n3He Wire Frame Soldering Steps

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November 4

Contents

1 Cleaning

Note: Wear clean gloves during handling to prevent contamination of the wire frame with oils from hands.

1.1 General Cleaning

Items other than the wire frames, such as the housing, screws, and end plates, will be cleaned following procedure given below starting with soap and finished with isopropyl alchohol.

The frame are to be cleaned differently as the metallization cannot be scrubbed clean without risking damage.

1. Scrub with soap and water to remove oils.
    - Large Kim wipes for scrub pad.
    - Caution: Be careful to avoid damaging the knife edge .
2. Clean with isopropyl alcohol to remove soap.
3. Allow to air dry.

Note: The ultrasonic bath may be used with either the soap and water solution or isopropyl alcohol to clean a batch of the small parts as required. Disposal of the alcohol would follow the same procedure given in the frame soldering section.

1.2 Clean Wire Frames

No need to clean frames prior to soldering.

2 Frame Stringing

Note: Wear clean gloves during handling to prevent contamination of the wire frame with oils from hands.
Caution:: Wear eye protection while soldering.
Note: Each frame needs to have all of its wire soldered into place under consistent tension.

3 Frame Soldering

Soldering temperature is to be 325°C.

Process for soldering a wire:

1. Clean copper wire length.
    - Use kim wipe and isopropyl alcohol to wipe each wire

2. Tin two sections of copper wire with 3 inches left bare at each end for signal board attachment later.
3. Place frame in jig and clamp down top and bottom.
    - It is important that the frame not lift while the wire is under tension as the wire can easily peel off.
4. Pre-heat first groove in the frame with hot air gun.
5. Tin frame groove.
    - Caution: Excessive heating duration can damage metallization. Apply heat for as short of duration as possible.
6. Solder wire to frame groove.
7. Attach weight to wire.
8. Allow 24 hours pre-creep for the copper deform over time.
9. Solder wire to other side of frame following same procedure of tinning the wire, and metallization prior to joining the pieces.

Note: Don't solder the HV wire frames all of the way to the top edge. A piece of solder overhanging could be a source of arcing.
Note: HV frame wire ends should be clipped below the top of the frame short so that they can't arc over to the signal frame wires.
Note: Signal frame wire ends should be left long so that they can be threaded onto the signal boards.

3.1 Ground Rings on HV Frames

Each HV frame has 6 ground rings that are used to drain leakage current from the surface of the HV frame off to ground before it can read the signal frames. These wires need to be attached back and front to the HV frames.

1. Tin 1/4"' on end of 3" wire section.
2. Use hot air gun to pre-heat ground ring.
3. Tin section of ground ring.
4. Solder wire to frame.

For back side the three point mount can be used to space the wire frame off the table by placing 4 tooling balls under the frame so that it sits flat.

4 Frame Cleaning Procedure

Following soldering the frames need to be cleaned to remove the solder flux and other contaminants from the board.

1. Prepare an ultrasonic cleaner bath with the Chemtronics ES132 flux remover following manufacturers directions.
   (a) Mix 10 parts deionized water to 1 part flux remover
   (b) allow 2 minutes to degas
   (c) Clean for 1 hour at 50 degrees Celsius.
   Note: Requires roughly 1.3 gallons of flux remover solution for a bath.
2. Rinse with de-ionized water.
3. Clean with isopropyl alcohol in ultrasonic bath for 30 minutes.
   - Requires roughly 1.3 gallons of alcohol per bath.

There are a total of roughly 50 frames to be soldered and cleaned. Each frame will take roughly 28 hours to complete. There are two wiring jigs so two frames can be constructed simultaneously. Some reuse of cleaning baths may be possible so total discarded fluids will have a maximum of 65 gallons over 30 days.

Isopropyl alcohol is to be discard into the provided container for later pickup.

Further Cleaning:

- Should each frame be pumped and baked then put into clean storage?
- What kind of clean storage? Ziploc bag after pumping?

5 Frame Storage

The frames need to be stored in a clean environment where no damage is done to the wires or the frames.

A dedicated area of the lab either using preferably some of the drawers or cupboards rather than the table top, needs to be set aside for this. Each frame will require more than one square foot to store, perhaps stacking on the end plate if storage space becomes limited.

CHEMTRONICS®
Technical Data Sheet

TDS # 132

Flux-Off® Aqueous

PRODUCT DESCRIPTION

Flux-Off® Aqueous is ideally formulated for flux removal in ultrasonic and in-line cleaning systems. It is an excellent cleaner for the removal of all rosin and no clean flux types from electronic subassemblies, printed circuit boards and all other electronic components. This concentrated formula can be diluted 1:10 with deionized water for many cleaning applications. Flux-Off® Aqueous will effectively remove other contaminants such as dirt, grease, handling soils and molding compounds.

- For use with ultrasonic and in-line cleaning systems
- Quickly removes all rosin and no clean flux types
- Removes encrusted, hard, baked fluxes
- Powerful cleaner leaves no residue
- Contains no CFCs or HCFCs
- Nonabrasive
- Nonflammable
- Noncorrosive

TYPICAL APPLICATIONS

Flux-Off® Aqueous removes flux residues and cleans:

- Chip Carriers
- Heat Sinks
- Metal Housings and Chassis
- Motors and Generators
- Printed Circuit Boards
- Surface Mount Device Pads

TYPICAL PRODUCT DATA AND PHYSICAL PROPERTIES

Boiling Point	212°F (Initial)
Solubility in Water @ 77°F/1 atm	100%
Specific Gravity (water = 1@ 77°F)	1.03
Flash Point (TCC)	None
Evaporation Rate (butyl acetate=1)	>1
Appearance	Clear, Amber Liquid
Surface Tension (dynes/cm @ 73°F)	28.0
pH	12.5
Shelflife	2 years after opening
RoHS/WEEE Status	RoHS WEEE Compliant
VOC content	164 g/L as purchased* 1:10 dilution- 16 g/L as used

***** SCAQMD compliant when diluted 1:7

COMPATIBILITY

Flux-Off® Aqueous is generally compatible with most materials used in printed circuit board fabrication. With any cleaning agent compatibility must be determined on a non-critical area prior to use.

Material	Compatibility
ABS Resin	Excellent
Buna-N	Fair
Butyl	Excellent
EPDM	Excellent
Graphite	Excellent
HDPE	Excellent
Kynar™	Excellent
LDPE	Excellent
Lexan™	Excellent
Neoprene	Good
Noryl®	Good
Nylon 101	Good
Cross-Linked PE	Good
Polyacrylate	Fair
Polypropylene	Good
Polystyrene	Good
PVC	Fair
Silicone Rubber	Good
Teflon™	Excellent
Viton™	Good

USAGE INSTRUCTIONS:
For industrial use only.
Read MSDS carefully prior to use.
Dilute 1:10 with deionized water for general cleaning. Can be used in hot or cold immersion, ultrasonic or aqueous cleaning systems. For immersion systems, soak as necessary. For ultrasonic cleaning, add Flux-Off® Aqueous to the ultrasonic cleaning tank, allow about two minutes for the mixture to degas, and immerse the part to be cleaned in the ultrasonic cleaner. After cleaning, rinse parts in de-ionized water and dry where required.

AVAILABILITY
ES132 1 Gallon Liquid

TECHNICAL & APPLICATION ASSISTANCE
Chemtronics® provides a technical hotline to answer your technical and application related questions. The toll free number is:
1-800-TECH-401.

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.
CHEMTRONICS® does not guarantee the accuracy of the data and assumes no liability in connection with damages incurred while using it.

MANUFACTURED BY:
ITW CHEMTRONICS
8125 COBB CENTER DRIVE
KENNESAW, GA 30152
1-770-424-4888 REV. E (06/06)

DISTRIBUTED BY:

SECTION 1: CHEMICAL PRODUCT AND COMPANY INFORMATION

Company Address:
8125 Cobb Center Drive
Kennesaw, GA 30152

Product Information: 800-TECH-401
Customer Service: 800-645-5244
Emergency: (Chemtrec) 800-424-9300
Revision Date: April 15, 2010

Product Identification

FLUX-OFF® AQUEOUS (Liquid)

Product Code: ES132, ES832L

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt. % Range
Deionized water	7732-18-5	50.0-75.0
Dipropylene glycol methyl ether	34590-94-8	10.0-20.0
Propylene glycol butyl ether	5131-66-8/15821-83-7	5.0-10.0
Sodium xylene sulfonate	1300-72-7	5.0-10.0
Sodium metasilicate	6834-92-0	1.0-5.0
Benzyl alcohol	100-51-6	0.5-2.0

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview: Clear, colorless liquid with mild solvent odor. Liquid will irritate eyes and skin under repeated or prolonged exposure. Breathing high concentrations of product vapor may produce central nervous system depression. This product is not flammable.

Potential Health Effects:

Eyes: DO NOT get in eyes. This product is irritating and can cause pain, tearing, reddening and swelling accompanied by a stinging sensation.

Skin: Contact may cause skin irritation.

Ingestion: DO NOT take internally. Harmful if swallowed. Irritating to mouth, throat and stomach. May cause vomiting.

Inhalation: Excessive inhalation of vapors can cause nasal and respiratory irritation and central nervous system effects including dizziness, weakness, fatigue, nausea, headache and unconsciousness.

Pre-Existing Medical Conditions Aggravated by Exposure: Lung, skin, eye and central nervous system.

SECTION 4: FIRST AID MEASURES

Eyes: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Have eyes examined and tested by medical personnel if irritation develops or persists.

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

Ingestion: Swallowing less than an ounce will not cause significant harm. For larger amounts, do not induce vomiting, but give one or two glasses of water to drink and get immediate medical attention.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

Flash Point: >200°F (>100C) LEL/UEL: Not established (% by volume in air)

Extinguishing Media: Use water fog, carbon dioxide, or dry chemical when fighting fires involving this material.

Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus (pressure-demand, MSHA/NIOSH approved or equivalent) and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Large Spills: Shut off leak if possible and safe to do so. Wear self-contained breathing apparatus and appropriate personal protective equipment. Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container for proper disposal. Do not flush to sewer. Avoid runoff into storm sewers and ditches which lead to waterways.

Small Spills: Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container for proper disposal.

SECTION 7: HANDLING AND STORAGE

Avoid prolonged or repeated contact with eyes, skin, and clothing. Wash hands thoroughly after handling or contact. Use with adequate ventilation. Avoid breathing product vapor or mist. Do not reuse this container. Store in a cool dry place away from heat, sparks and flame. Keep container 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
Dipropylene glycol methyl ether	100 ppm	100 ppm	150 ppm
Propylene glycol butyl ether	NA	NA	NA
Benzyl alcohol	NA	NA	NA

Work/Hygienic Practices: Good general ventilation should be sufficient to control airborne levels. 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	1	1
Flammability	0	0
Reactivity	0	0
Personal Protection	-	B

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Clear, pale yellow liquid
Odor: Mild solvent
pH: 12 - 14
Vapor Pressure: 14 mm Hg @ 25C
Vapor Density: Not available
Boiling Point: 212 F (100C)
Solubility in Water: Completely
Specific Gravity: (Water =1) 1.03
Evaporation Rate: <1 (Butyl acetate=1)
Melting Point: NA
Percent Volatile: 93%

SECTION 10: STABILITY AND REACTIVITY

Stability - This product is stable. Conditions to Avoid: Do not spray near open flames, red hot surfaces or other sources of ignition.
Incompatibility: Do not mix with aluminum, galvanized iron and zinc, powdered alkali and alkaline earth metals or strong oxidizing agents.
Products of Decomposition: Thermal decomposition may release carbon monoxide, carbon dioxide and incompletely burned hydrocarbons.
Hazardous Polymerization: Will not occur
Conditions to Avoid: NA

SECTION 11: TOXICOLOGICAL INFORMATION

Ingestion:

Sodium metasilicate	LD50/rats	1153 mg/kg
Dipropylene glycol methyl ether	LD50/rat	5135 mg/kg
Propylene glycol butyl ether	LD50/rat	3300 mg/kg

Inhalation: Not considered a hazard.

Skin:

Dipropylene glycol methyl ether	LD50/rats	9,500 mg/kg
Sodium metasilicate	Human	250 mg/24H SEV
Propylene glycol butyl ether	LD50/Rabbit	3100 mg/kg

Eye:

Dipropylene glycol methyl ether	human	8 mg MLD

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
Air and Ground:: Cleaning Compound
Not Regulated

SECTION 15: REGULATORY INFORMATION

SECTION 313 SUPPLIER NOTIFICATION
This product contains no 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).
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 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 Note: This MSDS is applicable to date codes of 1215 and later.

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.

INSTRUCTION MANUAL

DO NOT OPERATE YOUR ULTRASONIC CLEANER UNTIL YOU READ AND THOROUGHLY UNDERSTAND THESE INSTRUCTIONS.

ULTRASONIC CLEANING: Ultrasonic cleaning is the use of sound waves beyond the range of human audibility to perform scrubbing of a soiled part in a cleaning liquid. The transmission of these waves into the fluid causes the formation of millions of microscopic bubbles which collapse and release an intense amount of energy to literally "blast" the soils free from the external walls of the part being cleaned. This is known as "cavitation" and is the most modern, safe, gentle and thorough way of cleaning yet devised for most metallic and non-metallic parts.

An ultrasonic cleaning system consists of a "generator" which is an electronic device capable of generating electric energy at an ultrasonic frequency and a "transducerized tank" which holds liquid and parts. Together they create a "scrubbing action" in the liquid which results in thorough cleaning of the parts. The "S" systems are one piece consoles housing both the generator and transducerized tank in a rugged cabinet.

The SONICOR generators used in these systems are the most advanced in miniaturized solid-state technology. They consist of one or more modular type printed circuit board transistorized power packs. This modular concept simplifies maintenance, lowers initial operating costs and provides high operating efficiency.

OPERATION OF THE CLEANER: The "S" series cleaning systems are designed to be as foolproof as possible and to be simple enough to be operated without any special skill or training. The following suggestions should, however, assist in getting the most efficiency from them:

1. Select the desired cleaning solution (see SONICOR Chemical Data Sheets).
2. Fill the tank to the desired level with the solution. A minimum of two inches (heated systems must have three inches) of liquid should always be in the tank to prevent damage. Normally, the tank needs to be filled only enough to cover the parts being cleaned. **NEVER OPERATE THE UNIT WITHOUT LIQUID IN THE TANK.**
3. Plug the unit into an electrical outlet (110/120 volt, 50/60 cycle, 1 phase). Make certain a three prong (grounded) plug is used or that a separate ground is run to the unit.
4. Turn the unit "ON" using the amber colored switch (Timer equipped: turn to desired cleaning time cycle). The pilot light switch will glow and a characteristic buzzing noise will be heard in the tank. It is best to wait two to three minutes before cleaning when adding new liquid to permit the escape of entrapped air and other gasses (degassing) which would decrease cleaning efficiency. Some units are supplied with a toggle switch and a pilot light instead of the push button switch.
5. The model containing two switches is equipped with built-in heater system. These units must always be used with a minimum of 3" of cleaning solution. The amber switch is for ultrasonic cleaning ON/OFF and the red switch is for the heater ON/OFF. The heater system switch may be left on (providing there is always 3" of solution in the tank) thereby maintaining solution temperature and only activate the ultrasonic control when it is necessary to clean.
6. When the unit is "ON" you will be aware of the buzzing noise indicating ultrasonic activity in the tank. This will vary in intensity throughout the operation as will rippling of the surface. This variation has generally no bearing on the cleaning efficiency of the unit and may change considerably in intensity when work is introduced or as various aqueous and solvent cleaning solutions are used. Solvents must be warm before they operate properly.
7. Work to be cleaned should be positioned in the tank. In most cases, it may be desirable to use a rack or basket designed for ultrasonic use. Your SONICOR Applications Engineer or Technical Representative will be pleased to assist you in the selection of the best device to suit your needs.

8. "Cleaning time" will depend on the amount, location and type of soil to be removed. While most surface soils can be removed instantaneously, heavy soil embedded in the cracks, crevices and pores of the part may require several minutes. Loading the workbasket with heavily soiled parts that are touching will further increase the cleaning tine. As mentioned before, selection of the proper cleaning chemical and handling devices is extremely important in getting maximum efficiency from your unit.
9. When the cleaning solution has become heavily contaminated, it will lose its efficiency and fresh solution should be added. The amount of solution will vary according to the type of chemical used, the amount of soil removed and frequency of use.
10. When it is necessary to use several solutions or a chemical not compatible with type 302 stainless steel to properly clean and rinse the soiled parts, the following simple procedure will permit your ultrasonic to be used efficiently: (a) fill tank to about 2" level with water and one ounce SONICOR #101; (b) Using glass, stainless steel, linear polyethylene beakers or tanks filled with the desired solutions, position them in the tank in contrast to the liquid so that there are no air bubbles under them. The ultrasonic energy will pass through the walls of these "inner tanks" and clean efficiently.

GENERAL PRECAUTIONS

1. Never immerse your cleaner in water. When you are finished using the tank, rinse it thoroughly and wipe dry.
2. **NEVER OPERATE THE TANK WITHOUT AT LEAST TWO INCHES OF WATER IN IT.**
3. Do not overload the tank or place heavy objects on the tank bottom as this will decrease cleaning efficiency.
4. Never use volatile, toxic or inflammable solvents, as the use of ultrasonics tends to increase the evaporation rate and cause additional hazards.
5. When cleaning a new part, it is best to experiment on a sample before proceeding with a batch load.
6. Always rinse the parts after proper cleaning procedure.
7. Metal objects should always be lubricated after cleaning to prevent oxidation.
8. To avoid discomfort, do not place your fingers in the tank while it is in operation.
9. **NEVER USE ANY CHEMICAL SOULTION THAT WILL ATTACK STAINLESS STEEL ACCESSORIES.** A complete line of accessories is available for the Sonicor "SC" series. Please refer to your data sheets for more information.

CLEANING CHEMICALS: A complete line of cleaning chemicals is available from Sonicor and your distributor.

GUARANTEE INSTRUCTION: Your system has passed rigid factory inspection at each stage of assembly and has been life-tested under actual conditions prior to shipment. Defects in material and workmanship will be corrected without charge for parts and labor for one year after purchase. Cavitation erosion is a normal occurrence and develops with use of equipment and, therefore, not included as a part of the guarantee. A defective unit must be returned PREPAID to the factory. Collect shipments to the factory will not be accepted unless previously authorized. Service or parts supplied by unauthorized sources will nullify the guarantee. During the guarantee period, there will be a handling charge for repairs described above. The charge is $25.00 for S-30, S-50, S-100 and S-101 units. The handling charge for S-150, S-200 and S-211 is $35.00. For S-300 and S-400, S-401, S-550, S-650 $45.00. For all MSC-units, $50.00. Repairs necessitated for reasons beyond normal usage of the equipment will be billed at prevailing rates.

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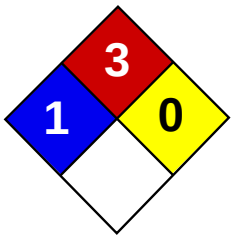

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Isopropyl alcohol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Isopropyl alcohol

Catalog Codes: SLI1153, SLI1579, SLI1906, SLI1246, SLI1432

CAS#: 67-63-0

RTECS: NT8050000

TSCA: TSCA 8(b) inventory: Isopropyl alcohol

CI#: Not available.

Synonym: 2-Propanol

Chemical Name: isopropanol

Chemical Formula: C3-H8-O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Isopropyl alcohol	67-63-0	100

Toxicological Data on Ingredients: Isopropyl alcohol: ORAL (LD50): Acute: 5045 mg/kg [Rat]. 3600 mg/kg [Mouse]. 6410 mg/kg [Rabbit]. DERMAL (LD50): Acute: 12800 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer, permeator).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE]. The substance may be toxic to kidneys, liver, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 399°C (750.2°F)

Flash Points: CLOSED CUP: 11.667°C (53°F) - 12.778 deg. C (55 deg. F) (TAG)

Flammable Limits: LOWER: 2% UPPER: 12.7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME. Hydrogen peroxide sharply reduces the autoignition temperature of Isopropyl alcohol. After a delay, Isopropyl alcohol ignites on contact with dioxgenyl tetrafluorborate, chromium trioxide, and potassium tert-butoxide. When heated to decomposition it emits acrid smoke and fumes.

Special Remarks on Explosion Hazards:
Secondary alcohols are readily autooxidized in contact with oxygen or air, forming ketones and hydrogen peroxide. It can become potentially explosive. It reacts with oxygen to form dangerously unstable peroxides which can concentrate and explode during distillation or evaporation. The presence of 2-butanone increases the reaction rate for peroxide formation. Explosive in the form of vapor when exposed to heat or flame. May form explosive mixtures with air. Isopropyl alcohol + phosgene forms isopropyl chloroformate and hydrogen chloride. In the presence of iron salts, thermal decompositon can occur, whicn in some cases can become explosive. A homogeneous mixture of concentrated peroxides + isopropyl alcohol are capable of detonation by shock or heat. Barium perchlorate + isopropyl alcohol gives the highly explosive alkyl perchlorates.

It forms explosive mixtures with trinitormethane and hydrogen peroxide. It produces a violent explosive reaction when heated with aluminum isopropoxide + crotonaldehyde. Mixtures of isopropyl alcohol + nitroform are explosive.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 983 STEL: 1230 (mg/m3) [Australia] TWA: 200 STEL: 400 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 980 STEL: 1225 (mg/m3) from NIOSH TWA: 400 STEL: 500 (ppm) from NIOSH TWA: 400 STEL: 500 (ppm) [United Kingdom (UK)] TWA: 999 STEL: 1259 (mg/m3) [United Kingdom (UK)] TWA: 400 STEL: 500 (ppm) from OSHA (PEL) [United States] TWA: 980 STEL: 1225 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Pleasant. Odor resembling that of a mixture of ethanol and acetone.

Taste: Bitter. (Slight.)

Molecular Weight: 60.1 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 82.5°C (180.5°F)

Melting Point: -88.5°C (-127.3°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.78505 (Water = 1)

Vapor Pressure: 4.4 kPa (@ 20°C)

Vapor Density: 2.07 (Air = 1)

Volatility: Not available.

Odor Threshold:
22 ppm (Sittig, 1991) 700 ppm for unadapted panelists (Verschuren, 1983).

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility:
Easily soluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone. Insoluble in salt solution. Soluble in benzene. Miscible with most organic solvents including alcohol, ethyl alcohol, chloroform.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, Ignition sources, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts violently with hydrogen + palladium combination, nitroform, oleum, COCl2, aluminum triisopropoxide, oxidants Incompatible with acetaldehyde, chlorine, ethylene oxide, isocyanates, acids, alkaline earth, alkali metals, caustics, amines, crotonaldehyde, phosgene, ammonia. Isopropyl alcohol reacts with metallic aluminum at high temperatures. Isopropyl alcohol attacks some plastics, rubber, and coatings. Vigorous reaction with sodium dichromate + sulfuric acid.

Special Remarks on Corrosivity: May attack some forms of plastic, rubber and coating

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3600 mg/kg [Mouse]. Acute dermal toxicity (LD50): 12800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 16000 8 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE]. May cause damage to the following organs: kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive/teratogenic effects (fertility, fetoxicity, developmental abnormalities(developmental toxin)) based on animal studies. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause mild skin irritation, and sensitization. Eyes: Can cause eye irritation. Inhalation: Breathing in small amounts of this material during normal handling is not likely to cause harmful effects. However, breathing large amounts may be harmful and may affect the respiratory system and mucous membranes (irritation), behavior and brain (Central nervous system depression - headache, dizziness, drowsiness, stupor, incoordination, unconciousness, coma and possible death), peripheral nerve and senstation, blood, urinary system, and liver. Ingestion: Swallowing small amouts during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful. Swallowing large amounts may cause gastrointestinal tract irritation with nausea, vomiting and diarrhea, abdominal pain. It also may affect the urinary system, cardiovascular system, sense organs, behavior or central nervous system (somnolence, generally depressed activity, irritability, headache, dizziness, drowsiness), liver, and respiratory system (breathing difficulty). Chronic Potential Health Effects: May cause defatting of the skin and dermatitis and allergic reaction. May cause adverse reproductive effects based on animal data (studies).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 100000 mg/l 96 hours [Fathead Minnow]. 64000 mg/l 96 hours [Fathead Minnow].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Isopropyl Alcohol UNNA: 1219 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Isopropyl alcohol Illinois toxic substances disclosure to employee act: Isopropyl alcohol Rhode Island RTK hazardous substances: Isopropyl alcohol Pennsylvania RTK: Isopropyl alcohol Florida: Isopropyl alcohol Minnesota: Isopropyl alcohol Massachusetts RTK: Isopropyl alcohol New Jersey: Isopropyl alcohol New Jersey spill list: Isopropyl alcohol Director's list of Hazardous Substances: Isopropyl alcohol Tennesee: Isopropyl alcohol TSCA 8(b) inventory: Isopropyl alcohol TSCA 4(a) final testing order: Isopropyl alcohol TSCA 8(a) IUR: Isopropyl alcohol TSCA 8(d) H

and S data reporting: Isopropyl alcohol: Effective date: 12/15/86 Sunset Date: 12/15/96 TSCA 12(b) one time export: Isopropyl alcohol SARA 313 toxic chemical notification and release reporting: Isopropyl alcohol

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R36- Irritating to eyes. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:53 PM

Last Updated: 05/21/2013 12:00 PM

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