SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: Varistor Powder
Product Description: Tan to Light Gray powder
Product Code: Contact vendor
Intended Use: Electrical Insulator/Surge Arrester

COMPANY IDENTIFICATION

Supplier: **Hubbell Power Systems, Inc.**
8711 Wadsworth Road
Wadsworth, OH 44281-8438

24 Hour Emergency	INFOTRAC
US & Canada	(800) 535-5053
International	(352) 323-3500
Hubbell Informational number	(330) 335-2361

NOTE: This SDS describes the properties of powdered material used in the manufacture of Metal Oxide Varistor (MOV) ceramic articles. It only reflects potential hazards of the finished articles IF the article has been finely divided by crushing, grinding, cutting, or pulverizing from its original form as supplied. MOV articles are supplied by Hubbell Power Systems, Inc. to be used as intact articles and are not intended to be changed in form as described above.

SECTION 2 HAZARDS IDENTIFICATION

CLASSIFICATION

Health	Environmental	Physical
•Acute Toxicity - Oral, Category 5 •Skin Irritation - Category 3 •Eye Irritation - Category 2B •Skin Sensitization - Category 1 •Target Organ System Toxicity, Single Exposure - Category 3 •Target Organ System Toxicity, Repeated Exposure - Category 1 •Carcinogenicity - Category 1A •Acute Inhalation Hazard - Category 3	•Acute Toxicity - Category 2 •Chronic Toxicity - Category 2	•No Classifiable Hazards

LABELING

Symbols:

Signal Word: DANGER

Hazard Statements	*Precautionary Statements*

•H 303: May be harmful if swallowed •H 316: Causes mild skin irritation •H 317: May cause allergic skin reaction •H 320: Causes eye irritation •H 335: May cause respiratory irritation •H 336: May cause drowsiness or dizziness •H 371: May cause damage to organs through prolonged or repeated exposure •H 350: May cause cancer •H 411: Toxic to aquatic life with long lasting effects	•P 201: Obtain special instructions before use •P 202: Do not handle until all safety precautions have been read and understood. •P 233: Keep container tightly closed •P 260: Do not breathe dust/fume/gas/mist/vapors/spray •P 264: Wash thoroughly after handling •P 271: Use only outdoors or in a well-ventilated area •P 272: Contaminated work clothing should not be allowed out of the workplace •P 273: Avoid release to the environment •P 281: Use personal protective equipment as required •P 391: Collect Spillage •P 405: Store Locked up •P 501: Dispose of contents in accordance with local/regional/national/international regulation

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	Common Name/Synonym	CAS#	Percentage	Impurities
Nickel Oxide	Nickel monoxide; Green nickel oxide	1313-99-1	1-5	None Known
Antimony Oxide	Antimony trioxide; Diantimony trioxide; Antimonious oxide	1309-64-4	<0.5	None Known
Bismuth Oxide	Dibismuth trioxide; Bismuth sesquioxide	1304-76-3	1-5	None Known
Zinc Oxide	Zincite; Ozide; Zinc monoxide	1314-13-2	85-95	None Known

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 4 FIRST AID MEASURES

ROUTES OF ENTRY: Ingestion, Contact, Inhalation

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Inhalation can cause fatigue, irritation to the respiratory tract, and aggravation of existing conditions such as asthma. Metal oxide fumes can cause metal fume fever. If exposed to excessive levels of fumes or dust, remove to fresh air. Evaluate for respiratory distress and support breathing if necessary. Get medical attention if cough or other symptoms develop. Get immediate medical help for individuals with difficult breathing.

Eye Contact: Product can cause eye irritation on direct contact. If product gets in the eyes irrigate with low pressure water for at least 15 minutes, including under the eyelids. If irritation, swelling, or redness persists seek medical attention.

Skin Contact: Product can cause rashes and skin irritation. Product may cause antimony spots and allergic contact dermatitis or skin sensitization. For skin contact wipe product off of skin, wash area thoroughly with soap and water. Remove contaminated shoes or clothing if necessary. Get medical help if rash or persistent irritation develops.

Ingestion: May cause gastric distress, stomach pains, vomiting, and diarrhea. Do not induce vomiting. Contact poison control and seek medical help. Never give anything by mouth to an unconscious victim.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: CO_2, foam, dry chemical, or water.

Inappropriate Extinguishing Media: Not Available

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Firefighters should use standard protective equipment and self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards/Combustible Products: High airborne concentrations of dust may pose an explosion hazard if contacted by an ignition source. When exposed to direct flames product may release toxic chemicals and oxides of carbon. Use caution – Product may be used in areas with high voltage electricity present.

SECTION 6 ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for firefighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for Personal Protective Equipment.

ENVIRONMENTAL PRECAUTIONS

Nickel compounds and zinc products can be toxic to the aquatic environment. Prevent entry into waterways, sewer, basements or confined areas. In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. The National Response Center can be reached at (800)424-8802.

CLEAN UP AND CONTAINMENT METHODS

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Do not touch or walk through spilled material. Avoid generating airborne dust concentrations. Avoid direct contact or breathing dusts and wear specific protective equipment specified in section 8. Use clean non-sparking tools to collect absorbed material. Vacuum or wet sweep large amounts of spilled material and transfer to disposal containers. Prevent entry into waterways, sewer, basements or confined areas.

Water Spill: Confine the spill immediately with booms. Stop leak if you can do it without risk. Remove from the surface by skimming.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local

experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

SECTION 7 HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT

Avoid accumulation of airborne dusts during work operations. Keep away from ignition sources. Avoid direct contact with skin and eyes, inhalation of dust, or ingestion. Use product in well ventilated areas. Wash hands before eating, drinking, and/or smoking. Read product label for additional information.

STORAGE REQUIREMENTS

Store in a cool, dry, and well-ventilated area with the lid tightly sealed. Do not store above 25^{o} C (77^{o}F). Keep away from children.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Component Name	CAS #	TWA/STEL	OSHA	ACGIH	Note
Nickel Oxide	1313-99-1	TWA	1 mg/m^3	1.5 mg/m^3	As a nickel compound
Antimony Oxide	1309-64-4	TWA	0.5 mg/m^3	0.5 mg/m^3	As antimony
Bismuth Oxide	1304-76-3	TWA	Not Established	Not Established	N/A
Zinc Oxide	1314-13-2	TWA	10 mg/m^3 (Total Dust) 5 mg/m^3 (Respirable)	2 mg/m^3 (Respirable)	N/A
		STEL	Not Established	10 mg/m^3 (Respirable)	N/A

ENGINEERING CONTROLS

Use appropriate local exhaust ventilation to remove chemical vapors below explosion limits, keep exposures below occupational exposure limits, and maintain air quality. Ventilation should be used to keep concentration of air contaminants as low as feasible because the product contains cancer causing agents. Additional engineering controls should be evaluated and implemented if applicable.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: For high airborne concentrations or in absence of ventilation use an appropriate NIOSH approved particulate type respirator or dust mask.

Hand Protection: Appropriate protective gloves are recommended to prevent direct skin contact with this product.

Eye Protection: Safety glasses or goggles are recommended to prevent direct eye contact with this product.

Skin and Body Protection: No protection is ordinarily required under normal conditions of use. If prolonged or repeated contact is likely, protective clothing or a laboratory apron is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL/CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Solid
Color: Light Gray
Odor: Odorless
Odor Threshold: Not Applicable

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Flash Point [Method]: Not Available
Flammable Limits (Approximate volume % in air): Not Applicable
Autoignition Temperature: Not Available
Flammability: Not Readily Flammable
Decomposition Temperature: Not Available
Boiling Point/Range: Not Available
Melting/Freezing Point: 1400^0C (2552^0F)
Vapor Pressure: Not Available
Vapor Density (Air = 1): >1
Solubility in Water: Insoluble

Specific Gravity (Water = 1): 5.7
% Volatile: Not Applicable
Evaporation Rate (n-butyl acetate = 1): <1
Viscosity: Not Available
Partition Coefficient (n-Octanol/Water): Not Available
pH: Not Applicable

Pour Point: Not Available
Molecular Weight: Not Available
Molecular Formula: Mixture

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Product is stable.

CONDITIONS TO AVOID: Excessive heat, direct contact with flames, and incompatible materials.

MATERIALS TO AVOID: Magnesium, linseed oil. Reacts with sulfuric acids to form zinc sulfate.

HAZARDOUS DECOMPOSITION PRODUCTS: Oxidative decomposition products include zinc and nickel compounds, acrid smoke, toxic fumes, and oxides of carbon.

POSSIBILITY OF HAZARDOUS REACTIONS: Zinc oxide reacts violently with magnesium and chlorinated rubber.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY VALUES

Ingredient	LD_{50}/LC_{50} Route and Species	Conclusion / Remarks
Nickel Oxide	Oral: >5000 mg/kg, Rat Oral Dermal: Not Available Inhalation: >5.15 mg/L/ 4hr. (Rat)	Effects not specified.
Antimony Oxide	Oral: >34,600 mg/kg (Rat) Dermal: >8,300 mg/kg (Rabbit) Inhalation: >5.2 mg/L/4 hr. (Rat)	Oral administration caused behavioral changes, somnolence, and dermal effects.
Bismuth Oxide	Oral: 5000 mg/kg (Rat) Dermal: Not Available Inhalation: >5.07 mg/L/4 hr. (Rat)	Effects not specified
Zinc Oxide	Oral: >8437 mg/kg (Rat) Dermal: Not Available Inhalation: >5.7 mg/L/4 hr. (Rat)	Effects not specified
TOTAL PRODUCT	Oral: >300 mg/kg (Rat) Dermal: >1000 mg/kg (Rat)	No gross changes observed in test animals.

ACUTE EFFECTS

Eye Contact: Direct contact with product dusts can cause eye irritation. Product contains particles, which can cause corneal abrasions.

Skin Contact: Product can cause skin irritation, rashes, and antimony spots. Product can cause skin sensitization.

Inhalation: Breathing dusts or generated fumes/vapors/gases may cause irritation to respiratory tract and fatigue. Inhalation of metal oxides may cause metal fume fever. Inhalation of product can worsen existing respiratory issues. Prolonged inhalation may cause chronic adverse health effects.

Ingestion: May cause gastric distress, stomach pains, vomiting, and diarrhea.

Target Organ Effects: Irritation of skin, eyes, and respiratory tract, skin sensitization, nervous system effects, gastrointestinal distress.

Medical Conditions Aggravated by Exposure: Dust can aggravate existing skin conditions and respiratory problems including asthma.

CHRONIC/OTHER EFFECTS

It has been reported that working in environments with extremely high, uncontrolled concentrations of zinc oxide fumes or dust for more than 6 months may lead to development of dermatitis, boils, conjunctivitis, abnormal liver function, and gastrointestinal disturbances. Individuals sensitized to nickel compounds may experience asthma. Inhalation of nickel dust compounds and antimony products has been linked to pulmonary irritation, asthma, pneumoconiosis, pulmonary fibrosis and pulmonary edema. Zinc oxide and nickel oxide combustion byproducts can cause may cause metal fume fever, characterized by fever, chills, malaise, headache, cough, and abdominal discomfort. Chronic exposure to antimony is may cause adverse effects on the liver. Nickel oxide are listed as human carcinogens by IARC (group 1), ACGIH (group A1), and reasonably anticipated to be carcinogenic by NTP (group 2). Zinc oxide is not classifiable with regards to carcinogenicity in humans. There is inadequate evidence of carcinogenicity for Antimony Oxide, however production of antimony trioxide is suspected of causing cancer (group A2) by ACGIH and is listed as a possible carcinogen by IARC (group 2B). Bismuth oxide is not listed as a human carcinogen.

Additional information may be available by request.

Carcinogenicity: IARC: Carcinogenic (1) ACGIH: Confirmed (A1)
NTP: Reasonably Anticipated (2) OSHA Regulated: NO

The following ingredients are cited on the lists below: Nickel Oxide (as a nickel compound): 2, 3
Antimony Oxide: 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Ingredient	LC_{50} and Species	Conclusion / Remarks
Nickel Oxide	15.3 mg/L / 96 hr., Oncorhynchus mykiss (Rainbow Trout)	Semi-static bioassay.
Antimony Oxide	>530 mg/L / 96 hr., Lepomis macrochirus (Bluegill Sunfish) >833 mg/L / 96 hr., *Pimphales promelas* (Fathead Minnow)	Conditions not specified, not acutely toxic to listed species.
Bismuth Oxide	>100 mg/L / 96 hr., Danio rerio (Zebra fish)	Freshwater static bioassay.
Zinc Oxide	1.79 mg/L / 96 hr., *Zebra danio* (Zebra Fish, Danio species)	As zinc oxide. Static Bioassay. Moderate toxicity.

Environmental Fate

Components in this product may cause significant environmental hazards. There is no evidence that components will biotransform in aquatic environments. Nickel oxide contamination is known to cause chronic toxicity in aquatic environments. Experimental data suggests a BCF of 675 for nickel oxide. Zinc product manufacturing has also been known to contaminate the surrounding environment and may have adverse effects and implications for environmental health and ecology. Zinc oxide bioassays indicate moderate acute toxicity in aquatic species. Bismuth oxide and antimony oxide have been

conclusively shown to cause adverse environmental effects, however data is not sufficient for classification. Industrial products should not be discharged to sewers or other water sources to prevent the risks of long term adverse effects and environmental contamination.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable Local, State and Federal laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

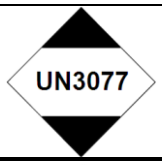
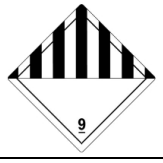
Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal, aquatic, and plant life; and conformance with environmental and public health regulations. Precautions must be taken in regards to products containing carcinogenic material.

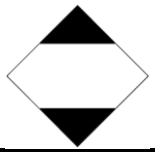
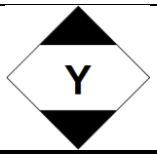
REGULATORY DISPOSAL INFORMATION

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-List: None listed
RCRA U-List: None listed

SECTION 14 TRANSPORTATION

Regulatory Information	ID Number	Proper Shipping Name	Hazard Class	Packing Group	Label(s)	RQ	Additional Information
US DOT	UN3077	Environmentally hazardous substance, solid, n.o.s. (Zinc oxide)	9	III		1,000 Lbs	Only regulated for transportation as a hazardous substance
TDG	UN3077	Environmentally hazardous substance, solid, n.o.s. (Zinc oxide)	9	III			
							May be offered as a Limited Quantity (See TDG Schedule 1)
ADR	UN3077	Environmentally hazardous substance, solid, n.o.s. (Zinc oxide)	9	III			

							May be offered as a Limited Quantity (See ADR Table A)
IATA	UN3077	Environmentally hazardous substance, solid, n.o.s. (Zinc oxide)	9	III			
							May be offered as a Limited Quantity (See IATA PI Y911)
IMDG	UN3077	Environmentally hazardous substance, solid, n.o.s. (Zinc oxide)	9	III			Zinc oxide is a marine pollutant

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purpose, this material is classified as hazardous in accordance with OSHA 29CFR 1910.1200.

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Immediate Health; Delayed Health

SARA (313) TOXIC RELEASE INVENTORY: N495 Nickel Compounds; N982 Zinc Compounds; Antimony Trioxide

CALIFORNIA PROP 65: WARNING: This product contains a chemical known to the State of California to cause cancer.

CLEAN WATER ACT/OIL POLLUTION ACT: Ingredients are not listed under CAA 112(r) TQ.

INTERNATIONAL REGULATIONS:

WHMIS CLASSIFICATION
Class D2A: Chronic Toxic Effects, Carcinogen
Class D2B: Skin/Eye Irritant, Skin Sensitizer

WHMIS HAZARD SYMBOLS

EUROPEAN INVENTORY OF EXISTING CHEMICALS (EINECS):

Chemical Name	CAS Number	EINECS NUMBER
Nickel Oxide	1313-99-1	215-215-7
Antimony Oxide	1309-64-4	215-175-0
Bismuth Oxide	1304-76-3	215-134-7
Zinc Oxide	1314-13-2	215-222-5

EU RISK (R) AND SAFETY (S) PHRASES:

R 36/37/38: Irritating to the eyes, respiratory system, and skin
R 43: May cause sensitization by skin contact
R 48: Danger of serious damage to health by prolonged exposure
R 51: Toxic to aquatic organisms
S 7: Keep container tightly sealed
S 53: Avoid exposure - obtain special instructions before use
S 61: Avoid release to the environment

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
Nickel Oxide	1313-99-1	1,4,10
Antimony Oxide	1309-64-4	1,4
Bismuth Oxide	1304-76-3	
Zinc Oxide	1314-13-2	1,4

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16	OTHER INFORMATION

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

Health - 2 Flammability - 0 Reactivity - 0

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS) RATINGS:

Health - 2* Flammability - 0 Physical Hazard - 0 PPE - E

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Date	Description	Sections Affected
7/6/11	First draft written.	1-16
7/26/11	Revised exposures, toxicology, and ecotoxicology	8,11,12
8/15/11	Updated to GHS Safety Data Sheet format	1-16
10/11/11	Updated Disposal Considerations and Transportation	13 - 14
10/17/11	Metallic ingredients changed to metal oxides, sections rewritten to reflect this change	1-16
1/11/12	Formatted and revised all SDS sections. Added dermal and inhalation toxicology data to section 11.	1-16
8/31/16	Added formula nomenclature and health hazard information	1-2

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