SAFETY DATA SHEET
VALVE REGULATED LEAD ACID BATTERIES

SECTION I. GENERAL INFORMATION

Manufacturer's Name	Zhejiang Narada Power Source C. Ltd.	Emergency Contact 24 Hours		CHEM TEL 800-255-3924 Outside U.S. 1-813-248-0585 MIS1406324	
Address:	72/Jingguan Road, Qingshan Town Lin'an Economic Development Zone Zhejian, China Post Code 311305	Label rating for Sulfuric Acid H_2SO_4	HMIS NFPA	**3 0 2 X** **2 0 1 X**	X=acid
Contact Information	MSDS Questions Safety Department U.S. 800-982-4339 China: +86-571-56975980	Issued Date Revised Date:		2018-01-31 2019-01-07	

II. COMPOSITION - INGREDIENTS /IDENTITY INFORMATION

Under normal use and batteries do not emit hazardous or regulated substances			Approximate Air Exposure Limits (μg/m^3)			* (mg/kg) ** (mg/m^3)		
Component	CAS Number	% by Wt.	OSHA PEL	ACGIH TLV	NIOS REL	LD50* Oral	LC50** Inhalation	LDLo* Contact
Inorganic Components (Hazard Category)								
Lead /Grid (Acute-Chronic)	7439-92-1	50-56	50	50	100	500	20	N/A
Lead Oxide/Dioxide (Acute-Chronic)	1309-60-0	15 - 20	50	50	100	500	20	N/A
Lead Sulfate/ Anglesite (Acute-Chronic)	7446-14-2	<1	50	50	100	500	20	N/A
Tin (Chronic)	7440-31-5	0.2-0.6	2000	2000	2000			
Copper (Chronic)	7440-50-8	< 0.1	1000	1000	1000			
Electrolyte –sulfuric acid (Reactive-Oxidizer Acute-Chronic)	7664-93-9	18-21	1000	200	1000 STEL	2140	18	135
Case /Cover Material:								
Acrylonitrile Butadiene Styrene - ABS	9003-56-9	6-10	N/A	N/A	N/A			
Other Material:								
Glass Mat	N/A	2-3	N/A	N/A	N/A			
Silicon Dioxide **Gel batteries only	7631-86-9	3 – 5%	5000	10000				

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Polypropylene - PP **Gel batteries only	9002-86-2	0.9%	N/A	N/A	N/A			

NOTE: Inorganic lead and electrolyte (water and sulfuric acid solution) are the primary components of every battery manufactured by Energy Storage Systems. Other ingredients may be present dependent upon battery type.

PEL's for Individual states may differ from OSHA's PEL's. Check with local authorities for the applicable state PEL's.

OSHA – Occupational Safety and Health Administration

ACGIH – American Conference of Governmental Industrial Hygienists

NIOSH – National Institute for Occupational Safety and Health.

COMMON NAME: (Used on label) Valve Regulated Lead Acid battery

(Trade Name & Synonyms) VRLA Battery, Valve Regulated Lead Acid Battery, NonSpillable Battery, AGM, GEL, HCT-Series, LD-Series, HR-Series, GP-Series, BC-Series

Chemical Family: Toxic and Corrosive Material Mixture

Chemical Formula: Lead/Acid

Name: Battery, Storage, Lead Acid, Valve Regulated, NonSpillable

Section III. HAZARDOUS IDENTIFICATION

Signs and Symptoms of Exposure	Acute Hazards	Do not open battery. Avoid contact with internal components. Internal components include lead and gelatinous electrolyte. **Electrolyte** - 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.
	Subchronic and Chronic Health Effects	**Electrolyte** - Repeated contact with electrolyte causes irritation and skin burns. Repeated exposure to mist may cause erosion of teeth, chronic eye irritation and/or chronic inflammation of the nose, throat and lungs. **Lead** – Prolonged exposure may cause central nervous system damage, gastrointestinal disturbances, anemia, wrist-drop and kidney dysfunction. 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	California Proposition 65 YES	National Toxicology Program YES	I.A.R.C. Monographs YES	O.S.H.A. NO	E.P.A. CAG YES	N.I.O.S.H. YES

SECTION IV. FIRST AID PROCEDURES

Inhalation	Electrolyte Electrolyte Gel	Remove to fresh air immediately. If breathing is difficult, give oxygen.
	Lead compounds	Remove from exposure, gargle, wash nose, eyes, and lips; consult physician.
Ingestion	Electrolyte Electrolyte Gel	Give large quantities of water; do not induce vomiting; consult physician.
	Lead compounds	Consult physician immediately.
Skin	Electrolyte Electrolyte Gel	Flush with large amounts of water for at least 15 minutes; remove contaminated clothing completely, including shoes and do not wear clothes again until cleaned. If acid is splashed on shoes, remove and discard it they contain leather.
	Lead compounds	Wash immediately with soap and water. Lead compounds are not readily absorbed through the skin.
Eyes	Electrolyte Electrolyte Gel Lead compounds	Flush immediately with large amounts of water for at least 15 minutes; consult physician immediately.

SECTION V. FIRE AND ELOSION HAZARD DATA

Flash Point (test method)	Auto Ignition Temperature	Flammable Limits in Air, % by 3/4 Vol. (Hydrogen)	
Hydrogen - 259°C	Hydrogen 580°C	Lower - 4.1	Upper - 74.2

Extinguishing Media	Dry chemical, foam, or CO_2
Special Fire Fighting 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 Hazard	Hydrogen and oxygen gases are produced in the cells during normal battery operation (hydrogen is flammable and oxygen supports combustion). These gases enter the air through the vent caps. To avoid the chance of a fire or explosion, keep sparks and other sources of ignition away from the battery.

SECTION VI. HANDLING AND STORAGE

Precautions	Store away from reactive materials, open flames and sources of ignition as defined in Section 10 – 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.

SECTION VII: ACCIDENTAL RELEASE MEASURES	
Steps to be Taken if Battery is Broken	Avoid contact with any spilled material. Contain spill, isolate hazard area, and deny entry. Limit site access to emergency responders. Neutralize with sodium bicarbonate, soda ash, lime or other neutralizing agent. pH should be at neutral 6-8. Provide adequate ventilation. Heat, carbon dioxide and hydrogen gas may be given off during neutralization. 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. Place the broken battery in a heavy-duty plastic bag or other non-metallic container. Properly recycle all battery residue and parts.
Personal Precautions	Acid resistant aprons, boots and protective clothing. ANSI approved safety glasses with side shields/face shield recommended.
Environmental Precautions	Lead and its compounds and sulfuric acid can pose a severe threat to the environment. Contamination of water, soil and air should be prevented.

SECTION VIII: CONTROL MEASURES PERSONAL PROTECTION	
Engineering Controls and Work Practices	Store and handle in well-ventilated area. If mechanical ventilation is used, components must be acid-resistant. Handle batteries cautiously. Make certain vent caps are on securely. If battery case is damaged, avoid bodily contact with internal components. Wear protective clothing, eye and face protection, when charging or handling batteries. Follow all manufacturers' recommendations when stacking or palletizing. Do not allow metallic materials to simultaneously contact both the positive and negative terminals of the batteries. Use a battery carrier to lift a battery or place hands at opposite corners to avoid spilling acid through the vents. Avoid contact with internal components of the batteries.
Hygiene Practices	Wash hands thoroughly before eating, drinking or smoking after handling batteries.
Respiratory Protection	None required under normal conditions. If an overcharging or overheating condition exists and concentrations of sulfuric acid mist are known or suspected to exceed PEL, use NIOSH or MSHA-approved respiratory protection.
Protective Clothing	None required under normal conditions. If battery case is damaged, use rubber or plastic acid-resistant gloves with elbow-length gauntlet, acid-resistant apron, clothing, and boots.
Eye Protection	None required under normal conditions. If battery case is damaged, ANSI approved chemical safety glasses with side shields/face shield recommended.
Emergency Flushing	In areas where water and sulfuric acid solutions are handled in concentrations greater than 1%, emergency eyewash stations and showers should be provided, with unlimited water supply.

SECTION IX. PHYSICAL AND CHEMICAL PROPERTIES

Component	Specific Gravity (g/cm^3)	Melting Point	Solubility in Water	Odor	Appearance
Lead	11.34	327.4°C	N/A	N/A	Silver-Gray Metal
Lead sulfate	6.32	1000°C	40mg/l	N/A	White Powder
Lead dioxide	9.37	289°C	N/A	N/A	Brown Powder
Sulfuric Acid	1.225 -1.300	114°C	100%	Acidic	Clear Liquid
Glass Separator	135-175	>900°C	N/A	N/A	White Fibrous Glass
ABS	1.05	220°C	N/A	N/A	Solid plastic
PP Separator (Gel)	1.05	150°C	N/A	N/A	Solid plastic

SECTION X. REACTIVITY DATA

Stability	Stable	Hazardous Polymerization	Will Not Occur
Incompatibility (materials to avoid)	Lead/lead compounds: Potassium, carbides, sulfides, peroxides, phosphorus, sulfur.		
Conditions to Avoid	Sparks and other sources of ignition. Prolonged overcharging and/or overheating.		
Hazardous Decomposition Products	Battery electrolyte (acid): combustible materials, strong reducing agents, most metals, carbides, organic materials, chlorates, nitrates, picrates, and fulminates.		
	Oxides of lead and sulfur, Hydrogen, sulfur dioxide, sulfur trioxide. Combustion can produce CO & CO_2		

SECTION XI. OTHER REGULATORY INFORMATION

See 29 C 1910.268(b)(2)

CERCLA SECTION 304 HAZARDOUS SUBSTANCES	LEAD	YES	RQ: N/A*
	SULFURIC ACID	YES	RQ: 1000 Lbs.
* RQ: Reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 ･m (micrometers).			
U.S. HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD	LEAD	YES	
	SULFURIC ACID	YES	
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE:	SULFURIC ACID	YES	
EPCRA SECTION 313 TOXIC RELEASE INVENTORY	LEAD	CAS NO: 7439-92-1	
	SULFURIC ACID	CAS NO: 7664-93-9	
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.		
INGREDIENTS LISTED ON TSCA INVENTORY	YES		
CANADIAN REGULATIONS	All chemical substances in this product are listed on the CEPA DSL/NDSL or are exempt from list requirements.		
RCRA	Spent lead-acid batteries are not regulated as hazardous waste by the EPA when recycled, however state and internationals regulations may vary.		

SECTION XII. TRANSPORTATION INFORMATION

AIR, SEA, SURFACE Classification	Battery, Electric Storage, Wet, Nonspillable, Not Regulated	
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**.	IATA/ICAO	Special Provision A67 & A48
	DOT HAZ MAT	C-Title 49 parts 171-189
	IMO IMGD	Exception 238

All Energy Storage Systems Batteries are shipped with protective terminal covers, contain a label on the battery stating NONSPILLABLE, contain a warning on the carton stating NONSPILLABLE, and identified in bulk shipments as NONSPILLABLE.
All Energy Storage Systems Batteries are exempt from all IATA/ICAO regulations provided the battery terminals are protected from short circuit and in accordance to IATA/ICAO packing instructions 806, IMDG Packing Instructions P003 and terminals are protected as per PP16.

Note: The shipper has the option of shipping the batteries Hazmat regulated under UN2800. Additional labeling and paperwork would be required. See C 49 and IATA Dangerous Goods Regulations for more information.

UN: 2800 DOT ID NUMBER: 2800	UN CLASS: 8 DOT HAZARD CLASS: 8	UN PACKING GROUP: III DOT PACKING GROUP: III
US DOT LABEL: CORROSIVE	IMO IMDG LABEL: NONE PAGE # 8120 EMS# - F-A, S-B VESSEL STOWAGE: A	IATA/ICAO LABEL: CORROSIVE ERG Code – 8L

SECTION XIII. DISPOSAL CONSIDERATIONS

Lead-acid batteries are completely recyclable. Return whole scrap batteries to distributor, manufacturer or lead smelter for recycling. Contact local and/or state environmental officials regarding disposal information. Product can be recycled along with automotive (SLI) lead-acid batteries.

SECTION XIV. OTHER INFORMATION

THE INFORMATION ABOVE IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, ENERGY STORAGE SYSTEMS MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, ERESSED OR IMPLIED, WITH RESPECT TOSUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING OM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES. ALTHOUGH REASONABLE PRECAUTIONS HAVE BEEN TAKEN IN THE PREPARATION OF THE DATA CONTAINED HEREIN, IT IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION. THIS MATERIAL SAFETY DATA SHEET PROVIDES GUIDELINES FOR THE SAFE HANDLING AND USE OF THIS PRODUCT; IT DOES NOT AND CANNOT ADVISE ON ALL POSSIBLE SITUATIONS, THEREFORE, YOUR SPECIFIC USE OF THIS PRODUCT SHOULD BE EVALUATED TO DETERMINE IF ADDITIONAL PRECAUTIONS ARE REQUIRED.