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SAFETY DATA SHEET

Valve Regulated Lead-acid Battery (VRLA Battery)
SDS No: SDS-CSB-002
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SAFETY DATA SHEET

Valve Regulated Lead-acid Battery (VRLA Battery)
SDS No: SDS-CSB-001
Revision: 08.07.2023 Version No: 12.0 Page 1/25

SAFETY DATA SHEET

Valve Regulated Lead-acid Battery (VRLA Battery)
SDS No: SDS-CSB-002

1. Identification

Product identifier : Valve Regulated Lead-acid Battery (VRLA Battery)

Information on company

Company name : Eaton Corporation

Address : 8609 Six Forks Rd., Raleigh, NC 27615

Phone number : 800-843-9433

E-mail : LargeUPSTS@eaton.com

2. Hazards Identification

Health hazards :	Acute Toxicity (Oral) ;	Category 4
	Acute Toxicity (Inhalation - Vapors) ;	Category 4
	Skin Corrosion/Irritation ;	Category 1A
	Eye Damage/Irritation ;	Category 1
	Carcinogenicity ;	Category 1B
	Reproductive Toxicity;	Category 1A
	Specific Target Organ Toxicity (repeated exposure) ;	Category 1
Environmental hazards :	Hazardous to the aquatic environment;	
	Short-term (acute) hazard ;	Category 1
	Long-term (chronic) hazard ;	Category 1

Signal Word : Danger

Hazard Statements : Harmful if swallowed, if inhaled.

Causes severe skin burns and eye damage.

Causes serious eye damage.

May damage fertility or the unborn child if ingested or inhaled.

May cause harm to breast-fed children.

May cause cancer if ingested or inhaled.

May cause damage to organs through prolonged or repeated exposure.

Very toxic to aquatic life.

Very toxic to aquatic life with long lasting effects.

Symbols :

Precautionary Statements :

Prevention ;

Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.

Wear protective gloves/protective clothing/eye protection/face protection.

Avoid breathing dust/fume/gas/mist/vapors/spray.

Use only outdoors or in a well-ventilated area.

Do not breathe dusts or mists.

Obtain special instructions before use.

Do not handle until all safety precautions have been read and understood.

Avoid contact during pregnancy/while nursing.

Response ;

If swallowed: Rinse mouth. Do NOT induce vomiting.

If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

Wash contaminated clothing before reuse.

If inhaled: Remove person to fresh air and keep comfortable for breathing.

Immediately call a poison center/doctor.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

If exposed or concerned: Get medical advice/attention.

Storage ;

Store locked up.

Store in accordance with local/regional/national/international regulations .

Disposal ;

Dispose of contents/container in accordance with local/regional/national/international regulations.

3. Composition/Information on Ingredients

Substance / Mixture : Mixture

Information on composition and ingredients:

NO.	Chemical name or common name	Component part	Content rate (mass ratio)	Chemical formula	CAS no.
1	Lead	Terminal, electrode plate	70-80%	Pb	7439-92-1
2	Lead dioxide	Electrode plate		PbO_2	1309-60-0
3	Lead sulfate	Electrode plate		$PbSO_4$	7446-14-2
4	Dilute sulfuric acid (27~50%)	Electrolyte	14-20%	H_2SO_4	7664-93-9
5	PP resin	Battery container, lid	5-9%	—	9003-07-0
6	Glass fiber	Separator	1-2%	—	65997-17-3

4. First-aid Measures

If inhaled : (Lead, lead dioxide, lead sulfate, dilute sulfuric acid)
Remove person to fresh air, keep comfortable for breathing.
Get medical advice/attention.

If on skin : (Lead, lead dioxide, lead sulfate)
Wash skin with plenty of water and soap.
If skin irritation occurs, get medical advice/attention.
(dilute sulfuric acid)
Take off or remove immediately all contaminated clothing.
Rinse skin with water or shower.
If skin irritation or chemical injury occurs, get medical advice/attention.

If in eyes : (Lead, lead dioxide, lead sulfate, dilute sulfuric acid)
Open the eyelids with your fingers, rinse thoroughly with water for at least 15 minutes.
Remove contact lenses, if present and easy to do.
Continue rinsing.
Get medical attention/advice.

If swallowed : (Lead, lead dioxide, lead sulfate)
Rinse mouth.

	Get medical advice/attention. (dilute sulfuric acid) Rinse mouth. Give plenty of water. Do not induce vomiting. Get medical advice/attention.
Most important symptoms/effects, acute and delayed :	(Lead, lead dioxide, lead sulfate) Stomach cramps, lethargy, headache, nausea, vomiting, weakness, wheezing, pallor, hemoglobinuria, collapse. (dilute sulfuric acid) Corrosive, burning sensation, sore throat, cough, breathlessness, shortness of breath, redness, pain, blisters, severe skin burns, severe burns, abdominal pain, shock or collapse.
Protection for first-aiders :	Rescuers wear protective equipment such as rubber gloves and tight-fitting safety goggles.
Special note to physician :	(Dilute sulfuric acid) Symptoms of lung edema often do not show until a few hours have passed, and it might aggravate if it does not take a rest. Therefore, it is necessary to take a rest and medical observation.

5. Fire Fighting Measures

Suitable extinguishing media :	Extinguish the fire by extinguishers of dry chemical agent, foam fire extinguish agent, and non-flammable gas.
Unsuitable extinguishing media :	No information.
Specific risk/hazard :	In case of fire, there is a possibility that irritative, corrosive or toxic fumes or gases are generated. There is a possibility of explosion of the product by heat. May form explosive air/gas mixture during charging. There is a possibility of hydrogen emission and explosion during charging.
Specific fire fighting method :	Cut off the power in case of connection/energizing the product into the device, if can be coped with safely. Move the product from the fire area if it is not dangerous.

	After extinguishing the fire, continue to cool the container thoroughly with plenty of water. Immediately move the movable product to safe place when fire occurs in surrounding. If it is not movable, cool the product with water spray. Keep away the combustible materials to prevent spread fire around.
Protection for fire-fighters :	Extinguish fire from upwind. Wear appropriate protective clothes for chemical (self-contained breathing apparatus, protective glasses, etc.) to fire fighting.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency measures :	Wear appropriate protective equipment (gloves, protective glasses, protective clothing and the like), when processing the leakage. Do not touch or walk through the leakage. Do not breathe dust, mist and vapour. May form explosive air/gas mixture during charging. There is a possibility of hydrogen emission and explosion during charging.
Precautions for the environment :	Be careful to not discharge the product into the rivers, sewer, and soil.
Method for containment and clean-up :	If dilute sulfuric acid is leaked, stopping the flow with sand and earth, absorbing mat and the like, remove by absorbing with them. And then, neutralized with sodium bicarbonate or slaked lime, and wash off with plenty of water. Absorb by sprinkling misty water when the gas is generated. Collected material should be disposed in compliance with '13. Disposal Considerations'.
Prevention of secondary hazards :	Immediately remove all ignition sources in the vicinity. Prepare fire extinguishing equipment just in case it is ignited.

7. Handling and Storage

Handling :

Technical measures ;	Take measure described in '8: Exposure Controls and Personal Protective Equipment', and wear appropriate protective equipment.
Local exhaust/general ventilation ;	Work in a well-ventilated place and provide local exhaust or general ventilation as necessary.
Cautions for Safety Handling ;	Do not use fire near the product. Do not dismantle or modify the product. Do not do short-circuit between the terminals. Handling and charging of the product should be in well ventilated place. Prevent falling and overturning of container. Careful to not give a shock. Try to not damage the product. Be careful not to spill the dilute sulfuric acid. Do not eat, drink or smoke when using this product.

Storage :

Technical measures ;	Provide a ventilation and lighting required for storing and handling hazardous materials in the storage location.
Storage condition ;	Do not store near the fire. Do not store in place where is exposed to high temperature, high humidity, rain, direct sunlight. Store in place where is no risk of fire, toxic gas, liquid droplets, generating or invasion of dust, and submerged.

8. Exposure Controls and Persor al Protective Equipment

Controlled exposure level :	Lead (electrode plate, terminal), lead dioxide(electrode plate), lead sulfate(electrode plate) Lead and its compounds(as lead) TLV = 0.05 mg/m^3
Permissible exposure level :	
OSHA PEL ;	Lead(electrode plate, terminal), lead dioxide(electrode plate), lead sulfate(electrode plate) Lead and inorganic compounds (as lead) : TWA = 0.05 mg/m^3 Dilute sulfuric acid(electrolyte)

Sulfuric acid: TWA = 1mg/m^3

ACGIH (2017) ; Lead(electrode plate, terminal), lead dioxide(electrode plate),lead sulfate(electrode plate)
LEAD AND INORGANIC COMPOUNDS, AS Pb
TLV-TWA = 0.05 mg/m^3
Dilute sulfuric acid(electrolyte)
Sulfuric acid: TLV-TWA = 0.2mg/m^3

Engineering controls : Provide hand wash and eyes wash facilities and safety shower near the handling place as necessary.

Personal protective equipment :

Respiratory protection ; Wear respiratory protective equipment (air respirator, dust mask, gas mask (for acid gases)) as necessary.

Hand protection ; Wear impermeable protective gloves (acid resistance).

Eye protection ; Wear protective glasses, goggle type safety glasses and the like.

Skin and body protection ; Wear protective clothing, protective apron and the like as necessary.

Hygiene measures : Do not eat, drink or smoke when handling.
Wash hands thoroughly after handling.
Protective equipment shall be inspected regularly according to the protective equipment checklist.

9. Physical and Chemical properties

Describes the information about the components below.

	Lead	Lead dioxide	Lead sulfate	Dilute sulfuric acid
Appearances (physical state, form, color, etc.)	Silver white solid	Brown crystal or powder	White crystal	Colorless transparent liquid
Odor	No information.	No information.	No information.	Odorless (normal temperature)
Threshold of odor	No information.	No information.	No information.	No information.
pH	No information.	No information.	No information.	≦1
Melting point	327.4°C	888°C	1170°C	No information
Boiling point, initial	1,749°C	1,480°C	No information	No information

boiling point and boiling range				
Flash point	Non flammable	Non flammable	Non flammable	Non flammable
Flammability(solid, gas)	Non flammable	Non flammable	Non flammable	Not applicable
Specific gravity(density)	11.35g/cm^3 (20°C)	9.53g/cm^3	6.2	Approx. 1.2～1.4
Solubility	Water: Insoluble.	Water: Insoluble.	Water: Hardly soluble.	Miscible in water. Soluble in alcohol.
Partition coefficient (n-octanol/water)	No information.	No information	No information	No information
Auto-ignition temperature	Non flammable	Non flammable	Non flammable	Non flammable
Decomposition temperature	No information.	290°C	1000°C	No information
Viscosity	No information.	No information.	No information.	No information.
Other Information	No information.	No information.	No information.	No information.

10. Stability and Reactivi t y

Stability :

(lead)

When oxygen is present, it will be eroded by pure water and the weak organic acid. At normal temperature, it will be eroded by fluorine or chlorine.

(lead dioxide/ lead sulfate)

It is considered to be stable under normal handling and storage.

(dilute sulfuric acid)

At first, vapor is generated by heating, and generate sulfuric acid vapors if continue to heat.

Rapid contact with water might be generate a large amount of heat, and sometimes the acid is scattered.

Dilute sulfuric acid which is generated by diluting with water, generates hydrogen gas by the corrosion of various metals and may cause flash explosion by mixing with air.

	There is hygroscopic.
Hazardous reactivity :	(lead) It does not occur hazardous reaction under normal condition. (lead dioxide) React violently with combustible materials and organic matter (sulfuric acid, hydrogen peroxide, phosphoric acid), and it may cause risk of fire. (lead sulfate) It may react with strong oxidizing agents. (dilute sulfuric acid) It may cause fire or explosion by many reactions. It is strong oxidant and reacts with combustible and reducing materials. It is strong acid and reacts violently with bases and is corrosive to most common metals forming a flammable/explosive gas(hydrogen). React with water and organic materials violently and release heat.
Conditions to avoid :	Heating, contact with ignition sources (open flame, spark, etc.,)
Incompatible materials :	(lead) ; Oxidizing agent. (lead dioxide) ; Flammable materials, reducing materials. (lead sulfate) ; Strong oxidizing agents. (dilute sulfuric acid) ; Combustible materials, reducing materials, strong oxidizing agents, strong bases.
Hazardous decomposition products :	In case of fire, there is a possibility that irritative or toxic gases or fumes are generated.
Other information	May form air/gas mixture during charging. There is a possibility of hydrogen emission and explosion during charging.

11. Toxicological Information

Indicate the information for each of components of lead acid battery as below.

○Lead (electrode plate, terminal)

Acute toxicity (Oral) :	Acute Toxicity Estimate (ATE) = 500 mg/kg It was classified as Category 4 of GHS acute toxicity (Oral).
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation - Gases) :	Classification not applicable because it is a solid in the definition of GHS.
Acute toxicity (Inhalation - Vapors) :	Acute Toxicity Estimate (ATE) = 11 mg/l It was classified as Category 4 of GHS acute toxicity (Inhalation - Vapors)
Acute toxicity (Inhalation - Dusts and Mists) :	No data.
Skin corrosion/irritation :	No data.
Serious eye damage/eye irritation :	No data.
Respiratory or skin sensitization :	No data.
Germ cell mutagenicity :	Although there are contradicting results about the chromosome aberration in the peripheral blood lymphocytes from people who are engaged in lead-related work (IARC suppl.7 (1987), EHC 3 (1977), DFGOTvol.17 (2002), ACGIH (7th, 2001)), there are descriptions of lead itself having chromosome aberration/micronucleus inductive actions. Therefore, it was classified as Category 2 of GHS Germ cell mutagenicity.
Carcinogenicity :	From the below classifications, it was classified as Category 2 of GHS Carcinogenicity. ● IARC Supplement 7 (1987) and Japan Society for Occupational Health: 2B ● ACGIH (7th, 2001): A3 ● EPA (IRIS (1993)): B2
Reproductive toxicity :	Since there is the description that there is the affect for sperm formation disorder in human exposure example (EHC 3 (1977), ACGIH (7th, 2001), DFGOTvol.17 (2002)), and ovulation dysfunction was observed in the female occupation exposure example (EHC 3 (1977)), it was classified as "Category 1A of GHS Reproductive toxicity".

	There are the descriptions about the relationship with neonatal developmental disorder of cognitive function (ACGIH (7th, 2001), DFGOTvol.17 (2002), PATTY (4th, 1994) and IARC 23 (1980)), and the descriptions about the relationship with the increase of miscarriage (DFGOTvol.17 (2002), and PATTY (4th, 1994)). However, the distinct conclusion has not obtained.
Specific target organ toxicity (single exposure) :	Although there was a case report that renal dysfunction was observed in the acute toxicity in human (DFGOT, vol.17 (2002)), there was the description that no kidney damage in the subsequent epidemiologic study in the same source of reference. Therefore, the data is insufficient for considering the kidney as target organ, therefore, it is classified as "classification not possible".
Specific target organ toxicity (repeated exposure) :	Due to the descriptions that the target organs were hematopoietic system, nervous system, kidney, and cardiovascular system in DFGOTvol.17 (2002), that heme synthesis inhibitors, nephropathy and brain diseases were observed in the human exposure examples in EHC 3 (1977), ACGIH (7th, 2001), PATTY (4th, 1994), and IARC 23 (1980), that it affects to the peripheral nerve and function of central nerve system in humans exposure examples in EHC 3 (1977), ACGIH (7th, 2001), PATTY (4th, 1994), that it affects to cardiovascular system, such as high blood pressure in human exposure examples in EHC 3 (1977), ACGIH (7th, 2001), that the immunosupressive effect was observed in human exposure examples in PATTY (4th, 1994), it is considered that the target organs were hematopoietic system, the kidney, central nervous systems, peripheral nervous system, cardiovascular system and immune system, and they all were classified as “Category 1 of GHS Specific target organ toxicity (repeated exposure)”. Although there are the descriptions of the case reports of thyroid or adrenal hypofunctions in EHC 3 (1977), each case reports

	are before 1970, and there is no similar report after that, since there is the description that no effects was observed in the thyroid in DFGOTvol.17 (2002), the thyroid and the adrenal gland were not considered as for target organs.
Aspiration hazard :	No data.
Others :	No information.

○Lead dioxide (electrode plate)

Acute toxicity (Oral) :	No data.
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation: Gases) :	Classification not applicable because it is a solid in the definition of GHS.
Acute toxicity (Inhalation: Vapors) :	No data.
Acute toxicity (Inhalation: Dust and Mists) :	No data.
Skin corrosion/irritation :	Since there is the description of "Probably a severe eye, skin, and mucous membrane irritant "(HSDB (2006)), it is considered that indicate severe irritation to skin. Therefore, it was classified as Category 2 of GHS Skin corrosion/irritation.
Serious eye damage/eye irritation :	Since there is the description of "Probably a severe eye, skin, and mucous membrane irritant "(HSDB (2006)), it is considered that indicate severe irritation to eyes. Therefore, it is classified as Category 2A of GHS Serious eye damage/eye irritation.
Respiratory or skin sensitization :	No data.
Germ cell mutagenicity :	From the description of NTP DB (Access on February 2006); ● Heritable germ cell mutagenicity tests: None. ● Germ cell/ somatic cells in vivo mutagenicity tests: None. ● Germ cell/ somatic cells in vivo genetic toxicity test: None. ● Positive (strong) results of multiple indicators in in vitro mutagenicity test: None.

	It was classified as “Classification not possible”.
Carcinogenicity :	From the below classifications, it was classified as Category 2 of GHS Carcinogenicity . ● NTP (2005): R ● IARC (1987): Group 2B ● ACGIH (2001): A3
Reproductive toxicity :	Since lead is known as neurotoxic substance and reproductive toxic substance for human, it is classified as "Category 1A of GHS Reproductive toxicity " based on experts' judgement.
Specific target organ toxicity (single exposure, repeated exposure) :	For this substance, it is assumed that the classification based on the effects of inorganic lead compounds. As the toxicity of inorganic lead compounds for humans, there is the description below; "acute effects and chronic effects of inorganic lead has been recognized almost the same symptoms. By inhalation or ingestion of inorganic lead, it has been reported that cause the convergence of the mouth, thirst. And also nausea, vomiting, upper abdominal discomfort, loss of appetite, abdominal pain, constipation and the like has been reported as effects on the digestive organs. Effects on hematopoiesis are typical effects of inorganic lead, it has been observed hemoglobin synthesis inhibition and anemia due to shortened of red blood cell life, caused by inhibition of δ-aminolevulinic acid and heme synthesis enzyme. Interstitial nephropathy as the effect to the kidneys, in addition to decreasing amount of urine, proteinuria, hematuria, urine cylinder, the proximal tubule disorder exhibiting a Fanconi syndrome typified by diabetes and amino acid urine is reported. Inorganic lead affects on the peripheral nervous system, in particular, muscle weakness in limbs, pain and convulsions are observed. In addition, although it is very rare case in adults, in case of being exposed to extremely high concentrations (details unknown), the effects on the central

	nervous system are observed such as ataxia, headache, paresthesia, depression and coma. However, in effects on the central nervous system, particularly sensitive in children, and the symptoms with no restless, aggressive personality, difficulty concentrating, decline of memory and the like have become a problem in the U.S." (CERI Hazard Assessment Report 2001-9(2002)) Therefore, blood system, kidney and nervous system are considered to be target organs. From the above, it was classified as "Category 1 of GHS Specific target organ toxicity (single exposure, repeated exposure) (blood system, kidney, nervous system)".
Aspiration hazard :	No data.
Others :	No information.

○ Lead sulfate (electrode plates)

Acute toxicity (Oral) :	No data.
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation: Gases) :	Classification not applicable because it is a solid in the definition of GHS.
Acute toxicity (Inhalation: Vapors) :	No data.
Acute toxicity (Inhalation: Dust and Mists) :	No data.
Skin corrosion/irritation :	No data. As effects on humans, although there is no data that can be obtained for local effects on the skin and mucous membranes by lead and inorganic lead compounds, there is the description of that there is likely to cause severe irritation and burns to the skin.
Serious eye damage/eye irritation :	No data. As effects on humans, although there is no data indicating the local effects on the mucous membranes by lead and inorganic lead compounds, there is the description of that there is likely to cause severe irritation and burns to the eye.

Respiratory or skin sensitization :	No data.
Germ cell mutagenicity :	It is “Classification not possible” due to insufficient data of invivo test. In addition, in the in vitro test, there is the negative report in Ames test. Moreover, although it may not be necessarily matched results have been obtained, there is also the positive result in chromosome analysis using peripheral blood of workers who received the occupational exposure of lead. However, the used method is insufficient in most of the tests, overall it stated that it cannot be conclusive evaluation of genotoxicity in human. Inorganic lead compounds in MAK / BAT (2010) are classified as germ cell mutagenicity 3A.
Carcinogenicity :	In carcinogenicity evaluation of IARC, it is classified as Group 2A as inorganic compounds. Therefore, this substance was classified as Category 1B of GHS Carcinogenicity. In addition, it is classified as A3 in ACGIH as inorganic lead compound.
Reproductive toxicity :	Although there is no data of this substance, as effect on humans of inorganic lead compounds, an increase in the spontaneous abortion of pregnancy before 20 weeks was observed by a high concentration exposure of mothers in cases or epidemiological studies. There is description that exposure during the pregnancy is related increased in teratogenicity, low weight newborns and suppression of body weight gain after birth. Although decrease in sperm count and semen volume, morphological changes of sperm, and decreasing of sperm motility were observed by the occupational exposure, in most studies, it is observed dose-response relationship between these effects and exposure concentration of lead, and toxicity for sperm has been reported to have been unclear.
Specific target organ toxicity (single exposure) :	Although there is no data of this substance, neurotoxic effect of lead is known, and receives the influence of the lead in both the peripheral nerves and the central nervous

	system. Lead encephalopathy is one of the early symptoms of acute exposure. From also that there is a report of the suppression of the pituitary hands and nerve conduction velocity by the occupational exposure, it is classified as "Category 1 of GHS specific target organ toxicity (single exposure) (nervous system)". In high concentration acute exposure of lead and inorganic lead compounds, it causes dysfunction of the proximal tubule. There is the description that it causes Fanconi syndrome (diabetes, amino acid urine disease, phosphate urine disease and the like) as renal symptoms of acute lead poisoning. Therefore, it was classified as “Category 1 of GHS specific target organ toxicity (single exposure) (kidney)”. Moreover, lead is also known to give a change in the blood system. There is the description that the hemoglobin synthesis inhibition and small blood cell anemia and hypochromic anemia due to shortened of red blood cell life are caused by δ-aminolevulinic acid and heme synthesis enzyme are inhibited. Therefore, it is classified as "Category 1 of GHS specific target organ toxicity (single exposure) (blood system)". Other, colic is the initial symptoms of occupational exposure or high concentration acute exposure. Since there is the description of the associated symptoms such as constipation, severe abdominal pain, nausea, vomiting, loss of appetite, it is classified as "Category 1 of GHS specific target organ toxicity (single exposure) (digestive system)".
Specific target organ toxicity (repeated exposure) :	Although there is no data of the substance, there is the description that in high concentration repeated exposure by lead and inorganic lead compounds, it leads to irreversible changes to kidney including tubular atrophy, interstitial fibrosis glomerular sclerosis, and eventually it cause chronic nephritis. Therefore, it was classified as "Category

1 of GHS specific target organ toxicity (repeated exposure) (kidney)".
In addition, there is the report of the lead epidemiological study, hemoglobin concentration and hematocrit value of poisoning patients were significantly decreased compared with control subjects of non-exposure.
There is the description that the hemoglobin synthesis inhibition and small blood cell anemia and hypochromic anemia due to shortened of red blood cell life are caused by δ-aminolevulinic acid and heme synthesis enzyme are inhibited. Therefore, it was classified as "Category 1 of GHS specific target organ toxicity (repeated exposure) (blood system)".
On the other hand, there is the research study to support the relationship between the chronic lead poisoning and myocardial injury, and there is reported that abnormal electrocardiogram in workers of lead poisoning was observed. In addition, from the data of epidemiological studies, since it has been concluded that internal absorption of lead causes a significant increase in blood pressure in both diastolic and systolic of the heart, it was classified as Category 1 of GHS specific target organ toxicity (repeated exposure) (cardiovascular).
Moreover, suppression of motor nerve conduction velocity was observed in worker who blood concentration of lead is high, and also there is a report of the Parkinson's syndrome has been observed in seven out of nine that have been exposed for more than 30 years in a lead-acid battery. Therefore, it was classified as "Category 1 of GHS specific target organ toxicity (repeated exposure) (nervous system)".

Aspiration hazard : No data.

Others : No information.

○ Dilute sulfuric acid (electrolyte)

Acute toxicity (Oral) :	Based on the Rat LD_{50} value: 2140mg/kg and the description of the death case report by the oral ingestion in humans (amount of intake is unknown), it was classified as Category 5 of GHS acute toxicity (Oral).
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation: Gases) :	Classification not applicable because it is a liquid in the definition of GHS.
Acute toxicity (Inhalation: Vapors) :	No data.
Acute toxicity (Inhalation: Dust and Mists) :	Based on rat LC_{50} value: 0.375mg/L (4 hour exposure) and 347ppm (1-hour exposure) (4 hour equivalent value: 0.347mg/L), it was classified as Category 2 of GHS acute toxicity (inhalation).
Skin corrosion/irritation :	Since pH of concentrated sulfuric acid was 1 or less, it was judged to be corrosive substance in accordance with the GHS classification standards, and classified as Category 1A-1C of GHS skin corrosion/irritation.
Serious eye damage/eye irritation :	There is the description that the critical damage to the eye accompanied by lysis of anterior chamber of eye was observed in accident case of human. And also from the description that the moderate irritation with 5% solution and the severe irritation with 10% solution were observed to the eye of rabbit, therefore, it was classified as "Category 1 of GHS serious eye damage/eye irritation".
Respiratory or skin sensitization :	Respiratory sensitization: No data. Skin sensitization: There is no test data on skin sensitizing of sulfuric acids. Although sulfuric acid has been industrially used for several decades, there is no case report of skin sensitization while skin injuries by skin irritation are well known. Although an extensive amount of sulfate ion exists internally (the sulfate ion in serum ~33 mmol/L, and 50 times more in cells), allergic reactions do not occur. In allergic test of sulfuric acid salt of metal, even if allergic

	positive with metal may occur, sulfuric ion is presumed to result in allergic negative as is suggested by the negative results in sulfate of zinc. Based on the description that conclusion is obtained from the results mentioned above that sulfate does not cause allergy to human, it is classified as "Not classified".
Germ cell mutagenicity :	For in vivo, there is not any test data which the reproductive cells and the somatic cells were used. For in vitro mutagenicity tests, there is the positive result only in the test system with the single indicator (chromosomal aberration test). However, there are negative results in other indices. Therefore, it was classified as "Classification not possible".
Carcinogenicity :	Occupational exposure of the mist of the inorganic strong acid including sulfuric acids is classified as group 1 according to IARC, as A2 according to ACGIH, and as K according to NTP. Respect the evaluation of IARC and the latest NTP, it was classified as category 1. However, sulfuric acids itself was classified as the category 4 according to DFGOT. And, since none of those institutions have carried out the carcinogenic classification, it was classified as "Classification not possible".
Reproductive toxicity :	In inhalation exposure test using rabbit and mouse in fetal organogenesis period, it is not observed of fetotoxicity and teratogenicity at the dose causing no maternal toxicity in both species. And also, the effect on the reproductive organ of both sexes is not observed in chronic toxicity test and carcinogenicity test. Since the direct effect by irritation/corrosive is the main toxicity, it is judged that there is no concern that indicates the reproductive toxicity, therefore, it was classified as "Not classified".
Specific target organ toxicity (single exposure) :	There is the descriptions that in the inhalation exposure of low concentration in humans, airway irritation symptoms such as cough and breath shortness are observed and at

	high concentration exposure, addition to acute effects such as cough, breath shortness and hemoptysis shedding etc., permanent effects such as functional depression of lungs, fibrosis and emphysema are observed. Additionally, there is the description that hemorrhage and dysfunction in lungs were observed in 8-hour inhalation exposure using guinea pigs. Based on these descriptions, it was classified as "Category 1 of GHS Specific target organ toxicity (single exposure) (respiratory systems)".
Specific target organ toxicity (repeated exposure) :	In the 28-day inhalation exposure test using rat, cell proliferation in laryngeal mucosa is observed in guidance value range of Category 1 of GHS Specific target organ toxicity (repeated exposure). In the 14 to 139-day repeated inhalation exposure test using the guinea pigs, respiratory and lung disorder, such as nasal-septum dropsy, pulmonary emphysema, atelectasis, hyperemia, dropsy, bleeding and thrombosis of bronchioles are observed at the concentration range of guidance value of Category 1 of GHS Specific target organ toxicity (repeated exposure). Furthermore, in the 78-week inhalation exposure test using a cynomolgus, histological change as hyperplasia of a cell, the wall thickening, etc. in bronchioles of lungs were observed at the dosage (0.048 mg/L, 23.5 Hr/Day) of the guidance value range of Category 1. From the above, it was classified as Category 1 of GHS Specific target organ toxicity (repeated exposure) (respiratory systems).
Aspiration hazard :	No data.
Others :	No information.

12. Ecological Information

Indicate the information for each of components of lead acid battery as below.

○ Lead (electrode plate, terminal)

Ecotoxicity :	No data.
Persistence/degradability :	No data.
Bioaccumulation :	No data.

Mobility in soil :	No information.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

○ Lead dioxide (electrode plate)

Ecotoxicity :	No data.
Persistence/degradability :	No data.
Bioaccumulation :	No data.
Mobility in soil :	No information.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

○ Lead sulfate

Ecotoxicity :	Crustacean: Daphnia magna, 48hr-IC_{50} = 0.5mg/L (Acute hazardous to the aquatic environment : Category 1 of GHS Ecotoxicity) Reliable chronic toxicity data has not been obtained. Since it is metal compound, the behavior in water is not known. Because acute toxicity is category 1, chronic hazardous to the aquatic environment was classified as "Category 1 of GHS Ecotoxicity ".
Persistence/degradability :	No data.
Bioaccumulation :	No data.
Mobility in soil :	No information.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

○ Dilute sulfuric acid (electrolyte)

Ecotoxicity :	Fishes: Bluegill, 96hr-LC_{50} = 16-28mg/L (Acute hazardous to the aquatic environment : Category 3 of GHS Ecotoxicity) Toxicity factor is considered to be aqueous solution which becomes strong acid, but toxic effect is eased by the buffer action in the environmental water. Therefore, Chronic hazardous to the aquatic environment was classified as

"Not classified".

Persistence/degradability :	No data.
Bioaccumulation :	No data.
Mobility in soil :	No data.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

13. Precautions for Disposal

Disposal considerations : In the disposal, follow the standards of the local government.
Entrust disposal to industrial waste disposal contractor who have obtained a license from local governor, otherwise if the local government is performing waste disposal, entrust them disposal.

14. Transport Information

International regulations(dangerous goods) :

Inland transport ;	Follow the regulation under ADR/RID.
In the U.S. and Canada ;	Follow the regulation under U.S. DOT.
Sea transport ;	Follow the regulation under IMO.
Air transport ;	Follow the regulation under ICAO/IATA(IATA Dangerous Goods Regulations (DGR) 64th Edition).
UN number ;	All batteries are identified as “Battery, Electric Storage, Wet, Nonspillable” when transported by air, sea or by land transportation. The battery(s) must be identified as above on the Bill of Lading and properly packaged with their terminals protected from short circuit. NA or UN numbers do not apply. Our battery(s) warning label identifies each battery as NONSPILLABLE.

Our seal lead-acid batteries are classified as “Nonspillable” for the purpose of transportation by DOT, and IATA/ICAO as result of passing the Vibration and Pressure Differential Test described in DOT [49 CFR 173.159 (f)] and IATA/ICAO [Special Provision A67].Our seal lead-acid batteries can be safely transported on deck, or under deck

	stored on either a passenger or cargo vessel as result of passing the Vibration and Pressure Differential Tests as described in the IMDG regulations(Special Provision 238). To transport these batteries as “non-spillable” they must be shipped in a condition that would protect them from short-circuits and be securely packaged so as to withstand conditions normal to transportation by a consumer, in or out of a device, they are unregulated thus requiring no additional special handling or packaging. For all modes of transportation, each battery and outer package is labeled “NON-SPILLABLE” per 49 CFR 173.159(f) and 49 CFR 173.159a. If you repackage our batteries either as batteries or as a component of another product you must label the outer package “NON-SPILLABLE” per 49 CFR 173.159(f) and 49 CFR 173.159a.
UN class ;	
Proper shipping name ;	BATTERIES, WET, NON-SPILLABLE, electric storage
Packing group ;	
Special requirements ;	IMO SP238, IATA A67
Marine pollutant ;	No
Special safety measures and condition for transport :	Avoid mixed load with other substances as much as possible. Handle the dilute sulfuric acid so as not to leak by overturning or falling. Load to not overturning, falling and damage, and take prevention of cargo collapse securely. Avoid transport under the direct sunlight and high temperature. Transport in accordance with the standards of other related laws and regulations.
Emergency response guideline number :	154
HS code :	8507.20 (Lead-acid batteries(any use except starting piston engines))

15. Regulatory Information

TSCA inventory :	All ingredients in this product are listed on the TSCA Inventory.
TSCA SNUR :	Not listed
SARA Title III :	
Section 302 EPCRA Extremely Hazardous Substances ;	Sulfuric acid is a listed "Extremely Hazardous Substance" under EPCRA, with a Threshold Planning Quantity (TPQ) of 1,000 lbs.
Section 304 CERCLA Hazardous Substances ;	Reportable Quantity (RQ) for spilled 100% sulfuric acid under CERCLA (Superfund) and EPCRA (Emergency Planning and Community Right to Know Act) is 1,000 lbs. State and local reportable quantities for spilled sulfuric acid may vary.
Section 311/312 Hazard Categorization ;	EPCRA Section 312 Tier Two reporting is required for non-automotive batteries if sulfuric acid is present in quantities of 500 lbs or more and/or if lead is present in quantities of 10,000 lbs or more.
Section 313 EPCRA Toxic Substances ;	"40 CFR § 372.38 Exemptions. (b) *Articles*" states "If a toxic chemical is present in an article at a covered facility, a person is not required to consider the quantity of the toxic chemical present in such article when determining whether an applicable threshold has been met under §372.25, §372.27, or §372.28 or determining the amount of release to be reported under §372.30. This exemption applies whether the person received the article from another person or the person produced the article. However, this exemption applies only to the quantity of the toxic chemical present in the article. If the toxic chemical is manufactured (including imported), processed, or otherwise used at the covered facility other than as part of the article, in excess of an applicable threshold quantity set forth in §372.25, §372.27, or §372.28, the person is required to report under §372.30. Persons potentially subject to this exemption should carefully review the definitions of article and release in §372.3. If a release of a toxic chemical occurs as a

	result of the processing or use of an item at the facility, that item does not meet the definition of article." Therefore, the Section 313 supplier notification requirement does not apply to VRLA batteries which are "consumer products".
Clean Air Act :	This product does not contain any substances regulated as hazardous air pollutants under Section 112 of the Clean Air Act.
Clean Water Act :	Lead is regulated as pollutants pursuant to the Clean Water Act.
STATE REGULATIONS (US) :	
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. Batteries also contain other chemicals known to the State of California to cause cancer. Wash hands after handling.

16. Other Information

Reference:

Globally Harmonized System of classification and labelling of chemicals, (5th ed., 2013), UN
JIS Z 7253:2019

1) NITE GHS classification data.
2) ECHA Home page (http://echa.europa.eu/information-on-chemicals)
3) NITE CHRIP (http://www.safe.nite.go.jp/japan/sougou/view/SystemTop_jp.faces)

Notice:

The contents described in this SDS are prepared based on the data and information currently available to us. However, it does not intend to be any guarantees in regard to content, physical and chemical properties, hazards, etc.

Please handle this product in the responsibility of the user after referring to this SDS.

In addition, the precautions are intended for normal handling. Please use under implementing safety measures that are suitable for application/usage if you want to special handling

Updated: JUN 11, 2023

SAFETY DATA SHEET

Valve Regulated Lead-acid Battery (VRLA Battery)
SDS No: SDS-CSB-001
Revision: 08.07.2023 Version No: 12.0 Page 1/25

1. Identification

Product identifier : Valve Regulated Lead-acid Battery (VRLA Battery)

Information on company

Company name : Eaton Corporation

Address : 8609 Six Forks Rd., Raleigh, NC 27615

Phone number : 800-843-9433

E-mail : LargeUPSTS@eaton.com

2. Hazards Identification

Health hazards :	Acute Toxicity (Oral) ;	Category 4
	Acute Toxicity (Inhalation - Vapors) ;	Category 4
	Skin Corrosion/Irritation ;	Category 1A
	Eye Damage/Irritation ;	Category 1
	Carcinogenicity ;	Category 1B
	Reproductive Toxicity;	Category 1A
	Specific Target Organ Toxicity (repeated exposure) ;	Category 1
Environmental hazards :	Hazardous to the aquatic environment;	
	Short-term (acute) hazard ;	Category 1
	Long-term (chronic) hazard ;	Category 1

Signal Word : Danger

Hazard Statements : Harmful if swallowed, if inhaled.

Causes severe skin burns and eye damage.

Causes serious eye damage.

May damage fertility or the unborn child if ingested or inhaled.

May cause harm to breast-fed children.

May cause cancer if ingested or inhaled.

May cause damage to organs through prolonged or repeated

exposure.

Very toxic to aquatic life.

Very toxic to aquatic life with long lasting effects.

Symbols :

Precautionary Statements :

Prevention ; Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.

Wear protective gloves/protective clothing/eye protection/face protection.

Avoid breathing dust/fume/gas/mist/vapors/spray.

Use only outdoors or in a well-ventilated area.

Do not breathe dusts or mists.

Obtain special instructions before use.

Do not handle until all safety precautions have been read and understood.

Avoid contact during pregnancy/while nursing.

Response ; If swallowed: Rinse mouth. Do NOT induce vomiting.

If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

Wash contaminated clothing before reuse.

If inhaled: Remove person to fresh air and keep comfortable for breathing.

Immediately call a poison center/doctor.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

If exposed or concerned: Get medical advice/attention.

Storage ; Store locked up.

Store in accordance with local/regional/national/international regulations .

Disposal ; Dispose of contents/container in accordance with local/regional/national/international regulations.

3. Composition/Information on Ingredients

Substance / Mixture : Mixture

Information on composition and ingredients:

NO.	Chemical name or common name	Component part	Content rate (mass ratio)	Chemical formula	CAS no.
1	Lead	Terminal, electrode plate	70-80%	Pb	7439-92-1
2	Lead dioxide	Electrode plate		PbO_2	1309-60-0
3	Lead sulfate	Electrode plate		$PbSO_4$	7446-14-2
4	Dilute sulfuric acid (27~50%)	Electrolyte	14-20%	H_2SO_4	7664-93-9
5	ABS resin	Battery container, lid	5-9%	—	9003-56-9
6	Tetrabromobisphenol-A	Battery container, lid	< 2.3%	$C_{15}H_{12}Br_4O_2$	79-94-7
7	Glass fiber	Separator	1-2%	—	65997-17-3

4. First-aid Measures

If inhaled : (Lead, lead dioxide, lead sulfate, dilute sulfuric acid)
Remove person to fresh air, keep comfortable for breathing.
Get medical advice/attention.

If on skin : (Lead, lead dioxide, lead sulfate)
Wash skin with plenty of water and soap.
If skin irritation occurs, get medical advice/attention.
(dilute sulfuric acid)
Take off or remove immediately all contaminated clothing.
Rinse skin with water or shower.
If skin irritation or chemical injury occurs, get medical advice/attention.

If in eyes : (Lead, lead dioxide, lead sulfate, dilute sulfuric acid)
Open the eyelids with your fingers, rinse thoroughly with water for at least 15 minutes.
Remove contact lenses, if present and easy to do.
Continue rinsing.
Get medical attention/advice.

If swallowed : (Lead, lead dioxide, lead sulfate)
Rinse mouth.

	Get medical advice/attention.
	(dilute sulfuric acid)
	Rinse mouth.
	Give plenty of water.
	Do not induce vomiting.
	Get medical advice/attention.
Most important symptoms/effects, acute and delayed :	(Lead, lead dioxide, lead sulfat e)
	Stomach cramps, lethargy, hea dache, nausea, vomiting, weakness, wheezing, pallor, hemoglobinuria, collapse.
	(dilute sulfuric acid)
	Corrosive, burning sensation, sore throat, cough, breathlessness, shortness of breath, redness, pain, blisters, severe skin burns, severe burns, abdominal pain, shock or collapse.
Protection for first-aiders :	Rescuers wear protective equipment such as rubber gloves and tight-fitting safety goggles.
Special note to physician :	(Dilute sulfuric acid)
	Symptoms of lung edema often do not show until a few hours have passed, and it might aggravate if it does not take a rest. Therefore, it is necessary to take a rest and medical observation.

5. Fire Fighting Measures

Suitable extinguishing media :	Extinguish the fire by extinguishers of dry chemical agent, foam fire extinguish agent, and non-flammable gas.
Unsuitable extinguishing media :	No information.
Specific risk/hazard :	In case of fire, there is a possibility that irritative, corrosive or toxic fumes or gases are generated.
	There is a possibility of explosion of the product by heat.
	May form explosive air/gas mixture during charging.
	There is a possibility of hydrogen emission and explosion during charging.
Specific fire fighting method :	Cut off the power in case of connection/energizing the product into the device, if can be coped with safely.
	Move the product from the fire area if it is not dangerous.

	After extinguishing the fire, continue to cool the container thoroughly with plenty of water. Immediately move the movable product to safe place when fire occurs in surrounding. If it is not movable, cool the product with water spray. Keep away the combustible materials to prevent spread fire around.
Protection for fire-fighters :	Extinguish fire from upwind. Wear appropriate protective clothes for chemical (self-contained breathing apparatus, protective glasses, etc.) to fire fighting.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency measures :	Wear appropriate protective equipment (gloves, protective glasses, protective clothing and the like), when processing the leakage. Do not touch or walk through the leakage. Do not breathe dust, mist and vapour. May form explosive air/gas mixture during charging. There is a possibility of hydrogen emission and explosion during charging.
Precautions for the environment :	Be careful to not discharge the product into the rivers, sewer, and soil.
Method for containment and clean-up :	If dilute sulfuric acid is leaked, stopping the flow with sand and earth, absorbing mat and the like, remove by absorbing with them. And then, neutralized with sodium bicarbonate or slaked lime, and wash off with plenty of water. Absorb by sprinkling misty water when the gas is generated. Collected material should be disposed in compliance with '13. Disposal Considerations'.
Prevention of secondary hazards :	Immediately remove all ignition sources in the vicinity. Prepare fire extinguishing equipment just in case it is ignited.

7. Handling and Storage

Handling :

Technical measures ;	Take measure described in '8: Exposure Controls and Personal Protective Equipment', and wear appropriate protective equipment.
Local exhaust/general ventilation ;	Work in a well-ventilated place and provide local exhaust or general ventilation as necessary.
Cautions for Safety Handling ;	Do not use fire near the product. Do not dismantle or modify the product. Do not do short-circuit between the terminals. Handling and charging of the product should be in well ventilated place. Prevent falling and overturning of container. Careful to not give a shock. Try to not damage the product. Be careful not to spill the dilute sulfuric acid. Do not eat, drink or smoke when using this product.

Storage :

Technical measures ;	Provide a ventilation and lighting required for storing and handling hazardous materials in the storage location.
Storage condition ;	Do not store near the fire. Do not store in place where is exposed to high temperature, high humidity, rain, direct sunlight. Store in place where is no risk of fire, toxic gas, liquid droplets, generating or invasion of dust, and submerged.

8. Exposure Controls and Persor al Protective Equipment

Controlled exposure level :	Lead (electrode plate, terminal), lead dioxide(electrode plate), lead sulfate(electrode plate) Lead and its compounds(as lead) TLV = 0.05 mg/m^3
Permissible exposure level :	
OSHA PEL ;	Lead(electrode plate, terminal), lead dioxide(electrode plate), lead sulfate(electrode plate) Lead and inorganic compounds (as lead) : TWA = 0.05 mg/m^3 Dilute sulfuric acid(electrolyte)

Sulfuric acid: TWA = 1mg/m^3

ACGIH (2017) ; Lead(electrode plate, terminal), lead dioxide(electrode plate),lead sulfate(electrode plate)
LEAD AND INORGANIC COMPOUNDS, AS Pb
TLV-TWA = 0.05 mg/m^3
Dilute sulfuric acid(electrolyte)
Sulfuric acid: TLV-TWA = 0.2mg/m^3

Engineering controls : Provide hand wash and eyes wash facilities and safety shower near the handling place as necessary.

Personal protective equipment :

Respiratory protection ; Wear respiratory protective equipment (air respirator, dust mask, gas mask (for acid gases)) as necessary.

Hand protection ; Wear impermeable protective gloves (acid resistance).

Eye protection ; Wear protective glasses, goggle type safety glasses and the like.

Skin and body protection ; Wear protective clothing, protective apron and the like as necessary.

Hygiene measures : Do not eat, drink or smoke when handling.
Wash hands thoroughly after handling.
Protective equipment shall be inspected regularly according to the protective equipment checklist.

9. Physical and Chemical properties

Describes the information about the components below.

	Lead	Lead dioxide	Lead sulfate	Dilute sulfuric acid
Appearances (physical state, form, color, etc.)	Silver white solid	Brown crystal or powder	White crystal	Colorless transparent liquid
Odor	No information.	No information.	No information.	Odorless (normal temperature)
Threshold of odor	No information.	No information.	No information.	No information.
pH	No information.	No information.	No information.	≦1
Melting point	327.4°C	888°C	1170°C	No information
Boiling point, initial	1,749°C	1,480°C	No information	No information

boiling point and boiling range				
Flash point	Non flammable	Non flammable	Non flammable	Non flammable
Flammability(solid, gas)	Non flammable	Non flammable	Non flammable	Not applicable
Specific gravity(density)	11.35g/cm^3 (20°C)	9.53g/cm^3	6.2	Approx. 1.2～1.4
Solubility	Water: Insoluble.	Water: Insoluble.	Water: Hardly soluble.	Miscible in water. Soluble in alcohol.
Partition coefficient (n-octanol/water)	No information.	No information	No information	No information
Auto-ignition temperature	Non flammable	Non flammable	Non flammable	Non flammable
Decomposition temperature	No information.	290°C	1000°C	No information
Viscosity	No information.	No information.	No information.	No information.
Other Information	No information.	No information.	No information.	No information.

10. Stability and Reactivi y

Stability :

(lead)

When oxygen is present, it will be eroded by pure water and the weak organic acid. At normal temperature, it will be eroded by fluorine or chlorine.

(lead dioxide/ lead sulfate)

It is considered to be stable under normal handling and storage.

(dilute sulfuric acid)

At first, vapor is generated by heating, and generate sulfuric acid vapors if continue to heat.

Rapid contact with water might be generate a large amount of heat, and sometimes the acid is scattered.

Dilute sulfuric acid which is generated by diluting with water, generates hydrogen gas by the corrosion of various metals and may cause flash explosion by mixing with air.

	There is hygroscopic.
Hazardous reactivity :	(lead) It does not occur hazardous reaction under normal condition. (lead dioxide) React violently with combustible materials and organic matter (sulfuric acid, hydrogen peroxide, phosphoric acid), and it may cause risk of fire. (lead sulfate) It may react with strong oxidizing agents. (dilute sulfuric acid) It may cause fire or explosion by many reactions. It is strong oxidant and reacts with combustible and reducing materials. It is strong acid and reacts violently with bases and is corrosive to most common metals forming a flammable/explosive gas(hydrogen). React with water and organic materials violently and release heat.
Conditions to avoid :	Heating, contact with ignition sources (open flame, spark, etc.,)
Incompatible materials :	(lead) ; Oxidizing agent. (lead dioxide) ; Flammable materials, reducing materials. (lead sulfate) ; Strong oxidizing agents. (dilute sulfuric acid) ; Combustible materials, reducing materials, strong oxidizing agents, strong bases.
Hazardous decomposition products :	In case of fire, there is a possibility that irritative or toxic gases or fumes are generated.
Other information	May form air/gas mixture during charging. There is a possibility of hydrogen emission and explosion during charging.

11. Toxicological Information

Indicate the information for each of components of lead acid battery as below.

○Lead (electrode plate, terminal)

Acute toxicity (Oral) :	Acute Toxicity Estimate (ATE) = 500 mg/kg It was classified as Category 4 of GHS acute toxicity (Oral).
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation - Gases) :	Classification not applicable because it is a solid in the definition of GHS.
Acute toxicity (Inhalation - Vapors) :	Acute Toxicity Estimate (ATE) = 11 mg/l It was classified as Category 4 of GHS acute toxicity (Inhalation - Vapors)
Acute toxicity (Inhalation - Dusts and Mists) :	No data.
Skin corrosion/irritation :	No data.
Serious eye damage/eye irritation :	No data.
Respiratory or skin sensitization :	No data.
Germ cell mutagenicity :	Although there are contradicting results about the chromosome aberration in the peripheral blood lymphocytes from people who are engaged in lead-related work (IARC suppl.7 (1987), EHC 3 (1977), DFGOTvol.17 (2002), ACGIH (7th, 2001)), there are descriptions of lead itself having chromosome aberration/micronucleus inductive actions. Therefore, it was classified as Category 2 of GHS Germ cell mutagenicity.
Carcinogenicity :	From the below classifications, it was classified as Category 2 of GHS Carcinogenicity. ● IARC Supplement 7 (1987) and Japan Society for Occupational Health: 2B ● ACGIH (7th, 2001): A3 ● EPA (IRIS (1993)): B2
Reproductive toxicity :	Since there is the description that there is the affect for sperm formation disorder in human exposure example (EHC 3 (1977), ACGIH (7th, 2001), DFGOTvol.17 (2002)), and ovulation dysfunction was observed in the female occupation exposure example (EHC 3 (1977)), it was classified as "Category 1A of GHS Reproductive toxicity".

	There are the descriptions about the relationship with neonatal developmental disorder of cognitive function (ACGIH (7th, 2001), DFGOTvol.17 (2002), PATTY (4th, 1994) and IARC 23 (1980)), and the descriptions about the relationship with the increase of miscarriage (DFGOTvol.17 (2002), and PATTY (4th, 1994)). However, the distinct conclusion has not obtained.
Specific target organ toxicity (single exposure) :	Although there was a case report that renal dysfunction was observed in the acute toxicity in human (DFGOT, vol.17 (2002)), there was the description that no kidney damage in the subsequent epidemiologic study in the same source of reference. Therefore, the data is insufficient for considering the kidney as target organ, therefore, it is classified as "classification not possible".
Specific target organ toxicity (repeated exposure) :	Due to the descriptions that the target organs were hematopoietic system, nervous system, kidney, and cardiovascular system in DFGOTvol.17 (2002), that heme synthesis inhibitors, nephropathy and brain diseases were observed in the human exposure examples in EHC 3 (1977), ACGIH (7th, 2001), PATTY (4th, 1994), and IARC 23 (1980), that it affects to the peripheral nerve and function of central nerve system in humans exposure examples in EHC 3 (1977), ACGIH (7th, 2001), PATTY (4th, 1994), that it affects to cardiovascular system, such as high blood pressure in human exposure examples in EHC 3 (1977), ACGIH (7th, 2001), that the immunosupressive effect was observed in human exposure examples in PATTY (4th, 1994), it is considered that the target organs were hematopoietic system, the kidney, central nervous systems, peripheral nervous system, cardiovascular system and immune system, and they all were classified as “Category 1 of GHS Specific target organ toxicity (repeated exposure)”. Although there are the descriptions of the case reports of thyroid or adrenal hypofunctions in EHC 3 (1977), each case reports

	are before 1970, and there is no similar report after that, since there is the description that no effects was observed in the thyroid in DFGOTvol.17 (2002), the thyroid and the adrenal gland were not considered as for target organs.
Aspiration hazard :	No data.
Others :	No information.

○Lead dioxide (electrode plate)

Acute toxicity (Oral) :	No data.
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation: Gases) :	Classification not applicable because it is a solid in the definition of GHS.
Acute toxicity (Inhalation: Vapors) :	No data.
Acute toxicity (Inhalation: Dust and Mists) :	No data.
Skin corrosion/irritation :	Since there is the description of "Probably a severe eye, skin, and mucous membrane irritant "(HSDB (2006)), it is considered that indicate severe irritation to skin. Therefore, it was classified as Category 2 of GHS Skin corrosion/irritation.
Serious eye damage/eye irritation :	Since there is the description of "Probably a severe eye, skin, and mucous membrane irritant "(HSDB (2006)), it is considered that indicate severe irritation to eyes. Therefore, it is classified as Category 2A of GHS Serious eye damage/eye irritation.
Respiratory or skin sensitization :	No data.
Germ cell mutagenicity :	From the description of NTP DB (Access on February 2006); ● Heritable germ cell mutagenicity tests: None. ● Germ cell/ somatic cells in vivo mutagenicity tests: None. ● Germ cell/ somatic cells in vivo genetic toxicity test: None. ● Positive (strong) results of multiple indicators in in vitro mutagenicity test: None.

	It was classified as “Classification not possible”.
Carcinogenicity :	From the below classifications, it was classified as Category 2 of GHS Carcinogenicity . ● NTP (2005): R ● IARC (1987): Group 2B ● ACGIH (2001): A3
Reproductive toxicity :	Since lead is known as neurotoxic substance and reproductive toxic substance for human, it is classified as "Category 1A of GHS Reproductive toxicity " based on experts' judgement.
Specific target organ toxicity (single exposure, repeated exposure) :	For this substance, it is assumed that the classification based on the effects of inorganic lead compounds. As the toxicity of inorganic lead compounds for humans, there is the description below; "acute effects and chronic effects of inorganic lead has been recognized almost the same symptoms. By inhalation or ingestion of inorganic lead, it has been reported that cause the convergence of the mouth, thirst. And also nausea, vomiting, upper abdominal discomfort, loss of appetite, abdominal pain, constipation and the like has been reported as effects on the digestive organs. Effects on hematopoiesis are typical effects of inorganic lead, it has been observed hemoglobin synthesis inhibition and anemia due to shortened of red blood cell life, caused by inhibition of δ-aminolevulinic acid and heme synthesis enzyme. Interstitial nephropathy as the effect to the kidneys, in addition to decreasing amount of urine, proteinuria, hematuria, urine cylinder, the proximal tubule disorder exhibiting a Fanconi syndrome typified by diabetes and amino acid urine is reported. Inorganic lead affects on the peripheral nervous system, in particular, muscle weakness in limbs, pain and convulsions are observed. In addition, although it is very rare case in adults, in case of being exposed to extremely high concentrations (details unknown), the effects on the central

nervous system are observed such as ataxia, headache, paresthesia, depression and coma.
However, in effects on the central nervous system, particularly sensitive in children, and the symptoms with no restless, aggressive personality, difficulty concentrating, decline of memory and the like have become a problem in the U.S." (CERI Hazard Assessment Report 2001-9(2002))
Therefore, blood system, kidney and nervous system are considered to be target organs. From the above, it was classified as "Category 1 of GHS Specific target organ toxicity (single exposure, repeated exposure) (blood system, kidney, nervous system)".

Aspiration hazard :	No data.
Others :	No information.

○ Lead sulfate (electrode plates)

Acute toxicity (Oral) :	No data.
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation: Gases) :	Classification not applicable because it is a solid in the definition of GHS.
Acute toxicity (Inhalation: Vapors) :	No data.
Acute toxicity (Inhalation: Dust and Mists) :	No data.
Skin corrosion/irritation :	No data. As effects on humans, although there is no data that can be obtained for local effects on the skin and mucous membranes by lead and inorganic lead compounds, there is the description of that there is likely to cause severe irritation and burns to the skin.
Serious eye damage/eye irritation :	No data. As effects on humans, although there is no data indicating the local effects on the mucous membranes by lead and inorganic lead compounds, there is the description of that there is likely to cause severe irritation and burns to the eye.

Respiratory or skin sensitization :	No data.
Germ cell mutagenicity :	It is “Classification not possible” due to insufficient data of in vivo test. In addition, in the in vitro test, there is the negative report in Ames test. Moreover, although it may not be necessarily matched results have been obtained, there is also the positive result in chromosome analysis using peripheral blood of workers who received the occupational exposure of lead. However, the used method is insufficient in most of the tests, overall it stated that it cannot be conclusive evaluation of genotoxicity in human. Inorganic lead compounds in MAK / BAT (2010) are classified as germ cell mutagenicity 3A.
Carcinogenicity :	In carcinogenicity evaluation of IARC, it is classified as Group 2A as inorganic compounds. Therefore, this substance was classified as Category 1B of GHS Carcinogenicity. In addition, it is classified as A3 in ACGIH as inorganic lead compound.
Reproductive toxicity :	Although there is no data of this substance, as effect on humans of inorganic lead compounds, an increase in the spontaneous abortion of pregnancy before 20 weeks was observed by a high concentration exposure of mothers in cases or epidemiological studies. There is description that exposure during the pregnancy is related increased in teratogenicity, low weight newborns and suppression of body weight gain after birth. Although decrease in sperm count and semen volume, morphological changes of sperm, and decreasing of sperm motility were observed by the occupational exposure, in most studies, it is observed dose-response relationship between these effects and exposure concentration of lead, and toxicity for sperm has been reported to have been unclear.
Specific target organ toxicity (single exposure) :	Although there is no data of this substance, neurotoxic effect of lead is known, and receives the influence of the lead in both the peripheral nerves and the central nervous

	system. Lead encephalopathy is one of the early symptoms of acute exposure. From also that there is a report of the suppression of the pituitary hands and nerve conduction velocity by the occupational exposure, it is classified as "Category 1 of GHS specific target organ toxicity (single exposure) (nervous system)". In high concentration acute exposure of lead and inorganic lead compounds, it causes dysfunction of the proximal tubule. There is the description that it causes Fanconi syndrome (diabetes, amino acid urine disease, phosphate urine disease and the like) as renal symptoms of acute lead poisoning. Therefore, it was classified as “Category 1 of GHS specific target organ toxicity (single exposure) (kidney)”. Moreover, lead is also known to give a change in the blood system. There is the description that the hemoglobin synthesis inhibition and small blood cell anemia and hypochromic anemia due to shortened of red blood cell life are caused by δ-aminolevulinic acid and heme synthesis enzyme are inhibited. Therefore, it is classified as "Category 1 of GHS specific target organ toxicity (single exposure) (blood system)". Other, colic is the initial symptoms of occupational exposure or high concentration acute exposure. Since there is the description of the associated symptoms such as constipation, severe abdominal pain, nausea, vomiting, loss of appetite, it is classified as "Category 1 of GHS specific target organ toxicity (single exposure) (digestive system)".
Specific target organ toxicity (repeated exposure) :	Although there is no data of the substance, there is the description that in high concentration repeated exposure by lead and inorganic lead compounds, it leads to irreversible changes to kidney including tubular atrophy, interstitial fibrosis glomerular sclerosis, and eventually it cause chronic nephritis. Therefore, it was classified as "Category

1 of GHS specific target organ toxicity (repeated exposure) (kidney)".
In addition, there is the report of the lead epidemiological study, hemoglobin concentration and hematocrit value of poisoning patients were significantly decreased compared with control subjects of non-exposure.
There is the description that the hemoglobin synthesis inhibition and small blood cell anemia and hypochromic anemia due to shortened of red blood cell life are caused by δ-aminolevulinic acid and heme synthesis enzyme are inhibited. Therefore, it was classified as "Category 1 of GHS specific target organ toxicity (repeated exposure) (blood system)".
On the other hand, there is the research study to support the relationship between the chronic lead poisoning and myocardial injury, and there is reported that abnormal electrocardiogram in workers of lead poisoning was observed. In addition, from the data of epidemiological studies, since it has been concluded that internal absorption of lead causes a significant increase in blood pressure in both diastolic and systolic of the heart, it was classified as Category 1 of GHS specific target organ toxicity (repeated exposure) (cardiovascular).
Moreover, suppression of motor nerve conduction velocity was observed in worker who blood concentration of lead is high, and also there is a report of the Parkinson's syndrome has been observed in seven out of nine that have been exposed for more than 30 years in a lead-acid battery. Therefore, it was classified as "Category 1 of GHS specific target organ toxicity (repeated exposure) (nervous system)".

Aspiration hazard : No data.

Others : No information.

○ Dilute sulfuric acid (electrolyte)

Acute toxicity (Oral) :	Based on the Rat LD_{50} value: 2140mg/kg and the description of the death case report by the oral ingestion in humans (amount of intake is unknown), it was classified as Category 5 of GHS acute toxicity (Oral).
Acute toxicity (Dermal) :	No data.
Acute toxicity (Inhalation: Gases) :	Classification not applicable because it is a liquid in the definition of GHS.
Acute toxicity (Inhalation: Vapors) :	No data.
Acute toxicity (Inhalation: Dust and Mists) :	Based on rat LC_{50} value: 0.375mg/L (4 hour exposure) and 347ppm (1-hour exposure) (4 hour equivalent value: 0.347mg/L), it was classified as Category 2 of GHS acute toxicity (inhalation).
Skin corrosion/irritation :	Since pH of concentrated sulfuric acid was 1 or less, it was judged to be corrosive substance in accordance with the GHS classification standards, and classified as Category 1A-1C of GHS skin corrosion/irritation.
Serious eye damage/eye irritation :	There is the description that the critical damage to the eye accompanied by lysis of anterior chamber of eye was observed in accident case of human. And also from the description that the moderate irritation with 5% solution and the severe irritation with 10% solution were observed to the eye of rabbit, therefore, it was classified as "Category 1 of GHS serious eye damage/eye irritation".
Respiratory or skin sensitization :	Respiratory sensitization: No data. Skin sensitization: There is no test data on skin sensitizing of sulfuric acids. Although sulfuric acid has been industrially used for several decades, there is no case report of skin sensitization while skin injuries by skin irritation are well known. Although an extensive amount of sulfate ion exists internally (the sulfate ion in serum ~33 mmol/L, and 50 times more in cells), allergic reactions do not occur. In allergic test of sulfuric acid salt of metal, even if allergic

	positive with metal may occur, sulfuric ion is presumed to result in allergic negative as is suggested by the negative results in sulfate of zinc. Based on the description that conclusion is obtained from the results mentioned above that sulfate does not cause allergy to human, it is classified as "Not classified".
Germ cell mutagenicity :	For in vivo, there is not any test data which the reproductive cells and the somatic cells were used. For in vitro mutagenicity tests, there is the positive result only in the test system with the single indicator (chromosomal aberration test). However, there are negative results in other indices. Therefore, it was classified as "Classification not possible".
Carcinogenicity :	Occupational exposure of the mist of the inorganic strong acid including sulfuric acids is classified as group 1 according to IARC, as A2 according to ACGIH, and as K according to NTP. Respect the evaluation of IARC and the latest NTP, it was classified as category 1. However, sulfuric acids itself was classified as the category 4 according to DFGOT. And, since none of those institutions have carried out the carcinogenic classification, it was classified as "Classification not possible".
Reproductive toxicity :	In inhalation exposure test using rabbit and mouse in fetal organogenesis period, it is not observed of fetotoxicity and teratogenicity at the dose causing no maternal toxicity in both species. And also, the effect on the reproductive organ of both sexes is not observed in chronic toxicity test and carcinogenicity test. Since the direct effect by irritation/corrosive is the main toxicity, it is judged that there is no concern that indicates the reproductive toxicity, therefore, it was classified as "Not classified".
Specific target organ toxicity (single exposure) :	There is the descriptions that in the inhalation exposure of low concentration in humans, airway irritation symptoms such as cough and breath shortness are observed and at

	high concentration exposure, addition to acute effects such as cough, breath shortness and hemoptysis shedding etc., permanent effects such as functional depression of lungs, fibrosis and emphysema are observed. Additionally, there is the description that hemorrhage and dysfunction in lungs were observed in 8-hour inhalation exposure using guinea pigs. Based on these descriptions, it was classified as "Category 1 of GHS Specific target organ toxicity (single exposure) (respiratory systems)".
Specific target organ toxicity (repeated exposure) :	In the 28-day inhalation exposure test using rat, cell proliferation in laryngeal mucosa is observed in guidance value range of Category 1 of GHS Specific target organ toxicity (repeated exposure). In the 14 to 139-day repeated inhalation exposure test using the guinea pigs, respiratory and lung disorder, such as nasal-septum dropsy, pulmonary emphysema, atelectasis, hyperemia, dropsy, bleeding and thrombosis of bronchioles are observed at the concentration range of guidance value of Category 1 of GHS Specific target organ toxicity (repeated exposure). Furthermore, in the 78-week inhalation exposure test using a cynomolgus, histological change as hyperplasia of a cell, the wall thickening, etc. in bronchioles of lungs were observed at the dosage (0.048 mg/L, 23.5 Hr/Day) of the guidance value range of Category 1. From the above, it was classified as Category 1 of GHS Specific target organ toxicity (repeated exposure) (respiratory systems).
Aspiration hazard :	No data.
Others :	No information.

12. Ecological Information

Indicate the information for each of components of lead acid battery as below.

○ Lead (electrode plate, terminal)

Ecotoxicity :	No data.
Persistence/degradability :	No data.
Bioaccumulation :	No data.

Mobility in soil :	No information.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

○Lead dioxide (electrode plate)

Ecotoxicity :	No data.
Persistence/degradability :	No data.
Bioaccumulation :	No data.
Mobility in soil :	No information.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

○Lead sulfate

Ecotoxicity :	Crustacean: Daphnia magna, 48hr-IC_{50} = 0.5mg/L (Acute hazardous to the aquatic environment : Category 1 of GHS Ecotoxicity) Reliable chronic toxicity data has not been obtained. Since it is metal compound, the behavior in water is not known. Because acute toxicity is category 1, chronic hazardous to the aquatic environment was classified as "Category 1 of GHS Ecotoxicity ".
Persistence/degradability :	No data.
Bioaccumulation :	No data.
Mobility in soil :	No information.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

○Dilute sulfuric acid (electrolyte)

Ecotoxicity :	Fishes: Bluegill, 96hr-LC_{50} = 16-28mg/L (Acute hazardous to the aquatic environment : Category 3 of GHS Ecotoxicity) Toxicity factor is considered to be aqueous solution which becomes strong acid, but toxic effect is eased by the buffer action in the environmental water. Therefore, Chronic hazardous to the aquatic environment was classified as

"Not classified".

Persistence/degradability :	No data.
Bioaccumulation :	No data.
Mobility in soil :	No data.
Hazardous to the ozone layer :	Not contain ingredients listed in the Annex of the Montreal Protocol.

13. Precautions for Disposal

Disposal considerations : In the disposal, follow the standards of the local government.

Entrust disposal to industrial waste disposal contractor who have obtained a license from local governor, otherwise if the local government is performing waste disposal, entrust them disposal.

14. Transport Information

International regulations(dangerous goods) :

Inland transport ;	Follow the regulation under ADR/RID.
In the U.S. and Canada ;	Follow the regulation under U.S. DOT.
Sea transport ;	Follow the regulation under IMO.
Air transport ;	Follow the regulation under ICAO/IATA(IATA Dangerous Goods Regulations (DGR) 64th Edition).
UN number ;	All batteries are identified as “Battery, Electric Storage, Wet, Nonspillable” when transported by air, sea or by land transportation. The battery(s) must be identified as above on the Bill of Lading and properly packaged with their terminals protected from short circuit. NA or UN numbers do not apply. Our battery(s) warning label identifies each battery as NONSPILLABLE.

Our seal lead-acid batteries are classified as “Nonspillable” for the purpose of transportation by DOT, and IATA/ICAO as result of passing the Vibration and Pressure Differential Test described in DOT [49 CFR 173.159 (f)] and IATA/ICAO [Special Provision A67].Our seal lead-acid batteries can be safely transported on deck, or under deck

	stored on either a passenger or cargo vessel as result of passing the Vibration and Pressure Differential Tests as described in the IMDG regulations(Special Provision 238). To transport these batteries as “non-spillable” they must be shipped in a condition that would protect them from short-circuits and be securely packaged so as to withstand conditions normal to transportation by a consumer, in or out of a device, they are unregulated thus requiring no additional special handling or packaging. For all modes of transportation, each battery and outer package is labeled “NON-SPILLABLE” per 49 CFR 173.159(f) and 49 CFR 173.159a. If you repackage our batteries either as batteries or as a component of another product you must label the outer package “NON-SPILLABLE” per 49 CFR 173.159(f) and 49 CFR 173.159a.
UN class ;	
Proper shipping name ;	BATTERIES, WET, NON-SPILLABLE, electric storage
Packing group ;	
Special requirements ;	IMO SP238, IATA A67
Marine pollutant ;	No
Special safety measures and condition for transport :	Avoid mixed load with other substances as much as possible. Handle the dilute sulfuric acid so as not to leak by overturning or falling. Load to not overturning, falling and damage, and take prevention of cargo collapse securely. Avoid transport under the direct sunlight and high temperature. Transport in accordance with the standards of other related laws and regulations.
Emergency response guideline number :	154
HS code :	8507.20 (Lead-acid batteries(any use except starting piston engines))

15. Regulatory Information

TSCA inventory :	All ingredients in this product are listed on the TSCA Inventory.
TSCA SNUR :	Not listed
SARA Title III :	
Section 302 EPCRA Extremely Hazardous Substances ;	Sulfuric acid is a listed "Extremely Hazardous Substance" under EPCRA, with a Threshold Planning Quantity (TPQ) of 1,000 lbs.
Section 304 CERCLA Hazardous Substances ;	Reportable Quantity (RQ) for spilled 100% sulfuric acid under CERCLA (Superfund) and EPCRA (Emergency Planning and Community Right to Know Act) is 1,000 lbs. State and local reportable quantities for spilled sulfuric acid may vary.
Section 311/312 Hazard Categorization ;	EPCRA Section 312 Tier Two reporting is required for non-automotive batteries if sulfuric acid is present in quantities of 500 lbs or more and/or if lead is present in quantities of 10,000 lbs or more.
Section 313 EPCRA Toxic Substances ;	"40 CFR § 372.38 Exemptions. (b) Articles" states "If a toxic chemical is present in an article at a covered facility, a person is not required to consider the quantity of the toxic chemical present in such article when determining whether an applicable threshold has been met under §372.25, §372.27, or §372.28 or determining the amount of release to be reported under §372.30. This exemption applies whether the person received the article from another person or the person produced the article. However, this exemption applies only to the quantity of the toxic chemical present in the article. If the toxic chemical is manufactured (including imported), processed, or otherwise used at the covered facility other than as part of the article, in excess of an applicable threshold quantity set forth in §372.25, §372.27, or §372.28, the person is required to report under §372.30. Persons potentially subject to this exemption should carefully review the definitions of article and release in §372.3. If a release of a toxic chemical occurs as a result

	of the processing or use of an item at the facility, that item does not meet the definition of article." Therefore, the Section 313 supplier notification requirement does not apply to VRLA batteries which are "consumer products".
Clean Air Act :	This product does not contain any substances regulated as hazardous air pollutants under Section 112 of the Clean Air Act.
Clean Water Act :	Lead is regulated as pollutants pursuant to the Clean Water Act.
STATE REGULATIONS (US) :	
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. Batteries also contain other chemicals known to the State of California to cause cancer. Wash hands after handling.
Substances of very high concern (SVHC) according to REACH, Article 57	CAS: 7439-92-1 Lead CAS: 79-94-7 Tetrabromobisphenol-A

16. Other Information

Reference:

Globally Harmonized System of classification and labelling of chemicals, (5th ed., 2013), UN
JIS Z 7253:2019

1) NITE GHS classification data.
2) ECHA Home page (http://echa.europa.eu/information-on-chemicals)
3) NITE CHRIP (http://www.safe.nite.go.jp/japan/sougou/view/SystemTop_jp.faces)

Notice:

The contents described in this SDS are prepared based on the data and information currently available to us. However, it does not intend to be any guarantees in regard to content, physical and chemical properties, hazards, etc.

Please handle this product in the responsibility of the user after referring to this SDS.

In addition, the precautions are intended for normal handling. Please use under implementing safety measures that are suitable for application/usage if you want to special handling