

## Praxair Material Safety Data Sheet

### 1. Chemical Product and Company Identification

<b>Product Name:</b> Tungsten hexafluoride (MSDS No. P-4855-C)		<b>Trade Name:</b> Tungsten hexafluoride
<b>Chemical Name:</b> Tungsten hexafluoride		<b>Synonyms:</b> Tungsten fluoride
<b>Formula:</b> WF <sub>6</sub>		<b>Chemical Family:</b> Inorganic halide
<b>Telephone:</b>	<b>Emergencies:</b> 1-800-645-4633* <b>CHEMTREC:</b> 1-800-424-9300* <b>Routine:</b> 1-800-PRAXAIR	<b>Company Name:</b> Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113

\* Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

### 2. Composition/Information on Ingredients

See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCENTRATION	OSHA PEL	ACGIH TLV-TWA (2002)
Tungsten Hexafluoride	7783-82-6	>99%*	None currently established	None currently established
Fluorides as F			2.5 mg/m <sup>3</sup> **	2.5 mg/m <sup>3</sup> **

\*The symbol > means "greater than."

\*\*Praxair recommends the values used for fluorides as F.

### 3. Hazards Identification



#### EMERGENCY OVERVIEW



**DANGER! Toxic, corrosive liquid and gas under pressure.  
Maybe fatal if inhaled.**

**Can cause eye, skin, and respiratory tract burns.  
Harmful if swallowed.**

**Symptoms may be delayed.**

**Contact with flammable materials may cause fire or explosion.  
Self-contained breathing apparatus must be worn by rescue workers.**

**Odor: None**

**THRESHOLD LIMIT VALUE:** None currently established (ACGIH, 2002). Praxair recommends the 2.5 mg/m<sup>3</sup> TLV-TWA for fluorides as F (ACGIH, 2002). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

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**EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:**

**INHALATION**—Poison gas. Causes difficulty with breathing. Causes formation of methemoglobin in the blood and resultant cyanosis (a blue discoloration) particularly of the lips, fingernails, and ears. At high concentrations, irritates the eyes, throat, and respiratory tract, resulting in a burning sensation, cough, choking, tightness in the chest, nausea, and pulmonary edema. Odor and irritation cannot be used as warning signs of dangerous toxicity. Pulmonary edema may be delayed up to 24 hours.

**SKIN CONTACT**—Corrosive. May produce painful chemical burns, deep local damage to underlying tissues, and local swelling. Severe local damage can occur without the immediate development of pain. Slow-healing skin ulcers may develop. If absorbed into the skin, may cause severe deep tissue injury and delayed swelling in areas of exposed skin.

**SWALLOWING**—Highly toxic. Produces burns of the mouth, throat, esophagus, and stomach. Early signs and symptoms of poisoning may include severe chest and abdominal pain, nausea, diarrhea, vomiting of blood, weakness, dizziness, and collapse.

**EYE CONTACT**—Vapor irritates the eyes. Liquid causes severe chemical burns and possible permanent eye damage.

**EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:** May cause lung congestion with hemorrhage and edema. Prolonged exposure by any route may lead to liver and kidney injury and to fluorosis (damage to bones and teeth).

**OTHER EFFECTS OF OVEREXPOSURE:** None known.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** Breathing vapors from tungsten hexafluoride may exacerbate asthma and inflammatory or fibric pulmonary disease.

**SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:** None known.

**CARCINOGENICITY:** Tungsten hexafluoride is not listed by NTP, OSHA, or IARC.

<b>4. First Aid Measures</b>
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**INHALATION:** Immediately remove to fresh air. If not breathing, give artificial respiration, preferably with simultaneous administration of oxygen. If breathing is difficult, qualified personnel may give oxygen. Keep warm and at rest. Call a physician.

**SKIN CONTACT:** Immediately flush with large quantities of water while removing contaminated clothing and shoes. Pay particular attention to skin under nails. Follow by applying iced saturation solution of epsom salts ( $\text{MgSO}_4$ ). If not available, continue washing in cool water until medical personnel arrive. Call a physician for all exposures. Discard contaminated clothing and shoes.

**SWALLOWING:** Do not induce vomiting. Give large quantities of milk if conscious. Call a physician immediately.

**EYE CONTACT:** Immediately flush eyes thoroughly with warm water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately. Continue flushing with water until medical help arrives.

**NOTES TO PHYSICIAN:** *Tungsten hexafluoride reacts on contact with water or moisture to form tungsten oxyfluoride and hydrogen fluoride (hydrofluoric acid). Systemic effects of overexposure are attributed primarily to hydrogen fluoride and should be treated as such. Local effects are due to the intensely irritating and corrosive nature of the material. For this reason, vomiting should not be induced if tungsten hexafluoride is swallowed, but careful gastric lavage should be performed. Complications of*

*swallowing tungsten hexafluoride include mediastinitis, peritonitis, hematemesis, melema, disseminated intravascular coagulation syndrome, dysphagia, and chemical pneumonitis.*

## 5. Fire Fighting Measures

<b>FLASH POINT</b> (test method):	Not Applicable
<b>AUTOIGNITION TEMPERATURE:</b>	Not Applicable
<b>FLAMMABLE LIMITS IN AIR</b> , % by volume:	<b>LOWER:</b> Not Applicable   <b>UPPER:</b> Not Applicable

**EXTINGUISHING MEDIA:** Oxidizing agent. May accelerate combustion. Use media appropriate for surrounding fire.

**SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Toxic, corrosive liquid and gas under pressure. May accelerate combustion.** Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool cylinders with water spray from maximum distance; then move them away from fire if without risk. If cylinders are leaking, reduce toxic vapors with water spray or fog. Shut off leak if without risk. Move cylinders away from fire if without risk. Reverse flow into cylinder may cause explosion. (See section 16.) On-site fire brigades must comply with OSHA 29 CFR 1910.156.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Oxidizing agent. May accelerate combustion. Contact with flammable materials may cause fire or explosion. Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Tungsten hexafluoride cylinders are not equipped with a pressure relief device.

**HAZARDOUS COMBUSTION PRODUCTS:** Thermal decomposition may produce fluorine and/or toxic fumes of fluorides.

## 6. Accidental Release Measures

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Toxic, corrosive liquid and gas under pressure. May accelerate combustion.** Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Reduce vapors with fog or fine water spray. Prevent runoff from contaminating surrounding environment. Reverse flow into cylinder may cause rupture. (See section 16.) Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area.

**WASTE DISPOSAL METHOD:** Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. (See section 16.) If necessary, call your local supplier for assistance.

## 7. Handling and Storage

**PRECAUTIONS TO BE TAKEN IN STORAGE:** Store and use with adequate ventilation, away from oil, grease, and other combustibles. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

**PRECAUTIONS TO BE TAKEN IN HANDLING:** Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using tungsten hexafluoride, see section 16.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to section 16 for the address and phone number along with a list of other available publications.

## 8. Exposure Controls/Personal Protection

### VENTILATION/ENGINEERING CONTROLS:

**LOCAL EXHAUST**—A corrosion-resistant system is acceptable.

**MECHANICAL (general)**—Inadequate.

**SPECIAL**—Use only in a closed system. A corrosion-resistant, canopy-type forced-draft fume hood is preferred.

**OTHER**—None

**RESPIRATORY PROTECTION:** Select per OSHA 29 CFR 1910.134 and ANSI Z88.2. Respirators must be acceptable to MSHA and NIOSH.

**PROTECTIVE GLOVES:** Wear work gloves for cylinder handling; appropriate chemical gloves (e.g., nitrile) where contact with product is possible.

**EYE PROTECTION:** Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or wherever contact with product is possible. Select in accordance with OSHA 29 CFR 1910.133.

**OTHER PROTECTIVE EQUIPMENT:** Metatarsal shoes for cylinder handling and protective clothing where needed. Select per OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

## 9. Physical and Chemical Properties

<b>MOLECULAR WEIGHT:</b>	297.84
<b>LIQUID DENSITY</b> at 77°F (25°C):	211.44 lb/ft <sup>3</sup> (3387 kg/m <sup>3</sup> )
<b>SPECIFIC GRAVITY</b> (Air = 1) at 68°F (20°C) and 1 atm:	10.7
<b>VAPOR PRESSURE</b> at 70°F (21.1°C):	17.07 psia (117.7 kPa abs)
<b>SOLUBILITY IN WATER:</b>	Reacts violently with water
<b>PERCENT VOLATILES BY VOLUME:</b>	100
<b>EVAPORATION RATE</b> (Butyl Acetate = 1):	High
<b>BOILING POINT</b> at 1 atm:	63.14°F (17.3°C)
<b>MELTING POINT</b> at 1 atm:	31.1°F (-0.5°C)

**APPEARANCE, ODOR, AND STATE:** Colorless, odorless gas at normal temperature and pressure; pale yellow liquid.

**10. Stability and Reactivity****STABILITY:**☐ Unstable☒ Stable**INCOMPATIBILITY (materials to avoid):** Water, glass, flammable materials, oil, grease.**HAZARDOUS DECOMPOSITION PRODUCTS:** Contact with oil or moisture will produce tungsten oxyfluoride and hydrofluoric acid. Thermal decomposition may produce fluorine and/or toxic fumes of fluorides.**HAZARDOUS POLYMERIZATION:**☐ May Occur☒ Will Not Occur**CONDITIONS TO AVOID:** Temperatures approaching 900°F (482.22°C).**11. Toxicological Information**See section 3. LC<sub>50</sub> = 160 ppm.**12. Ecological Information**

Tungsten hexafluoride does not contain any Class I or Class II ozone-depleting chemicals. Tungsten hexafluoride is not listed as a marine pollutant by DOT.

**13. Disposal Considerations****WASTE DISPOSAL METHOD:** Keep waste from contaminating surrounding environment. Keep personnel away. Do not dispose of unused quantities. Return cylinder to supplier.**14. Transport Information****DOT/IMO SHIPPING NAME:**

Tungsten hexafluoride

**HAZARD CLASS:** 2.3**PACKING GROUP/ZONE:** None/A**IDENTIFICATION NUMBER:** UN 2196**PRODUCT RQ:** None**SHIPPING LABEL(s):**

POISON GAS, CORROSIVE\*

**PLACARD (when required):**

POISON GAS, CORROSIVE\*

*\*The words In the POISON GAS diamond are INHALATION HAZARD.***SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.**Additional Marking Requirement:** INHALATION HAZARD

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

**15. Regulatory Information**

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

**U.S. FEDERAL REGULATIONS:****EPA (ENVIRONMENTAL PROTECTION AGENCY)**

**CERCLA:** COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

**Reportable Quantity (RQ):** None

**SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:**

**SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

**Threshold Planning Quantity (TPQ):** None

**EHS RQ (40 CFR 355):** None

**SECTIONS 311/312:** Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

**IMMEDIATE:** Yes

**PRESSURE:** No

**DELAYED:** Yes

**REACTIVITY:** Yes

**FIRE:** No

**SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Tungsten hexafluoride does not require reporting under Section 313.

**40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION:** Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Tungsten hexafluoride is not listed as a regulated substance.

**TSCA: TOXIC SUBSTANCES CONTROL ACT:** Tungsten hexafluoride is listed on the TSCA inventory.

**OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:**

**29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS:** Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Tungsten hexafluoride is not listed in Appendix A as a highly hazardous chemical.

**STATE REGULATIONS:**

**CALIFORNIA:** Tungsten hexafluoride is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

**PENNSYLVANIA:** Tungsten hexafluoride is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

**16. Other Information**

Be sure to read and understand all labels and instructions supplied with all containers of this product.

**OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:** *Toxic, corrosive liquid and gas under pressure.* Do not breathe gas. Do not get liquid or vapor in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. Store and use with adequate ventilation at all times. *Use piping and equipment conditioned for tungsten*

**hexafluoride service and adequately designed to withstand pressures to be encountered.** Use only in a closed system constructed of corrosion-resistant materials. **All materials and components must be free of oil, grease, and other contaminants.** Clean them thoroughly with a solvent, and purge them dry with an inert gas prior to use. Contact with combustible materials may cause fire or explosion. **Prevent reverse flow.** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. **Close cylinder valve after each use; keep closed even when empty.** Be sure to read and understand all labels and instructions supplied with all containers of this product. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state, and local laws; then repair the leak. **Follow safe practices when returning cylinder to supplier.** Be sure valve is closed; then tightly install valve outlet cap or plug. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

**Recommended Equipment:** In semiconductor process gas and other suitable applications, Praxair recommends the use of engineering controls such as gas cabinet enclosures, automatic gas panels (used to purge systems on cylinder changeout), excess-flow valves throughout the gas distribution system, double containment for the distribution system, and continuous gas monitors.

**MIXTURES:** When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

#### HAZARD RATING SYSTEMS:

##### NFPA RATINGS:

HEALTH	= 4
FLAMMABILITY	= 0
INSTABILITY	= 1
SPECIAL	= <del>W</del>

##### HMIS RATINGS:

HEALTH	= 3
FLAMMABILITY	= 0
PHYSICAL HAZARD	= 1

#### STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

##### THREADED:

CGA-670 connection is standard

##### PIN-INDEXED YOKE:

Not applicable

##### ULTRA-HIGH-INTEGRITY CONNECTION:

CGA-638

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5<sup>th</sup> Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700.

G-4.1	<i>Cleaning Equipment for Oxygen Service</i>
P-1	<i>Safe Handling of Compressed Gases in Containers</i>
V-1	<i>Compressed Gas Cylinder Valve Inlet and Outlet Connections</i>
—	<i>Handbook of Compressed Gases, Fourth Edition</i>

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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