Victron Energy OPzS Battery, wet, filled with acid
MATERIAL SAFETY DATA SHEET

SECTION 1 - GENERAL INFORMATION

MANUFACTURER'S NAME: Victron Energy B.V
ADDRESS: De Paal 35 1351 JG Almere-Haven The Netherlands
EMERGENCY TELEPHONE NO.: +31-36-5359700
OTHER INFORMATION CALLS: +31-36-5359700

Chemical / Trade Name (as used on label): Lead-Acid Battery
Chemical Family / Classification: Electric Storage Battery
PERSON RESPONSIBLE FOR PREPARATION: Reinout Vader, Managing Director
Revised date: July 31, 2014

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>CAS Number</th>
<th>% Weight</th>
<th>OSHA</th>
<th>ACGIH</th>
<th>NIOSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inorganic compounds:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>7439-92-1</td>
<td>90-95</td>
<td>50</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>Calcium</td>
<td>7440-70-2</td>
<td>0.92</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Tin</td>
<td>7440-31-5</td>
<td>0.06</td>
<td>2000</td>
<td>2000</td>
<td>--</td>
</tr>
<tr>
<td>Antimony</td>
<td>7440-36-0</td>
<td>1-6</td>
<td>500</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>Arsenic</td>
<td>7440-38-2</td>
<td>&lt;1</td>
<td>500</td>
<td>500</td>
<td>--</td>
</tr>
<tr>
<td>Copper</td>
<td>7440-50-8</td>
<td>&lt;1</td>
<td>1000</td>
<td>1000</td>
<td>--</td>
</tr>
<tr>
<td>Electrolyte (sulfuric acid)</td>
<td>7664-93-9</td>
<td>25-44</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>NON-HAZARDOUS INGREDIENTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyester</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Polyethylene</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Styrenacrylnitril (SAN) cell container</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SECTION 3 - PHYSICAL AND CHEMICAL PROPERTIES

- **Boiling point (electrolyte):** 95-115°C (203-240°F)
- **Vapor pressure (electrolyte):** 10 mm Hg
- **Specific gravity (electrolyte):** 1.215 – 1.350
- **Melting point:** > 160°C (320°F) (styrenacrylnitril (SAN) cell container)
- **Percent Volatile By Volume:** not Applicable
- **Vapor Density:** Hydrogen: 0.069
  - (Air = 1)
  - Electrolyte: 3.4 @ STP
  - (Air = 1)
- **Evaporation rate:** less than 1
  - (Butyl Acetate = 1)
- **Solubility in water:** 100% soluble (electrolyte)
- **Appearance and Odor:** Battery: styrenacrylnitril (SAN) cell container, solid; may be contained within an outer casing of aluminum or steel. Case has metal terminals.
  - Lead: gray, metallic, solid; brown/grey oxide.
  - Electrolyte: clear liquid with a sharp, penetrating, pungent odor.

SECTION 4 - HAZARD IDENTIFICATION

1. **Acute hazards**
   - Do not open battery. Avoid contact with internal components. Internal components include lead and electrolyte (sulfuric acid).
   - Electrolyte is corrosive and contact may cause skin irritation and chemical burns. Electrolyte causes severe irritation and burns of eyes, nose and throat. Ingestion can cause severe burns and vomiting.
   - Lead - Direct skin or eye contact may cause local irritation. Inhalation or ingestion of lead dust or fumes may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm and joint pain.

2. **Sub-chronic and chronic health effects**
   - Do not open battery. Avoid contact with internal components. Internal components include lead and electrolyte (sulfuric acid).
   - Electrolyte is corrosive and contact may cause skin irritation and chemical burns. Electrolyte causes severe irritation and burns of eyes, nose and throat. Ingestion can cause severe burns and vomiting.
   - Lead - Direct skin or eye contact may cause local irritation. Inhalation or ingestion of lead dust or fumes may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm and joint pain.
   - Lead - Prolonged exposure may cause central nervous system damage, gastrointestinal disturbances, anemia, irritability, metallic taste, insomnia, wrist-drop, kidney dysfunction and reproductive system disturbances. Pregnant women should be protected from excessive exposure to prevent lead from crossing the placental barrier and causing infant neurological disorders. California Proposition 65 Warning: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm, and during charging, strong inorganic acid mists containing sulfuric acid are evolved, a chemical Known to the State of California to cause cancer. Wash hands after handling.

- **Medical conditions generally aggravated by exposure:** Contact with internal components if battery is broken or opened, then persons with the following medical conditions must take precautions: pulmonary edema, bronchitis, emphysema, dental erosion and tracheobronchitis.

- **Routes of entry**
  - Inhalation - YES
  - Ingestion - YES
  - Eye Contact- YES

- **Chemical(s) listed as carcinogen or potential carcinogen**
  - Proposition 65 - YES
  - National Toxicology Program - YES
  - I.A.R.C. Monographs - YES
  - O.S.H.A. - NO
### SECTION 5 - FIRST AID MEASURES

**Routes of Entry: Lead compounds**

**Hazardous exposure can occur only when product is heated above the melting point, oxidized, or otherwise processed or damaged to create dust, vapor, or fume.**

<table>
<thead>
<tr>
<th>Routes of Entry</th>
<th>Hazardous Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Inhalation</strong></td>
<td>Inhalation of lead dust of fumes may cause irritation of upper respiratory tract and lungs. Remove from exposure, gargle, wash nose and lips; consult physician.</td>
</tr>
<tr>
<td><strong>2. Ingestion</strong></td>
<td>Acute ingestion may cause abdominal pain, nausea, vomiting, diarrhea, and severe cramping. This may lead rapidly to systemic toxicity. Consult physician immediately.</td>
</tr>
<tr>
<td><strong>3. Skin contact</strong></td>
<td>Not absorbed through the skin. Wash with soap and water.</td>
</tr>
<tr>
<td><strong>4. Eye contact</strong></td>
<td>May cause eye irritation.</td>
</tr>
<tr>
<td><strong>5. Effects of overexposure – acute</strong></td>
<td>Symptoms of toxicity include headache, fatigue, abdominal pain, loss of appetite, muscular aches and weakness, sleep disturbances, and irritability.</td>
</tr>
<tr>
<td><strong>6. Effects of overexposure – chronic</strong></td>
<td>Anemia; neuropathy, particularly of the motor nerves, with wrist drop; kidney damage; reproductive changes in both males and females.</td>
</tr>
<tr>
<td><strong>7. Carcinogenicity</strong></td>
<td>Listed as a 2B carcinogen, likely in animals at extreme doses. Proof of carcinogenicity in humans is lacking at present.</td>
</tr>
<tr>
<td><strong>8. Medical conditions generally aggravated by exposure</strong></td>
<td>Lead and its compounds can aggravate some forms of kidney, liver, and neurologic diseases.</td>
</tr>
</tbody>
</table>

**Routes of Entry: Electrolyte (sulfuric acid)**

**Harmful by all routes of entry**

<table>
<thead>
<tr>
<th>Routes of Entry</th>
<th>Hazardous Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Inhalation</strong></td>
<td>Breathing of sulfuric acid vapors or mists may cause severe respiratory irritation. Remove to fresh air immediately. If breathing is difficult; give oxygen.</td>
</tr>
<tr>
<td><strong>2. Ingestion</strong></td>
<td>May cause severe irritation of mouth, throat, esophagus and stomach. Give large quantities of water; do not induce vomiting; consult physician.</td>
</tr>
<tr>
<td><strong>3. Skin contact</strong></td>
<td>Severe irritation, burns and ulceration. Flush with large amounts of water for at least 15 minutes; remove contaminated clothing completely, including shoes.</td>
</tr>
<tr>
<td><strong>4. Eye contact</strong></td>
<td>Severe irritation, burns, cornea damage, and blindness. Flush immediately with large amounts of water for at least 15 minutes; consult physician.</td>
</tr>
<tr>
<td><strong>5. Effects of overexposure – acute</strong></td>
<td>Severe skin irritation, cornea damage, upper respiratory irritation.</td>
</tr>
<tr>
<td><strong>6. Effects of overexposure – chronic</strong></td>
<td>Possible erosion of tooth enamel, inflammation of nose, throat and bronchial tubes.</td>
</tr>
<tr>
<td><strong>7. Carcinogenicity</strong></td>
<td>The International Agency for Research on Cancer (IARC) has classified &quot;strong inorganic acid mist containing sulfuric acid&quot; as a Category I carcinogen, a substance that is carcinogenic to humans. This classification does not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within a battery. Inorganic acid mist (sulfuric acid mist) is not generated under normal use of this product. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist.</td>
</tr>
<tr>
<td><strong>8. Medical conditions generally aggravated by exposure</strong></td>
<td>Overexposure to sulfuric acid mist may cause lung damage and aggravate pulmonary conditions. Contact of sulfuric acid with skin may aggravate diseases such as eczema and contact dermatitis.</td>
</tr>
</tbody>
</table>

### SECTION 6 - FIREFIGHTING MEASURES

<table>
<thead>
<tr>
<th>Flash point: not applicable</th>
<th>Flammable limits in air % by volume: LEL = 4.1% (hydrogen gas) UEL = 74.2%</th>
<th>Extinguishing Media: CO2, foam, dry chemical</th>
<th>Auto-Ignition temperature: 500°C (900°F) (stynencylchloritril)</th>
</tr>
</thead>
</table>

**Special firefighting procedures**

Lead/acid batteries do not burn, or burn with difficulty. Do not use water on fires where molten metal is present. Extinguish fire with agent suitable for surrounding combustible materials. Cool exterior of battery if exposed to fire to prevent rupture. The acid mist and vapors generated by heat or fire are corrosive. Use NIOSH approved self-contained breathing apparatus (SCBA) and full protective equipment operated in positive-pressure mode.

**Unusual fire and explosion hazards**

Highly flammable hydrogen gas is generated during charging and operation of OPZS batteries. To avoid risk of fire or explosion, keep sparks or other sources of ignition away from batteries. Do not allow metallic materials to simultaneously contact negative and positive terminals of cells and batteries. Follow manufacturer’s instructions for installation and service.

### SECTION 7 - ACCIDENTAL RELEASE MEASURES

**Procedures for cleanup**

Avoid contact with any spilled material. Contain spill, isolate hazard area, and deny entry. Limit site access to emergency responders. Neutralize spilled electrolyte with sodium bicarbonate, soda ash, lime or other neutralizing agent. Place battery in suitable container for disposal. Dispose of contaminated material in accordance with applicable local, state and federal regulations. Sodium bicarbonate, soda ash, sand, lime or other neutralizing agent should be kept on-site for spill remediation.

**Personal precautions**

Acid resistant aprons, boots and protective clothing, ANSI approved safety glasses with side shields/face shield recommended.

**Environmental precautions**

Acid resistant aprons, boots and protective clothing, ANSI approved safety glasses with side shields/face shield recommended.

### SECTION 8 - HANDLING AND STORAGE

**Precautions to be taken in handling and storage**

Store away from reactive materials, open flames and sources of ignition as defined in Section 9 – Stability and Reactivity Data. Store batteries in cool, dry, well-ventilated areas. Batteries should be stored under roof for protection against adverse weather conditions. Avoid damage to containers.

**Other precautions**

GOOD PERSONAL HYGIENE AND WORK PRACTICES ARE MANDATORY. Refrain from eating, drinking or smoking in work areas. Thoroughly wash hands, face, neck and arms, before eating, drinking and smoking. Work clothes and equipment should remain in designated lead contaminated areas, and never taken home or laundered with personal clothing. Wash soiled clothing, work clothes and equipment before reuse.

**Respiratory protection**

None required under normal conditions.

**Protective gloves**

Wear rubber or plastic acid resistant gloves.

**Eye protection**

ANSI approved safety glasses with side shields/face shield recommended.

**Other protective clothing or equipment**

Safety shower and eyewash.
SECTION 9 - STABILITY AND REACTIVITY

<table>
<thead>
<tr>
<th>Stability</th>
<th>Stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions to avoid</td>
<td>Prolonged overcharge; sources of ignition</td>
</tr>
<tr>
<td>Incompatibility (materials to avoid)</td>
<td>Sulfuric acid: Contact with combustibles and organic materials may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidizers and water. Contact with metals may produce toxic sulfur dioxide fumes and may release flammable hydrogen gas. Lead compounds: Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen and reducing agents.</td>
</tr>
<tr>
<td>Hazardous decomposition products</td>
<td>Sulfuric acid: Sulfur trioxide, carbon monoxide, sulfuric acid mist, sulfur dioxide, and hydrogen. Lead compounds: High temperatures likely to produce toxic metal fume, vapor, or dust; contact with strong acid or base or presence of nascent hydrogen may generate highly toxic arsine gas.</td>
</tr>
<tr>
<td>Hazardous polymerization</td>
<td>Hazardous polymerization has not been reported.</td>
</tr>
</tbody>
</table>

SECTION 10 - ECOLOGICAL INFORMATION

In most surface water and groundwater, lead forms compounds with anions such as hydroxides, carbonates, sulfates, and phosphates, and precipitates out of the water column. Lead may occur as sorbed ions or surface coatings on sediment mineral particles or may be carried in colloidal particles in surface water. Most lead is strongly retained in soil, resulting in little mobility. Lead may be immobilized by ion exchange with hydrous oxides or clays or by chelation with humic or fulvic acids in the soil. Lead (dissolved phase) is bioaccumulated by plants and animals, both aquatic and terrestrial.

SECTION 11 - DISPOSAL CONSIDERATIONS

Lead-acid batteries are completely recyclable. Return whole scrap batteries to distributor, manufacturer or lead smelter for recycling. For information on returning batteries to Victron Energy for recycling call +31-36-5359700. For neutralized spills, place residue in acid-resistant containers with sorbent material, sand or earth and dispose of in accordance with local, state and federal regulations for acid and lead compounds. Contact local and/or state environmental officials regarding disposal information.

SECTION 12 – TRANSPORT INFORMATION

GROUND – US-DOT/CAN-TDG/EU-ADR/APEC-ADR:
Proper shipping name: Batteries, wet, filled with acid
Hazard class 8
Packing Group III
ID Number: UN2794
Labels: Corrosive

AIRCRAFT – ICAO-IATA:
Proper shipping name: Batteries, wet, filled with acid
Hazard class 8
Packing Group III
ID Number: UN2794
Labels: Corrosive
Reference IATA packing instructions 870

VESSEL – IMO-IMDG:
Proper shipping name: Batteries, wet, filled with acid
Hazard class 8
Packing Group III
ID Number: UN2794
Labels: Corrosive
Reference IMDG packing instructions P801

Additional Information
Transport requires proper packaging and paperwork, including the Nature and Quantity of goods, per applicable origin/destination/customs points as-packed.

SECTION 13 – REGULATORY INFORMATION

U.S. HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD:
LEAD – YES
ARSENIC – YES
SULFURIC ACID – YES

INGREDIENTS LISTED ON TSCA INVENTORY:
YES

CERCLA SECTION 304 HAZARDOUS SUBSTANCES:
LEAD – YES
ARSENIC – YES
SULFURIC ACID – YES
RQ: 1 POUND
RQ: 1000 POUNDS

* RQ: REPORTING NOT REQUIRED WHEN DIAMETER OF THE PIECES OF SOLID METAL RELEASED IS EQUAL TO OR EXCEEDS 100 µM (micrometers).

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE:
SULFURIC ACID – YES

EPCRA SECTION 313 TOXIC RELEASE INVENTORY:
LEAD – CAS NO: 7439-92-1
ARSENIC – CAS NO: 7440-38-2
SULFURIC ACID – CAS NO: 7664-93-9

SECTION 14 – OTHER INFORMATION

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