

CHEMTRONICS®

Technical Data Sheet

TDS # CW2200

CircuitWorks® Conductive Pen

PRODUCT DESCRIPTION

CircuitWorks® Conductive Pen makes instant highly conductive silver traces on circuit boards. CW2200 is used in prototype, rework, and repair of circuit boards by linking components, repairing defective traces, and making smooth jumpers. The silver traces dry in minutes and have excellent adhesion to most electronic materials. Engineers, repair technicians, and manufacturers will find that the CircuitWorks® Conductive Pen speeds project completion and cuts rework time.

- Single component system
- High electrical conductivity
- Fast drying
- Highly adherent to circuit boards
- Operating temperature to 400°F (205°C)

TYPICAL APPLICATIONS

CircuitWorks® Conductive Pen may be used for electronics applications including:

- Circuit Trace Repair
- Solderless Linking of Components
- EMI Shielding
- Solderable Terminations
- Quick Prototype Modifications

TYPICAL PRODUCT DATA AND PHYSICAL PROPERTIES

Composition

Material	Silver Filled Polymer
Silver Particle Size	10-15 microns
Color	Silver Gray
Setting Rate	<2mm/hr.

Properties

Conductivity	0.02-0.05 ohms/sq/mil 0.00005-0.000125 ohm cm
Max. Temperature	400°F (205°C)
Tack-Free Time @ 25°C	3 to 5 Minutes
Cure Time @ 25°C	20 to 30 Minutes
Solder Wetting	2 to 3 Seconds
Electrical Conductivity	Excellent
Adhesion	Excellent
Flexibility	Good
Chemical Resistance	Good

Shelflife

18 months

RoHS/WEEE

Status



COMPATIBILITY

CircuitWorks® Conductive Pen material has excellent compatibility with materials used in printed circuit board fabrication. As with any chemical system, compatibility with the substrate must be determined on a non-critical area prior to use.

USAGE INSTRUCTIONS

Read MSDS carefully prior to use.

Cleaning: For best adhesion, clean board with one of Chemtronics Electro-Wash[®] or Pow-R-Wash[®] solvents in order to remove any surface contamination which may prevent adequate material contact.

Mixing: Although this system has been formulated to resist hard-packing, it should be shaken vigorously for 30 seconds to insure the proper dispersion of the silver flakes. If pen has been allowed to sit idle for a long period of time, the mixing ball may seize in the barrel. To free the ball use force to tap the barrel end of the pen until the ball begins to move inside the pen.

Application: The conductive ink is dispensed through the CircuitWorks[®] Conductive Pen. Squeezing the pen body while pressing down on the surface will allow the material to flow, enabling the trace to be drawn. Practice with the pen before attempting detail work. The bulk form of this material may be applied by brushing, banding, or automatic dispensing equipment.

Thinning: The conductive ink has been optimized for the CircuitWorks[®] Conductive Pen and thinning is not normally necessary. However, Butyl Acetate may be added with thorough mixing to make slight adjustments for ease of application in the bulk form.

Clean-up/Removal: The conductive ink may be cleaned or removed using a strong organic solvent such as Chemtronics[®] Electro-Wash[®] PX.

Curing: Tack-free in 3 to 5 minutes at room temperature. Achieves electrical conductivity within 30 minutes. Heat cure for 5 minutes at 250 to 300°F (120 to 150°C) for maximum conductivity, durability and chemical resistance.

Soldering: Low temperature soldering is possible to the *heat-cured* silver conductive traces if done at 350°F (177°C) for <5 seconds.

AVAILABILITY

CW2200STP 8.5 g (0.3 oz.), Standard Tip Pen
CW2200MTP 8.5g (0.3 oz.), Micro Tip Pen

NOTE:

This information is believed to be accurate. It is intended for professional end users having the skills to evaluate and use the data properly. ITW CHEMTRONICS[®] does not guarantee the accuracy of the data and assumes no liability in connection with damages incurred while using it.

SECTION 1: CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Information: 800-TECH-401

Product Identification**CIRCUITWORKS® CONDUCTIVE PEN**

Product Code: CW2200MTP, CW2200STP, CW2200BLK

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Wt. % Range
Silver	7440-22-4	35.0-65.0
Propylene Glycol Methyl Ether Acetate	108-65-6	2.0-20.0
Ethylene Glycol Monobutyl Ether Acetate	112-07-2	2.0-20.0
n-Butyl Acetate	123-86-4	5.0-35.0
Acrylic Resin	mixture	15.0-40.0

SECTION 3: HAZARDOUS IDENTIFICATION

Emergency Overview: Silver colored paint with an aromatic hydrocarbon odor. This product is flammable. Liquid and vapors will irritate eyes and skin. Breathing high concentrations of product may produce headache, nausea, and drowsiness.

Potential Health Effects:

Eyes: Vapors of this product may irritate the eyes. Liquid is irritating and may cause tearing, redness, swelling or temporary corneal damage.

Skin: Contact may cause irritation. prolonged contact may cause dermatitis.

Ingestion: Harmful if swallowed. May cause nervous system depression.

Inhalation: Harmful if inhaled. May cause headache, nausea, vomiting, dizziness, drowsiness, irritation of the respiratory tract/mucous membranes. Extreme over-exposure may cause loss of consciousness and narcosis.

Pre-Existing Medical Conditions Aggravated by Exposure: Heart, lung, eye, skin.

SECTION 4: FIRST AID MEASURES

Eyes: Immediately flush with large amounts of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Have eyes examined by a physician if discomfort persists.

Skin: Remove contaminated clothing and wash skin with soap and water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse.

Ingestion: If swallowed, give two or more glasses of water immediately. **DO NOT** induce vomiting. Get medical attention.

Inhalation: In case of exposure to high concentrations of vapor or mist, remove to fresh air. If breathing is difficult, give oxygen and call a Physician. If breathing has stopped, apply artificial respiration and call a Physician.

SECTION 5: FIRE FIGHTING MEASURES

Flash Point: 76°F (24C) (TCC) **LEL/UEL:** 1.5/10.0 (% by volume in air)

Extinguishing Media: Use alcohol foam, water foam, carbon dioxide, dry chemical, or water spray. Water may not be effective in fighting the fire but can be used to cool overheated areas. Care must be taken to not spread the fire.

Fire Fighting Instructions: Remove all ignition sources. Use water spray to cool overheated containers. Take care not the spread fire with water. As in any fire, wear self-contained breathing apparatus (pressure demand, OSHA/NIOSH approved or equivalent) and full protective gear. Solvent vapors are an explosion hazard. Keep material away from all sources of ignition, extreme heat, sparks or open flame. Material can be easily ignited and burns with intense heat.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Large Spills: Remove all sources of ignition (sparks, open flames, etc.). Wear self-contained breathing apparatus and appropriate personal protective equipment. Ventilate area and contain and absorb spill with inert material. Collect spill by scooping up liquids and absorbent material and place in a chemical waste container for proper disposal. Do not flush to sewer. Prevent material from entering storm sewers, ditches that lead to waterways and ground.

Small Spills: Absorb spill with absorbent material, then place in a chemical waste container for proper disposal.

SECTION 7: HANDLING AND STORAGE

Avoid prolonged or repeated contact with skin, eyes or clothing. Wash hands before eating. Use with adequate ventilation. Avoid breathing product vapor. Do not reuse this container. Store in a cool dry place, away from heat, sparks or flames. Keep container tightly closed when not in use. Do not store in direct sunlight.

KEEP OUT OF REACH OF CHILDREN.**SECTION 8: EXPOSURE CONTROLS, PERSONAL PROTECTION****Exposure Guidelines:**

CHEMICAL NAME	ACGIH TLV	OSHA PEL	ACGIH STEL
Silver	0.1 mg/m3	0.01mg/m3	NA
Propylene Glycol Methyl Ether Acetate	NA	NA	NA
Ethylene Glycol Monobutyl Ether Acetate	NA	NA	NA
n-Butyl Acetate	150 ppm	150 ppm	200 ppm
Acrylic Resin	NA	NA	NA

Work/Hygienic Practices: Good general ventilation should be sufficient to control airborne levels. Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product. If vapor concentration exceeds TLV, use NIOSH approved organic vapor cartridge respirator. Wear safety glasses with side shields or goggles and rubber or other chemically resistant gloves when handling this material.

NFPA and HMIS Codes:	NFPA	HMIS
Health	2	2
Flammability	3	3
Reactivity	1	1
Personal Protection	-	B

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Silver colored paint
Odor: Aromatic hydrocarbon
pH: NA
Vapor Pressure: 5-6 mmHg @ 20°C
Percent Volatile: 30-40%
Vapor Density: >1 (Air = 1)

Solubility in Water: > 10%
Specific Gravity: 1.8-2.0
Evaporation Rate: >1
 (Butyl acetate=1)
Boiling Range: 259-378°F (127 – 192C)

SECTION 10: STABILITY AND REACTIVITY

Stability: This product is stable. Conditions to Avoid: Avoid heat, sparks, open flame and strong oxidizing conditions.
Incompatibility: Do not mix strong oxidizers, acids, bases, caustics, amines and alkali contamination.
Products of Decomposition: Decomposition may release carbon monoxide, carbon dioxide, oxides of nitrogen, monomers and smoke. Depending on conditions, some highly reactive peroxides may be formed.
Hazardous Polymerization: Will not occur. Material is not known to polymerize.
Conditions to avoid: NA

SECTION 11: TOXICOLOGICAL INFORMATION

Ingredients	LD50 (rat) Oral	LD50 (rbt) Dermal	LC50 (rat) Inhalation
Silver	>10000 mg/kg (mouse)	5,000 mg/kg	
Propylene Glycol Methyl Ether Acetate	8,500 mg/kg	>5000 mg/kg	>4300 ppm
Ethylene Glycol Monobutyl Ether Acetate	2400 mg/kg	500 mg/24H MLD	
n-Butyl Acetate	10,768 mg/kg	500 mg/24H MLD	2000 ppm/4H
Acrylic Resin	NA	NA	NA
Cancer Information: No ingredients listed as human carcinogens by NTP or IARC			
Reproductive effects: none		Teratogenic effects: none	Mutagenic effects: none

SECTION 12: ECOLOGICAL INFORMATION

Environmental Impact Information

Avoid runoff into storm sewers and ditches which lead to waterways. Water runoff can cause environmental damage.

REPORTING

US regulations require reporting spills of this material that could reach any surface waters. The toll free number for the US Coast Guard National Response Center is: **1-800-424-8802**

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all federal, state and local regulations. Water runoff can cause environmental damage.

SECTION 14: TRANSPORTATION INFORMATION

Proper Shipping Name	UN Number	Class	Sub. Risk	Pkg. Group	Hazard Label	Pkg. Instr.	Max. Quantity
<u>Air:</u> PAINT	UN1263	3	-	III	Flammable Liquid	Y309	1L 5L
<u>Ground:</u> Consumer Commodity ORM-D	-	ORM-D	-	-	ORM-D	173.150	5L

SECTION 15: REGULATORY INFORMATION

SECTION 313 SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372).

Silver CAS# 7440-22-4 35.0-65.0%

This information should be included on all MSDSs copied and distributed for this material.

TOXIC SUBSTANCES CONTROL ACT (TSCA)

All ingredients of this product are listed on the TSCA Inventory.

WHMIS: Class B2; Class D2B

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

SECTION 16: OTHER INFORMATION

Normal ventilation for standard manufacturing practices is usually adequate. Local exhaust should be used when large amounts are released.

To the best of our knowledge, the information contained herein is accurate. However, all materials may present unknown hazards and should be used with caution. In particular, improper use of our products and their inappropriate combination with other products and substances may produce harmful results which cannot be anticipated. Final determination of the suitability of any material is the sole responsibility of the user. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that may exist.