Neu Isenburg, Germany
Telephone:  +49-6102-297-0
Facsimile:  +49-6102-297-50100
Email:info@seiko-instruments.de
http://www.seiko-instruments.de

Seiko Instruments Korea Inc.
#507, 508, Korea City Air Terminal Bldg.,
159-6, Samsung-dong, Gangnam-gu,
Seoul, 135-728 Korea
Telephone:  +82-2-565-8006
Facsimile:  +82-2-565-8306
http://www.sii.co.kr

Seiko Instruments U.S.A., Inc.
21221 S. Western Ave., Suite 250,
Torrance, CA 90501, U.S.A.
Telephone:  +1-310-517-7802
Facsimile:  +1-310-517-7792
Email:info@seiko-instruments.com
http://www.sii-me.com

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Released in October 2014