SAFETY DATA SHEET

1,1,2,2-Tetrafluoroethyl 2,2,3,3-tetrafluoropropyl ether (TTE)

SECTION 1: IDENTIFICATION

Product identifier: 1,1,2,2-Tetrafluoroethyl 2,2,3,3-tetrafluoropropyl ether

Other identifier: TTE

CAS number: 16627-68-2

Recommended use: Co-solvent/diluent for lithium-ion and lithium-metal battery electrolytes; laboratory reagent

Restrictions on use: Only for uses supported by the supplier’s product specification and applicable regulatory status.

Supplier: Automat Solutions, Inc.

U.S. address: 2100 Williams St, San Leandro, CA 94577, United States.

U.S. telephone: +1 (510) 982-6488.

Email: contact@automatsoln.com.

Emergency telephone: +1 (510) 982-6488 (24 hours/day, 7 days/week).

Uses advised against: Any use outside the stated research and development restriction.

SECTION 2: HAZARD IDENTIFICATION

GHS classification: Flammable liquids, Category 3.

GHS classification: Skin irritation, Category 2.

GHS classification: Eye irritation, Category 2A.

GHS classification: Specific target organ toxicity, single exposure, Category 3 (respiratory irritation).

Signal word: Warning.

Hazard symbols (named): GHS02 — Flame; GHS07 — Exclamation mark.

H226: Flammable liquid and vapor.

H315: Causes skin irritation.

H319: Causes serious eye irritation.

H335: May cause respiratory irritation.

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P233: Keep container tightly closed.

P240: Ground and bond container and receiving equipment.

P241: Use explosion-proof electrical, ventilating and lighting equipment.

P242: Use non-sparking tools.

P243: Take action to prevent static discharges.

P261: Avoid breathing dust, fume, gas, mist, vapors or spray.

P264: Wash hands and exposed skin thoroughly after handling.

P271: Use only outdoors or in a well-ventilated area.

P280: Wear protective gloves, protective clothing, eye protection and face protection.

P303+P361+P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.

P302+P352: IF ON SKIN: Wash with plenty of water.

P304+P340+P312: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor if you feel unwell.

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313: If eye irritation persists: Get medical advice or attention.

P332+P313: If skin irritation occurs: Get medical advice or attention.

P362+P364: Take off contaminated clothing and wash it before reuse.

P370+P378: In case of fire: Use dry chemical, carbon dioxide or alcohol-resistant foam to extinguish.

P403+P233: Store in a well-ventilated place. Keep container tightly closed.

P403+P235: Store in a well-ventilated place. Keep cool.

P405: Store locked up.

P501: Dispose of contents and container through an approved waste disposal facility in accordance with applicable local, state and federal regulations.

Other hazards / hazards not otherwise classified: Thermal decomposition may release hydrogen fluoride. Heavy vapor may travel to ignition sources.

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Type: Substance.

Chemical name: 1,1,2,2-Tetrafluoroethyl 2,2,3,3-tetrafluoropropyl ether

Synonym / abbreviation: TTE

CAS number: 16627-68-2

Molecular formula: C5H4F8O

Molecular weight: 232.07 g/mol

Composition declaration: ≥99% 1,1,2,2-tetrafluoroethyl 2,2,3,3-tetrafluoropropyl ether.

Hazardous impurities / stabilizers: No additional information available.

SECTION 4: FIRST AID MEASURES

Inhalation: Remove person to fresh air and keep comfortable for breathing. Obtain medical attention if symptoms occur or persist.

Skin contact: Immediately remove contaminated clothing. Rinse affected skin thoroughly with water or shower. Wash with soap and water. Obtain medical attention if irritation or rash occurs. Wash contaminated clothing before reuse.

Eye contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses if present and easy to do. Continue rinsing. Obtain medical attention if irritation persists.

Ingestion: Rinse mouth. Do not induce vomiting. Never give anything by mouth to an unconscious person. Call a POISON CENTER or doctor if you feel unwell; obtain advice after ingestion.

Most important acute and delayed effects: Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation.

Medical attention / treatment: Treat symptomatically. Protect rescuers from exposure.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable / unsuitable extinguishing media: Water spray, alcohol-resistant foam, dry chemical or carbon dioxide, as appropriate to the surrounding fire. Do not direct a solid water jet at spilled liquid.

Specific hazards: Vapors can form ignitable mixtures, travel along floors and flash back. Heated closed containers may rupture.

Hazardous combustion products: Carbon monoxide, carbon dioxide and hydrogen fluoride.

Firefighter protection: Wear self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance.

Additional precautions: Prevent contaminated firefighting runoff from entering drains and waterways.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions: Isolate the area. Keep unprotected personnel away. Ensure ventilation; avoid breathing dust, mist or vapor and avoid skin/eye contact. Wear the protection described in Section 8.

Emergency procedures: Evacuate the affected area when exposure cannot be controlled; trained responders only for significant releases.

Environmental precautions: Prevent entry into drains, sewers and waterways. Contain released material.

Ignition control: Remove ignition sources if safe. Use non-sparking tools and suitable explosion-proof equipment.

Containment / cleanup: Absorb with non-combustible inert material such as sand or vermiculite. Collect into a compatible, closed, labeled waste container.

Waste handling: Dispose of collected material and contaminated packaging according to Section 13.

SECTION 7: HANDLING AND STORAGE

Handling: Use suitable local exhaust ventilation. Avoid contact and inhalation. Wash after handling. Do not eat, drink or smoke in work areas.

Storage: Keep containers tightly closed in a dry, well-ventilated location away from incompatible substances. Protect from moisture.

Flammable / combustible handling: Keep away from heat and ignition sources; ground and bond containers during transfer and control static discharge. Use non-sparking tools and explosion-proof equipment as applicable.

Security: Store locked up.

Atmosphere / sensitivity: Store under dry inert gas where compatible with the supplier’s packaging and instructions; material is moisture-sensitive or hygroscopic as described in this SDS.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No substance-specific occupational exposure limit available in the source information. Apply exposure limits and workplace controls required by the applicable jurisdiction.

Engineering controls: Use local exhaust or a suitable fume hood. Provide an eyewash and safety shower near the work area.

Eye / face protection: Chemical safety goggles; use a face shield in addition to goggles when splashing or corrosive exposure is possible.

Hand protection: Wear chemical-resistant gloves selected for the chemical, exposure duration, temperature and task. Confirm permeation/breakthrough performance with the glove manufacturer; select gloves with a breakthrough time appropriate for the task.

Skin / body protection: Wear protective clothing suitable for the task. Use flame-resistant, antistatic clothing where a flammable atmosphere is possible.

Respiratory protection: Use a properly selected, fit-tested, NIOSH-approved respirator under a respiratory-protection program when engineering controls are insufficient. Cartridge/filter selection must address all relevant gases, vapors and particles. Unknown or immediately dangerous concentrations require appropriate supplied-air protection or SCBA.

Hygiene: Remove contaminated clothing and wash before reuse. Wash hands and exposed skin after handling.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Data basis: Reference values from available supplier and literature information. These values are not batch specifications; estimates and test conditions are identified where available.

Molecular formula: C5H4F8O

Molecular weight: 232.07 g/mol

Appearance / physical state: Clear, colorless liquid

Odor: Ether-like (reported)

Odor threshold: No data available.

Melting / freezing point: No data available from two independent suppliers.

Initial boiling point / boiling range: 92–93 °C at 760 mmHg

Flammability: Flammable liquids, Category 3

Lower / upper flammability limits: No data available.

Flash point: 27 °C, closed cup.

Autoignition temperature: No data available.

Decomposition temperature: No data available.

pH: Not applicable; non-aqueous liquid

Kinematic viscosity: No data available.

Dynamic viscosity: No data available.

Water solubility: Negligible; quantitative data unavailable

Other solubility: No data available.

Partition coefficient (n-octanol/water): log Kow 3.2 (computed XLogP3; not measured)

Vapor pressure: No data available.

Density / relative density: 1.53–1.54 g/cm³ at 20–25 °C; relative density 1.54 (20/20 °C)

Relative vapor density: Approximately 8.0 (calculated from molecular weight; air = 1)

Evaporation rate: No data available.

Particle characteristics: Not applicable to the liquid; no particle data for any solidified phase.

Refractive index: n20/D 1.29

Oxidizing properties: No data available.

SECTION 10: STABILITY AND REACTIVITY

Reactivity: No additional data available; follow incompatibility and handling information.

Chemical stability: Stable under recommended dry storage conditions; protect from stated sensitivities.

Possibility of hazardous reactions: Ignitable vapor/air mixtures may form.

Conditions to avoid: Excess heat, incompatible materials and moisture where sensitive. Avoid sparks, flames and static discharge.

Incompatible materials: Strong oxidizing agents, strong acids and reactive metals.

Hazardous decomposition products: Carbon monoxide, carbon dioxide and hydrogen fluoride.

SECTION 11: TOXICOLOGICAL INFORMATION

Data basis: Available supplier toxicological information; missing study conditions are stated where applicable. No-data entries do not establish absence of hazard.

Likely routes of exposure: Inhalation, skin contact, eye contact and ingestion.

Acute toxicity / numerical measures: No validated oral or dermal LD50 available. One supplier reports rat inhalation LC50 3.16 mg/L (2 hours); this result is not used to classify acute inhalation toxicity.

Skin corrosion / irritation: Causes skin irritation.

Serious eye damage / irritation: Causes serious eye irritation.

Respiratory / skin sensitization: No sensitization data available.

Germ cell mutagenicity: No data available.

Carcinogenicity: No data available. IARC, NTP and OSHA carcinogen-list information: No data available.

Reproductive toxicity: No data available.

STOT, single exposure: May cause respiratory irritation (Category 3).

STOT, repeated exposure: No data available.

Aspiration hazard: No data available.

Symptoms / delayed effects: Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation.

Interactions: No additional information available.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: No data available.

Persistence / degradability: No measured persistence/degradability data available.

Bioaccumulative potential: No bioaccumulation study data available; partition coefficient, if available, is listed in Section 9.

Mobility in soil: No data available.

Other adverse effects: No additional data available. Prevent release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment: Collect waste and contaminated absorbents in compatible, closed, labeled containers. Use a licensed waste contractor and comply with applicable local, state and federal requirements.

Environmental precautions: Do not discharge to drains, soil or waterways. Do not mix with incompatible wastes.

Contaminated packaging: Handle residues and uncleaned packaging with the same precautions as the product. Empty containers may retain ignitable vapor; do not cut, weld or heat them.

Thermal treatment: Any authorized incineration requires controls suitable for fluorinated decomposition products, including HF.

Waste classification: Unused product may meet U.S. ignitable-waste criterion D001 based on a 27 °C flash point; classify the waste as generated under applicable rules.

SECTION 14: TRANSPORT INFORMATION

DOT (U.S.): UN3271; Ethers, n.o.s. (1,1,2,2-tetrafluoroethyl 2,2,3,3-tetrafluoropropyl ether); Class 3; Packing Group III.

IMDG: UN3271; ETHERS, N.O.S. (1,1,2,2-tetrafluoroethyl 2,2,3,3-tetrafluoropropyl ether); Class 3; Packing Group III.

IATA: UN3271; Ethers, n.o.s. (1,1,2,2-tetrafluoroethyl 2,2,3,3-tetrafluoropropyl ether); Class 3; Packing Group III.

Transport hazard labels: 3.

ERG guide: 127 (reported value).

IMDG EmS: F-E, S-D (reported value).

Environmental hazards / IMDG marine pollutant: No, as reported by the source supplier.

Transport in bulk under IMO instruments: Not assessed; these entries address packaged product.

Special precautions: Keep containers closed, secure and protected from damage and incompatible materials. Apply handling/storage precautions in Sections 7 and 10.

Air shipment details: Apply the current packing instructions, quantity limits and carrier restrictions for the actual shipment.

SECTION 15: REGULATORY INFORMATION

TSCA inventory: Not listed, as stated in the Automat Solutions TTE source SDS (v1.0, 2026-10-13).

TSCA research and development exemption: Supply and use are restricted to qualifying small-quantity research and development under 40 CFR 720.36, including supervision by a technically qualified individual and required risk notification.

SARA 311/312 hazard categories: Flammable liquids; Skin irritation; Eye irritation; Specific target organ toxicity, single exposure.

Additional federal and state regulatory information: No additional verified information available.

SECTION 16: OTHER INFORMATION

Preparation / revision date: 2026-10-22.

Document version: AS-TTE-20261022-01.

Revision description: Issued a new SDS using the lab-approved TTE reference and ≥99% composition; filled confirmed supplier and 24-hour contact information. Supplier address and telephone updated.

Information sources: Automat Solutions TTE source SDS and supplier information. Automat lab decision dated 2026-10-21; Automat TTE_AS_SDS v1.0 dated 2026-10-13; TCI T3069, SynQuest 2107-3-56, Fluoryx FC13-4500 and Sigma-Aldrich 933961.

Data limitations: Supplier and literature values are reference information and are not measurements on an Automat production lot. Missing test conditions and unavailable data are stated in the relevant sections.

Abbreviations: GHS, Globally Harmonized System; LD50, median lethal dose; LC50, median lethal concentration; ATE, acute toxicity estimate; STOT, specific target organ toxicity; DOT, U.S. Department of Transportation; IMDG, International Maritime Dangerous Goods; IATA, International Air Transport Association.

Disclaimer: This information describes safety precautions for the identified material. It is not a certificate of analysis or a guarantee of product properties. The information may not apply when the material is combined with other substances or used in processes not described here.