



MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name **Worthington High Activity Stainless Steel Soldering Flux**
Version # 01
Issue date 18-June-2013
Revision date -
Supersedes date -
CAS # Mixture
MSDS Number WC019
Product use Soldering flux.
Manufacturer information
Manufacturer/Supplier Worthington Cylinder Corporation
Address 1690 Lowery Street
 Winston-Salem, NC 27101
 United States
Contact Person: Melissa Grimes
 Melissa.Grimes@worthingtonindustries.com
Telephone Number: 336-831-8601
CHEMTREC - 24 HOURS: (800) 424-9300

2. Hazards Identification

Physical state Liquid.
Appearance Clear, colorless liquid.
Emergency overview DANGER

Causes skin and eye burns. Harmful if swallowed. Irritating to respiratory system.
OSHA regulatory status This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects
Routes of exposure Fume inhalation. Ingestion. Skin contact. Eye contact.
Eyes Causes eye burns.
Skin Causes skin burns.
Inhalation Irritating to respiratory system. Elevated temperatures or mechanical action may form dust and fumes which may be irritating to the respiratory tract.
Ingestion Harmful if swallowed. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.
Target organs Eyes. Skin. Respiratory system.
Signs and symptoms Symptoms of overexposure include: pulmonary edema, abdominal pain, vomiting, eye damage, and skin burn.
Potential environmental effects Very toxic to aquatic organisms. May cause long-term adverse effects in the environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
Zinc chloride	7646-85-7	30 - 45
Ammonium chloride	12125-02-9	4 - 15
Hydrochloric acid	7647-01-0	3 - 15
Ammonium bifluoride	1341-49-7	3 - 6

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First Aid Measures

First aid procedures

Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Skin contact	Remove and isolate contaminated clothing and shoes. Immediately flush with plenty of water for at least 15 minutes. Get medical attention immediately. Wash clothing separately before reuse.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	Rinse mouth and drink plenty of water. Induce vomiting, if person is conscious. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical attention immediately.

Notes to physician

Treat symptomatically.

General advice

Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Flammable properties

Hydrogen fluoride, a corrosive and toxic gas, and other potentially hazardous fluorine-containing compounds may be released upon combustion.

Extinguishing media

Suitable extinguishing media	Dry chemical, foam, carbon dioxide.
Unsuitable extinguishing media	None.

Protection of firefighters

Specific hazards arising from the chemical	Fire may produce irritating, corrosive and/or toxic gases.
Protective equipment and precautions for firefighters	Firefighters should wear full protective clothing including self contained breathing apparatus.

Fire fighting

equipment/instructions

Move containers from fire area if you can do it without risk.

Specific methods

Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental Release Measures

Personal precautions

Use personal protection as recommended in Section 8 of the MSDS. Avoid inhalation of dust and contact with skin and eyes.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not contaminate water.

Methods for cleaning up

Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Neutralize with Sodium Bicarbonate or Soda Ash. Flush with water to dilute. For waste disposal, see Section 13 of the MSDS.

7. Handling and Storage

Handling

Wear appropriate personal protective equipment (See Section 8). Use only with adequate ventilation. Do not breathe fumes. Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling.

Storage

Store in plastic containers in cool area away from heat. Do not store in glass or porcelain containers. Store away from incompatible materials.

8. Exposure Controls / Personal Protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Ammonium bifluoride (CAS 1341-49-7)	TWA	2.5 mg/m ³	
Ammonium chloride (CAS 12125-02-9)	STEL	20 mg/m ³	Fume.
Hydrochloric acid (CAS 7647-01-0)	TWA Ceiling	10 mg/m ³ 2 ppm	Fume.
Zinc chloride (CAS 7646-85-7)	STEL	2 mg/m ³	Fume.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
	TWA	1 mg/m ³	Fume.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Ammonium bifluoride (CAS 1341-49-7)	PEL	2.5 mg/m ³	
Hydrochloric acid (CAS 7647-01-0)	Ceiling	7 mg/m ³	
		5 ppm	
Zinc chloride (CAS 7646-85-7)	PEL	1 mg/m ³	Fume.

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value	Form
Ammonium bifluoride (CAS 1341-49-7)	TWA	2.5 mg/m ³	Dust.

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value	Form
Ammonium chloride (CAS 12125-02-9)	STEL	20 mg/m ³	Fume.
	TWA	10 mg/m ³	Fume.
Hydrochloric acid (CAS 7647-01-0)	Ceiling	3 mg/m ³	
		2 ppm	
Zinc chloride (CAS 7646-85-7)	STEL	2 mg/m ³	Fume.
	TWA	1 mg/m ³	Fume.

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value	Form
Ammonium bifluoride (CAS 1341-49-7)	TWA	2.5 mg/m ³	
Ammonium chloride (CAS 12125-02-9)	STEL	20 mg/m ³	Fume.
	TWA	10 mg/m ³	Fume.
Hydrochloric acid (CAS 7647-01-0)	Ceiling	2 ppm	
Zinc chloride (CAS 7646-85-7)	STEL	2 mg/m ³	Fume.
	TWA	1 mg/m ³	Fume.

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value	Form
Ammonium bifluoride (CAS 1341-49-7)	TWA	2.5 mg/m ³	
Ammonium chloride (CAS 12125-02-9)	STEL	20 mg/m ³	Fume.
	TWA	10 mg/m ³	Fume.
Hydrochloric acid (CAS 7647-01-0)	Ceiling	2 ppm	
Zinc chloride (CAS 7646-85-7)	STEL	2 mg/m ³	Fume.
	TWA	1 mg/m ³	Fume.

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value	Form
Ammonium bifluoride (CAS 1341-49-7)	TWA	2.5 mg/m3	
Ammonium chloride (CAS 12125-02-9)	STEL	20 mg/m3	Fume.
Hydrochloric acid (CAS 7647-01-0)	TWA	10 mg/m3	Fume.
	Ceiling	7.5 mg/m3	
Zinc chloride (CAS 7646-85-7)	TWA	5 ppm	
		1 mg/m3	Fume.

Mexico. Occupational Exposure Limit Values

Components	Type	Value	Form
Ammonium bifluoride (CAS 1341-49-7)	TWA	2.5 mg/m3	
Ammonium chloride (CAS 12125-02-9)	STEL	20 mg/m3	Fume.
Hydrochloric acid (CAS 7647-01-0)	TWA	10 mg/m3	Fume.
	Ceiling	7 mg/m3	
Zinc chloride (CAS 7646-85-7)	TWA	5 ppm	
	STEL	2 mg/m3	Fume.
	TWA	1 mg/m3	Fume.

Exposure guidelines

Use personal protective equipment as required. Keep working clothes separately.

Engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal protective equipment**Eye / face protection**

Wear safety glasses with side shields (or goggles) and a face shield. Wear a full-face respirator, if needed.

Skin protection

Chemical resistant gloves. Rubber apron.

Respiratory protection

If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

General hygiene considerations

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. Provide eyewash station and safety shower.

9. Physical & Chemical Properties

Appearance	Clear, colorless liquid.
Physical state	Liquid.
Form	Liquid.
Color	Clear, colorless.
Odor	Odorless.
Odor threshold	Not available.
pH	0.1
Vapor pressure	Not available.
Vapor density	Not available.
Boiling point	219.2 °F (104 °C)
Melting point/Freezing point	32 °F (0 °C)
Solubility (water)	Unlimited.

Specific gravity	1.5
Flash point	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Auto-ignition temperature	Not available.
Evaporation rate	0.6 (Butyl acetate = 1)
Percent volatile	55 %

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Contact with metals. Excessive heat or cold.
Incompatible materials	Alkalines. Strong oxidizing agents. Reducing agents. Cyanides. Combustible material.
Hazardous decomposition products	Thermal decomposition or combustion may liberate corrosive gases or fumes. Hydrogen chloride gas. Zinc oxide. Zinc chloride. Ammonium fume.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Components	Species	Test Results
Ammonium bifluoride (CAS 1341-49-7)		
Acute		
<i>Oral</i>		
LD50	Rat	130 mg/kg
Ammonium chloride (CAS 12125-02-9)		
Acute		
<i>Oral</i>		
LD50	Rat	1650 mg/kg
Hydrochloric acid (CAS 7647-01-0)		
Acute		
<i>Dermal</i>		
LD50	Mouse	1449 mg/kg
<i>Inhalation</i>		
LC50	Rat	3124 mg/l, 1 Hours
<i>Oral</i>		
LD50	Rabbit	900 mg/kg
Zinc chloride (CAS 7646-85-7)		
Acute		
<i>Inhalation</i>		
LC50	Rat	<= 1.975 mg/l, 10 Minutes
<i>Oral</i>		
LD50	Rat	350 mg/kg

Sensitization	Not available.
Acute effects	Causes burns. Be aware that symptoms of chemical pneumonia (shortness of breath) may occur several hours after exposure. Harmful if swallowed.
Local effects	Causes burns. Irritating to respiratory system.
Chronic effects	Can cause delayed lung injury.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

ACGIH Carcinogens

Ammonium bifluoride (CAS 1341-49-7)	A4 Not classifiable as a human carcinogen.
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Hydrochloric acid (CAS 7647-01-0)

A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

Ammonium bifluoride (CAS 1341-49-7)

3 Not classifiable as to carcinogenicity to humans.

Hydrochloric acid (CAS 7647-01-0)

3 Not classifiable as to carcinogenicity to humans.

Symptoms and target organs Corrosive effects. Causes skin and eye burns.

12. Ecological Information

Ecotoxicological data

Product		Species	Test Results
Worthington High Activity Stainless Steel Soldering Flux (CAS Mixture)			
Aquatic			
Crustacea	EC50	Daphnia	2.4947 mg/l, 48 Hours, estimated
Fish	LC50	Fish	19.9769 mg/l, 96 hours, estimated

Components		Species	Test Results
Zinc chloride (CAS 7646-85-7)			
Aquatic			
Crustacea	EC50	American or virginia oyster (Crassostrea virginica)	0.1511 - 0.2782 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.101 - 0.197 mg/l, 96 hours

Ecotoxicity Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulation / Accumulation Not available.

13. Disposal Considerations

Waste codes D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]

Disposal instructions Dispose waste and residues in accordance with applicable federal, state, and local regulations.

Waste from residues / unused products Dispose in accordance with all applicable regulations.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information

DOT

Basic shipping requirements:

UN number UN3264
Proper shipping name Corrosive liquid, acidic, inorganic, n.o.s. (Zinc chloride, Hydrochloric acid)
Hazard class 8
Packing group III

Additional information:

Special provisions IB3, T7, TP1, TP28
Packaging exceptions 154
Packaging non bulk 203
Packaging bulk 241

IATA

UN number UN3264
UN proper shipping name Corrosive liquid, acidic, inorganic, n.o.s. (Zinc chloride, Hydrochloric acid)
Transport hazard class(es) 8
Packing group III
ERG code 8L

IMDG

UN number UN3264
UN proper shipping name CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (Zinc chloride, Hydrochloric acid)
Transport hazard class(es) 8
Packing group III
EmS F-A, S-B

TDG

UN number	UN3264
Proper shipping name	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (Zinc chloride, Hydrochloric acid)
Hazard class	8
Packing group	III
Marine pollutant	D
Special provisions	16

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Hydrochloric acid (CAS 7647-01-0)

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Spill: Reportable quantity

Hydrochloric acid (CAS 7647-01-0) 5000 lbs

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Substance: Threshold Planning Quantity

Hydrochloric acid (CAS 7647-01-0) 500 lbs

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

Ammonium bifluoride (CAS 1341-49-7) 1.0 %
Ammonium chloride (CAS 12125-02-9) 1.0 %
Hydrochloric acid (CAS 7647-01-0) 1.0 %
Zinc chloride (CAS 7646-85-7) 1.0 % N982

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

Ammonium bifluoride (CAS 1341-49-7) Listed.
Ammonium chloride (CAS 12125-02-9) Listed.
Hydrochloric acid (CAS 7647-01-0) Listed.
Zinc chloride (CAS 7646-85-7) N982 Listed.

CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)

Zinc chloride: 1000
Ammonium chloride: 5000
Hydrochloric acid: 5000
Ammonium bifluoride: 100

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance (40 CFR 355, Appendix A) No

SARA 311/312 Hazardous chemical Yes

Drug Enforcement Administration (DEA) (21 CFR 1308.11-15) Not controlled

Canadian regulations This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS status Controlled

WHMIS classification D1A - Immediate/Serious-VERY TOXIC
D2B - Other Toxic Effects-TOXIC

WHMIS labeling



Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

State regulations

This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - California Hazardous Substances (Director's): Listed substance

Ammonium bifluoride (CAS 1341-49-7)	Listed.
Ammonium chloride (CAS 12125-02-9)	Listed.
Hydrochloric acid (CAS 7647-01-0)	Listed.
Zinc chloride (CAS 7646-85-7)	Listed.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

US - New Jersey RTK - Substances: Listed substance

Ammonium bifluoride (CAS 1341-49-7)	Listed.
Ammonium chloride (CAS 12125-02-9)	Listed.
Hydrochloric acid (CAS 7647-01-0)	Listed.
Zinc chloride (CAS 7646-85-7)	Listed.

US. Massachusetts RTK - Substance List

Ammonium bifluoride (CAS 1341-49-7)	Listed.
Ammonium chloride (CAS 12125-02-9)	Listed.
Hydrochloric acid (CAS 7647-01-0)	Listed.
Zinc chloride (CAS 7646-85-7)	Listed.

US. New Jersey Worker and Community Right-to-Know Act

Hydrochloric acid (CAS 7647-01-0)	500 lbs
Zinc chloride (CAS 7646-85-7)	500 lbs

US. Pennsylvania RTK - Hazardous Substances

Ammonium bifluoride (CAS 1341-49-7)	Listed.
Ammonium chloride (CAS 12125-02-9)	Listed.
Hydrochloric acid (CAS 7647-01-0)	Listed.
Zinc chloride (CAS 7646-85-7)	Listed.

Mexico regulations

This safety data sheet was prepared in accordance with the Official Mexican Standard (NOM-018-STPS-2000).

16. Other Information

Further information

HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings

Health: 3
Flammability: 0
Physical hazard: 0

NFPA ratings

Health: 3
Flammability: 0
Instability: 0

Disclaimer

All information in this Material Safety Data Sheet is believed to be accurate and reliable. However, no guarantee or warranty of any kind is made with regard to the accuracy of information or the suitability of the recommendations contained herein. It is the user's responsibility to assess the safety and toxicity of this product under their own conditions of use and to comply with all applicable laws and regulations.