



Material Safety Data Sheet

(Essentially Similar to U.S. Department of Labor Suggested
 Form For Hazard Communication Compliance)

I. Product Identification

Hazard Ratings
 4 = Extreme
 3 = High
 2 = Moderate
 1 = Slight
 0 = Insignificant

Product Type - ALL-STATE SILVER SOLDERS

Manufacturer - THE ESAB GROUP, INC.
Website: www.esabna.com

Telephone No. - 1-717-637-8911
 1-800-933-7070

Address - 801 Wilson Avenue
 Hanover, PA 17331

Emergency No. - 1-717-637-8911
 (CHEMTREC) 1-800-424-9300

Product Description: Solid wires (Aquasafe 100 and 430 Solder) and a solid suspension (430 Paste) that is a paste consisting of a mixture of acids, halide powders and solvents. These products are used primarily in soldering copper and copper based alloys.

APPROXIMATE COMPOSITION (Wt. %)

All-State Product Trade Name	Aquasafe 100 Solder ❶	430 Solder ❶	430 Paste Solder ❶
Ammonium Chloride	--	--	1-7
Antimony	< 2	--	--
Copper	< 5	--	--
Silver	< 2	1-6	4-5
Tin	> 90	94-99	70-76
Zinc Chloride	--	--	15-24

NOTE: X indicates material is present; other ingredients, if any, are non-hazardous trade secrets.

❶ See Note 1 in Section VI

THE ESAB GROUP requests the users of these products to study this Material Safety Data Sheet (MSDS) and the product labels and become fully aware of the product hazards and safety information. To promote the safe use of these products a user should (1) notify and train its employees, agents and contractors concerning the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for these products, and (3) request that such customers notify and train their employees and customers, for these products, of the same product hazards and safety information.

II. Hazardous Ingredients

IMPORTANT: This section covers the materials from which this product is manufactured. The fumes and gases produced during normal use of these products are covered in Section V. The term **HAZARDOUS** should be interpreted as a term required and defined by Laws, Statutes or Regulations, and does not necessarily imply the existence of any hazard when the products are used as directed by **THE ESAB GROUP**.

Material	(CAS No.)	SARA	ACGIH TLV		OSHA - PEL	
			TWA (mg/m ³)		TWA (mg/m ³)	STEL (mg/m ³)
Ammonium Chloride (NH ₄ Cl)	12125-02-9		10	C 20	10	20
Antimony (Sb)	7440-36-0	*	0.5		0.5	--
Copper (Cu)	7440-50-8	*	0.2	(Fume)	0.1 (Fume)	--
Silver (Ag)	7440-22-4	*	0.1	Metal	0.01 Metal	--
			0.01	Soluble Compounds as Ag	0.01 Soluble Compounds as Ag	
Tin (Sn)	7440-31-5	*	2	Metal and Oxides as Sn	2 Metal and Oxides as Sn	--
Zinc Chloride (ZnCl ₂) Fume	7646-85-7	*	1	C (2)	1	2

NOTE: In the ingredients table, an asterisk (*) after the CAS number indicates a toxic chemical subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (SARA) and 40 CFR Part 372.

Some of these products may not contain all of the materials listed. For details of composition, refer to the COMPOSITION TABLE in Section I.

In the table above, "C" indicates "Ceiling Limit."

In the table above under the TLV column, ACGIH "2003 Guide to Occupational Exposure Values" SEN (TLV) is defined as "confirmed potential for worker sensitization as a result of dermal contact and/or inhalation exposure, based on the weight of scientific evidence.

In the table above under the TLV column, ACGIH "2003 Guide to Occupational Exposure Values", (L) is defined as: "exposure by all routes should be carefully controlled to levels as low as possible.

III. Physical Data

Product Name	Aquasafe 100 Solder	430 Solder	430 Paste Solder
VAPOR DENSITY (Air = 1)	N/A	N/A	N/A
VAPOR PRESSURE (Non-Aerosols) (mm Hg @ Temperature)	N/A	N/A	NH ₄ Cl 1 @ 160° C (sublimes) ZnCl ₂ 1 @ 426° C
PERCENT VOLATILES BY VOLUME	N/A	N/A	N/A
EVAPORATION RATE (butyl acetate = 1)	N/A	N/A	N/A
MELTING POINT	221° C	Approx 221° C	NH ₄ Cl 338° C ZnCl ₂ 290° C Metal 221° C

Product Name	Aquasafe 100 Solder	430 Solder	430 Paste Solder
BOILING POINT	< 2200°C	2250°C	NH ₄ Cl 520°C ZnCl ₂ 732°C Sn 2270°C Ag 2212°C
SPECIFIC GRAVITY (H ₂ O = 1)	7.1	7.1	NH ₄ Cl 1.62 ZnCl 2 2.91 Metal 7.1
SOLUBILITY IN WATER	Insoluble	Insoluble	Flux Soluble Metal Insoluble
ODOR AND APPEARANCE	Silver-White Metal, Odorless	Silver-White Metal, Odorless	Metallic Grey Color

IV. Fire & Explosion Hazard

Flammable/Explosive:

Aquasafe 100 Solder	NO (X) YES ()	430 Solder	NO (X) YES ()
430 Paste Solder	NO (X) YES ()		

Flash Point:

Aquasafe 100 Solder	N/A	430 Solder	N/A
430 Paste Solder	N/A		

Flammable Limits in Air: (% by Volume)

Aquasafe 100 Solder	N/A	430 Solder	N/A
430 Paste Solder	LEL 220 oz./1000 ft ³ UEL N/A		

Extinguishing Media:

430 Paste Solder - Use dry sand or other inert material. Do not use Class "A", "B", or "C" extinguishers or halogenated agents.

All others - Do not use carbon dioxide. If water is the only media available, use in flooding amounts. Use dry sand, dry chemical, soda ash, or lime. Use the extinguishing media recommended for the burning materials and fire situation.

Special Fire Fighting Procedures: Full protective equipment required. May release zinc oxide and HCl fumes. Toxic metal halide fumes produced.

Unusual Fire and Explosion Hazards: Dense smoke may be generated.

430 Paste Solder Ammonium Chloride decomposes upon heating and can form very toxic fumes and gases including ammonia, oxides of nitrogen and chlorides. Zinc Chloride emits toxic fumes and gases including chlorides and zinc oxide.

Note: Welding processes can ignite combustible and flammable materials. See ANSI Z49.1 "Safety in Welding and Cutting" and "Safe Practices" Code: SP, published by the American Welding Society, P. O. Box 351040, Miami, FL 33135, and NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work" published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169 for additional fire prevention and protection information.

V. Reactivity Data

Stability: Stable (X) Unstable () Hazardous polymerization will not occur.

Conditions to Avoid: Excessive Heat—decomposes, forming corrosive skin penetrating toxic gases, strong acids, strong oxidizing agents, caustics. Do not grind or pulverize the products; the dusts can be toxic and poisonous. See the TLV for silver.

Incompatibility (Materials to Avoid): Strong acids, isocyanates, aliphatic amines, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide silver salts, potassium chlorate, ammonium nitrate, bromine trifluoride and iodine heptafluoride).

Hazardous Decomposition Products: When heated to decomposition ammonium chloride may form hydrogen chloride, nitrogen oxides and ammonia. Zinc chloride emits toxic fumes and gases including chlorides and zinc oxide. In addition, antimony when heated or on contact with acid emits toxic fumes including antimony hydride, and tin when heated or on contact with strong acids may produce toxic and poisonous compounds.

Generally, when soldering, brazing, braze welding and welding, the fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the material being worked, the process, procedures, carrier gas and consumables used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the material being worked (such as paint, plating or galvanizing), the number of metal joining and fume generating operations and the volume of the work area, the quality and amount of ventilation, the position of the worker's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning or painting activities). When the materials are consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section II. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the ingredients, plus those from the material being worked and the coatings etc. noted above.

Reasonably expected decomposition products from normal use of these products include a complex of the oxides of the materials listed in Section II, as well as carbon monoxide, carbon dioxide, ozone and nitrogen oxides (refer to "Characterization of Arc Welding Fume" available from the American Welding Society). THE GENERAL LIMIT FOR WELDING FUMES is 5 mg/m³. The TLV for some of the hazardous airborne ingredients listed in Section II may be exceeded before the general TLV for welding fumes. The only way to determine the true identity of the decomposition products is by sampling and analysis. The composition and quantity of the fumes and gases to which a worker may be overexposed can be determined from a sample obtained from inside the welder's helmet, if worn, or in the worker's breathing zone. See ANSI/AWS F1.5 "Methods for Sampling and Analyzing Gases from Welding and Allied Processes" and ANSI/AWS F1.1 "Method for Sampling Airborne Particles Generated by Welding and Allied Processes", available from the American Welding Society.

VI. Physical and Health Hazard Data

All-State 430 Paste Solder:

DANGER! CORROSIVE PASTE AND VAPORS CAUSE SEVERE BURNS TO ALL BODY TISSUE. VAPOR IS SEVERELY IRRITATING TO EYES AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED.

Soldering Fumes and Gases can be dangerous to your health. Noise can damage hearing. An additional detailed description of the Health and Physical Hazards and their consequences may be found in ESAB's publications F52-529 "Precautions and Safe Practices for Electric Welding and Cutting" and 17982 "Standard for Fire Prevention During Welding, Cutting and Other Hot Work." You may obtain copies from your local supplier or by writing to the address in Section I.

Route Of Overexposure: The primary routes of entry of these products are by skin contact and eye contact; inhalation and ingestion are possible. The primary route of entry of the decomposition products is by inhalation; skin contact, eye contact, and ingestion are possible. When these products are used as recommended by THE ESAB GROUP, and ventilation maintains exposure to the vapors and to the decomposition products below the limits recommended in this section, overexposure is unlikely.

Effects Of Acute (short-term) Overexposure. Some toxic gases associated with welding may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty in breathing, frequent coughing, or chest pain. The presence of tin and copper in the fume can cause metal fume fever. Short term symptoms may include a metallic taste in the mouth, dryness or irritation of the throat followed by coughing, shortness of breath, nausea, fever, body ache, and chills. Symptoms usually disappear within 24 hours. Acute effects of these products are:

Inhalation: Causes benign pneumoconiosis and irritation to the respiratory tracts symptoms include shortness of breath, coughing. The following are the known hazards from acute exposure to these components:

Ammonium Chloride vapors cause severe irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.

Zinc Chloride vapors are extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Eye Contact: Causes irritation, redness and pain. The following are the known hazards from acute exposure to these components:

Zinc Chloride may cause redness, pain and blurred vision. Splashes from solutions may cause eye damage and blindness.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain. Prolonged and repeated contact may cause dermatitis. The following are the known hazards from acute exposure to these components:

Zinc Chloride may cause severe irritation, skin burns and ulcerations. Solutions are corrosive. Symptoms include redness and pain.

Ingestion: May cause gastronomic gastrointestinal irritation with nausea, vomiting and diarrhea. Ingested inorganic tin salts may interfere with various enzyme systems and may cause systemic effects on the central nervous system, heart, and liver. The following are the known hazards from acute exposure to these components

Ammonium Chloride causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Zinc Chloride is toxic. May cause irritation or corrosion to the gastrointestinal tract with abdominal pain, nausea, and vomiting. May cause delayed death occurring from strictures of the esophagus and pylorus.

Pre-existing Medical Conditions Aggravated by Overexposure: Individuals with allergies or impaired respiratory function may have symptoms worsened by exposure to soldering fumes; however, such reaction cannot be predicted due to the variation in composition and quantity of the decomposition products. These products may cause aggravation to pre-existing heart, liver, kidney, skin, lung, and eye disorders.

Effects of chronic (long-term) overexposure: to air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest X-rays. The severity of the change is proportional to the length of the exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on X-rays may be caused by non-work factors such as smoking, etc. Long term exposure to welding and allied processes gases, dusts and fumes may contribute to pulmonary irritation or pneumoconiosis. Repeated skin contact with zinc chloride can cause varying degrees of problems ranging from dermatitis to ulcerations; repeated inhalation can cause occupational asthma. Copper poisoning has been reported in the literature from exposure to high levels of copper. Liver damage can occur due to copper accumulation in the liver; the damage is characterized by cell destruction and cirrhosis. High levels of copper may cause central nervous system damage characterized by nerve fiber separation and cerebral degeneration. Overexposure to silver may result in argyria, a permanent pigmentation (gray to purple) of the skin and eyes. Exposure to high silver levels has resulted in respiratory problems and stomach pains. Prolonged or repeated skin contact with tin may cause dermatitis. Chronic exposure to tin oxide dusts and fumes may result in stannosis (benign pneumoconiosis).

Exposure limits for the ingredients are listed in Section II. The ACGIH and the 1989 OSHA TWA for welding fume is 5 mg/m³. At time the limit for a particular hazardous chemical is reached before the limit for welding fumes. TLV-TWA's should be used as a guide in the control of health hazards and not as firm lines between safe and excessive concentrations. As noted in Section V, the fume from welding and allied processes is a mixture of many components. Therefore, a statutory computation of the equivalent exposure is required. The equivalent exposure value for the welding and brazing fume mixture shall always be less than one. When these products are used as recommended by THE ESAB GROUP, and the preventive measures taught in this MSDS are followed, overexposure to hazardous substances will not occur.

Emergency First Aid Measures: In case of emergency, call for medical aid.

Eye Contact: With eyelids retracted, flush eyes with plenty of water for at least 15 minutes to remove all residue. Get medical attention immediately.

Skin Contact: Get medical attention immediately. In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. copiously apply polyethyleneglycol 400 to the affected area. If contact is with paste product, remove paste with paper or cloth. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Inhalation: Remove to fresh air. Obtain medical assistance immediately advise physicians of ingredients listed in Section II. If breathing has stopped, perform artificial respiration. Administer oxygen if available

Ingestion: Immediately consult a physician. Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Carcinogenic Assessment (NTP Annual Report, IARC Monographs, Other):

Antimony oxide MAK-2—substances that are considered to be carcinogenic for man because sufficient data from long-term studies or limited evidence from animal studies substantiated by evidence from epidemiological studies.

Antimony trioxide MAK-2 (see antimony oxide), IARC 2B possibly carcinogenic to humans.

Copper dusts and mists EPA-D not classifiable as to human carcinogenicity.

Silver metal EPA-D not classifiable as to human carcinogenicity.

● **WARNING:** This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code §25249.5 et seq.)

VII. Precautions for Safe Handling and Use/Applicable Control Measures

Read and understand the manufacturer's instructions and the precautionary label on this product. See American National Standard Z-49.1, "Safety in Welding and Cutting," published by the American Welding Society, P. O. Box 351040, Miami, FL 33135 and OSHA Publication 2206 (29 C.F.R. 1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 for more detail on many of the following:

Ventilation: Use enough ventilation, local exhaust at the source, or both, to keep the exposure within legal limits. In the worker's breathing zone and the general area, the fumes and gases must be kept below the TLVs and the *equivalent exposure* must compute to less than one. Train the operator to keep his head out the fumes.

Respiratory Protection: Use respirable fume respirator or air supplied respirator when welding in confined spaces or where local exhaust or ventilation does not keep exposure below the TLVs. Where respiratory protection is necessary, OSHA mandates that NIOSH and Mine Safety and Health Administration (MSHA) approved respiratory protection must be used. The selection of the appropriate respiratory protection (dust respirator, etc.) should be based on the actual or potential airborne contaminants and their concentrations present.

Respiratory Protection: In case of high vapor concentration, wear self-contained breathing apparatus.

Eye Protection: Wear protective eyewear compliant with ANSI Z87.1 shade 3 or higher. As a rule, start with a shade that is too dark (shade 6 or higher) to see the work zone and progress to a shade that gives a sufficient view (shade 3 to 5). Provide protective screens and chemical tight safety goggles to protect others in the area. Do NOT wear contact lenses. Readily available eye baths are recommended in areas where operations may produce fumes and dusts.

Protective Clothing and Equipment: Wear hand, head and body protection that help to prevent injury from heat, infrared and ultraviolet radiation, and sparks as well as skin contact with the flux. At minimum, rubber gloves, eyewear, respirator, arm protectors, protective footwear, aprons, hats, and dark clothing must be considered.

Hygienic Work Practices: Avoid contact to eyes, skin, and mucous membranes. Avoid inhalation of vapors. Wash thoroughly after handling. Do not eat, drink, or smoke in vicinity of use or storage. Otherwise follow the standards of good industrial hygiene practices.

Steps to be taken if material is spilled or released: Prevent product from getting into water or sewer systems. Absorb with absorbent material (i.e. sawdust, sand, diatomaceous earth). Collect in separate containers. Keep containers closed and dispose of as recommended. Avoid skin contact. Provide ventilation and exhaust at the spill site to keep exposure below the TLVs.

Waste Disposal Method: Dispose of in accordance with all local, state, and federal regulations. Precautions to be Taken in Handling and Storage: Avoid contact to the eyes, skin, and mucous membranes. Wash hands thoroughly after handling to remove all residue. Store material in sealed container in dry, cool and, well-ventilated area, away from sources of ignition and moisture.

Other Precautions and/or Special Hazards: Do not breathe fumes. Remove and professionally wash contaminated clothing before re-use. Existing lung disorders will have increased toxic susceptibility.

Toxic Substances Control Act: All active components of this compound are listed within the TSCA inventory.

Hazard Communication Program: Hazardous warnings and training requirements as mandated for corrosive material.

The opinions expressed in this MSDS are those of qualified experts within THE ESAB GROUP. We believe that the information contained herein is current as of the date of this MSDS. Since the use of this information and these opinions and the conditions of use of these products are not within the control of THE ESAB GROUP, it is the user's obligation to determine the conditions of safe use of these products.