



Safety Data Sheet

110PPM SO₂, 135PPM NO_X, BALANCE N₂

Section 1: Product and Company Identification

Tier 5 Labs, LLC

Geoff Delbridge
Tier 5 Labs, LLC
geoff.delbridge@tier5labs.com

Chicago Area: (630) 961-5227
Indianapolis Area: (317) 536-5590
Fax: (630) 961-5231

Tier 5 Labs
5353 W. Southern Avenue
Indianapolis, IN 46241

Product Code: 110PPM SO₂, 135PPM NO_X, BALANCE N₂
Part Number: T5E AM0001-A1-11

Synonyms:

Recommended Use:

Usage Restrictions:

Section 2: Hazards Identification



Warning

Hazard Classification:

Gases Under Pressure

Hazard Statements:

Contains gas under pressure; may explode if heated

Precautionary Statements

Storage:

Protect from sunlight.
Store in well-ventilated place.

Section 3: Composition/Information on Ingredients

	CAS #	Concentration
Sulfur Dioxide	7446-09-5	110PPM
Nitric Oxide	10102-43-9	135PPM
Nitrogen	7727-37-9	BALANCE

	Chemical Substance	Chemical Family	Trade Names
Sulfur Dioxide	SULFUR DIOXIDE	Inorganic gases	SULFUROUS ACID ANHYDRIDE; SULFUROUS OXIDE; SULPHUR DIOXIDE; SULFUROUS ANHYDRIDE; FERMENTICIDE LIQUID; SULFUR DIOXIDE(SO ₂); SULFUR OXIDE; SULFUR OXIDE(SO ₂); STCC 4904290; UN 1079; O ₂ S
Nitric Oxide	NITRIC OXIDE	Inorganic gases	NITROGEN OXIDE (NO); NITRIC OXIDE (NO); NITRIC OXIDE TRIMER; NITROGEN MONOXIDE; NITROGEN MONOOXIDE; NITROGEN OXIDE (N ₄ O ₄); NITROSYL RADICAL; RCRA P076; STCC 4920330; UN 1660; NO
Nitrogen	NITROGEN, COMPRESSED GAS	Inorganic gases	DIATOMIC NITROGEN; DINITROGEN; NITROGEN; NITROGEN-14; NITROGEN GAS; UN 1066; N ₂

Section 4: First Aid Measures

	Skin Contact	Eye Contact	Ingestion	Inhalation	Note to Physicians
Sulfur Dioxide	Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing before reuse. Destroy contaminated shoes.	Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.	If a large amount is swallowed, get medical attention.	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.	For inhalation, consider oxygen.
Nitric Oxide	Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.	Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.	If a large amount is swallowed, get medical attention.	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.	None
Nitrogen	Wash exposed skin with soap and water.	Flush eyes with plenty of water.	If a large amount is swallowed, get medical attention.	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.	For inhalation, consider oxygen.

Section 5: Fire Fighting Measures

	Suitable Extinguishing Media	Products of Combustion	Protection of Firefighters
Sulfur Dioxide	Non-flammable. Use suitable extinguishing media for surrounding fire.	None known	<ul style="list-style-type: none"> ▪ Non-flammable ▪ Non-flammable
Nitric Oxide	Water Do not use dry chemicals, carbon dioxide or halogenated extinguishing agents. Large fires: Flood with fine water spray.	Nitrogen oxides	<ul style="list-style-type: none"> ▪ Any self-contained breathing apparatus with a full facepiece. ▪ Any self-contained breathing apparatus with a full facepiece.
Nitrogen	Non-flammable. Use suitable extinguishing media for surrounding fire. Cylinders may rupture or explode if exposed to heat.	Non-flammable	<ul style="list-style-type: none"> ▪ Respiratory protection may be needed for frequent or heavy exposure.

Section 6: Accidental Release Measures

	Personal Precautions	Environmental Precautions	Methods for Containment
Sulfur Dioxide	Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Evacuation radius: 150 feet.	Avoid contamination of environment.	Stop leak if possible without personal risk. Reduce vapors with water spray. Do not get water directly on material.
Nitric Oxide	Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering. Avoid contact with combustible materials.	Avoid contamination of water, soil, drains, and sewers.	Stop leak if possible without personal risk.
Nitrogen	Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas.	No significant effects from contamination expected.	Stop leak if possible without personal risk.

	Methods for Cleanup	Other Information
Sulfur Dioxide	Stop leak, evacuate area. Contact emergency personnel.	Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).
Nitric Oxide	Contact emergency personnel.	Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).
Nitrogen	N/A	N/A

Section 7: Handling and Storage

	Handling	Storage
Sulfur Dioxide	Store and use with adequate ventilation. 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 125F (52C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.	Do not get liquid in eyes, on skin, or clothing. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Open valve slowly. Close cylinder valve after each use; keep closed even when empty. If valve is hard to open, discontinue use and contact your supplier.
Nitric Oxide	Store and handle in accordance with all current regulations and standards. NFPA 430 Code for the Storage of Liquid and Solid Oxidizing Materials. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).	Keep separated from incompatible substances.
Nitrogen	Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.	Keep separated from incompatible substances.

Section 8: Exposure Controls/Personal Protection

	Exposure Guidelines
Sulfur Dioxide	SULFUR DIOXIDE: 2 ppm (5 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993) 5 ppm (13 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993) 5 ppm (13 mg/m3) OSHA TWA 2 ppm ACGIH TWA 5 ppm ACGIH STEL 2 ppm (5 mg/m3) NIOSH recommended TWA 10 hour(s) 5 ppm (13 mg/m3) NIOSH recommended STEL
Nitric Oxide	NITRIC OXIDE: 25 ppm (30 mg/m3) OSHA TWA 25 ppm ACGIH TWA 25 ppm (30 mg/m3) NIOSH recommended TWA 10 hour(s)
Nitrogen	NITROGEN, COMPRESSED GAS: NITROGEN: ACGIH (simple asphyxiant)

Engineering Controls

Handle only in fully enclosed systems.

	Eye Protection	Skin Protection	Respiratory Protection
Sulfur Dioxide	Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.	For the gas: Wear appropriate chemical resistant clothing. For the liquid: Wear appropriate protective, cold insulating clothing.	Non-flammable

	Eye Protection	Skin Protection	Respiratory Protection
Nitric Oxide	Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.	Wear appropriate chemical resistant clothing.	Any self-contained breathing apparatus with a full facepiece.
Nitrogen	Eye protection not required, but recommended.	Protective clothing is not required.	Respiratory protection may be needed for frequent or heavy exposure.

General Hygiene considerations

- Avoid breathing vapor or mist
- Avoid contact with eyes and skin
- Wash thoroughly after handling and before eating or drinking

Section 9: Physical and Chemical Properties

	Physical State	Appearance	Color	Change in Appearance	Physical Form	Odor	Taste
Sulfur Dioxide	Gas	Clear	Colorless	N/A	Gas	Irritating odor	N/A
Nitric Oxide	Gas	Clear	Colorless	N/A	Gas	Not available	N/A
Nitrogen	Gas	Clear	Colorless	N/A	Gas	Odorless	Tasteless

	Flash Point	Flammability	Partition Coefficient	Autoignition Temperature	Upper Explosive Limits	Lower Explosive Limits
Sulfur Dioxide	Not flammable	Not available	Not available	Nonflammable	Nonflammable	Nonflammable
Nitric Oxide	Not applicable	Not available	Not available	Nonflammable	Nonflammable	Nonflammable
Nitrogen	Not flammable	Not available	Not available	Nonflammable	Nonflammable	Nonflammable

	Boiling Point	Freezing Point	Vapor Pressure	Vapor Density	Specific Gravity	Water Solubility	pH	Odor Threshold	Evaporation Rate	Viscosity
Sulfur Dioxide	14 F (-10 C)	-99 F (-73 C)	2432 mmHg @ 20 C	2.26 (Air=1)	1.462 @ -10 C	22.8% @ 0 C	Acidic in solution	3-5 ppm	>1 (butyl acetate=1)	Not available
Nitric Oxide	-242 F (-152 C)	-263 F (-164 C)	26000 mmHg @ 20 C	1.036 (Air=1)	Not applicable	7.3% @ 0 C	Not applicable	0.3-1.0 ppm	Not applicable	0.0188 cP @ 25 C
Nitrogen	-321 F (-196 C)	-346 F (-210 C)	760 mmHg @ -196 C	0.967 (Air=1)	Not applicable	1.6% @ 20 C	Not applicable	Not available	Not applicable	0.01787 cP @ 27 C

	Molecular Weight	Molecular Formula	Density	Weight per Gallon	Volatility by Volume	Volatility	Solvent Solubility
Sulfur Dioxide	64.06	S-O2	0.169	Not available	Not available	Not applicable	Soluble: Alcohol, acetic acid, sulfuric acid, ether, chloroform, benzene, sulfuryl chloride, nitrobenzenes, toluene, acetone
Nitric Oxide	30.01	N-O	1.3402 g/L	Not available	Not available	Not applicable	Soluble: Sulfuric acid, alcohol, ferrous sulfate solutions, carbon disulfide
Nitrogen	28.0134	N2	1.2506 g/L	Not available	100%	1	Soluble: Liquid ammonia

Section 10: Stability and Reactivity

	Stability	Conditions to Avoid	Incompatible Materials
Sulfur Dioxide	Stable at normal temperatures and pressure.	Stable at normal temperatures and pressure.	Combustible materials, metals, bases, oxidizing materials, halogens, metal carbide, metal oxides, peroxides, reducing agents, potassium, sodium, nitryl chloride, acrolein, metal oxides, carbide

	Stability	Conditions to Avoid	Incompatible Materials
Nitric Oxide	May react on contact with air. May react on contact with water. Releases toxic, corrosive, flammable or explosive gases. May explode during distillation or evaporation.	May react on contact with air. May react on contact with water. Releases toxic, corrosive, flammable or explosive gases. May explode during distillation or evaporation.	Metals, bases, metal oxides, reducing agents, combustible materials, halo carbons, oxidizing materials, halogens, metal carbide, metal salts
Nitrogen	Stable at normal temperatures and pressure.	Stable at normal temperatures and pressure.	Metals, oxidizing materials

	Hazardous Decomposition Products	Possibility of Hazardous Reactions
Sulfur Dioxide	Forms sulfurous acid solution on reaction with water.	Will not polymerize.
Nitric Oxide	Oxides of nitrogen	Will not polymerize.
Nitrogen	Oxides of nitrogen	Will not polymerize.

Section 11: Toxicology Information

Acute Effects

	Oral LD50	Dermal LD50	Inhalation
Sulfur Dioxide	LC50, 1 hr, rat = 2520 ppm	Not available	Allergic reactions, burns, toxic
Nitric Oxide	LC50 Inhalation Gas. Rat 1068 mg/m ³ 4 hours	Not available	Irritation, nausea, vomiting, stomach pain, chest pain, difficulty breathing, headache, dizziness, bluish skin color, lung congestion
Nitrogen	Not available	Not available	Nausea, vomiting, difficulty breathing, headache, drowsiness, dizziness, tingling sensation, loss of coordination, convulsions, coma

	Eye Irritation	Skin Irritation	Sensitization
Sulfur Dioxide	Corrosive, burns	Corrosive, burns	Respiratory tract burns, skin burns, eye burns, allergic reactions
Nitric Oxide	Irritation (possibly severe)	Irritation (possibly severe)	Harmful if inhaled, respiratory tract irritation, skin irritation, blood damage
Nitrogen	Contact with rapidly expanding gas may cause burns or frostbite	No information on significant adverse effects	Difficulty breathing

Chronic Effects

	Carcinogenicity	Mutagenicity	Reproductive Effects	Developmental Effects
Sulfur Dioxide	IARC: Human Inadequate Evidence, Animal Limited Evidence, Group 3; ACGIH: A4 -Not Classifiable as a Human Carcinogen	Available.	Available.	No data
Nitric Oxide	Not available	Available.	Not available	No data
Nitrogen	Not hazardous	Not available	Not available	No data

Section 12: Ecological Information

Fate and Transport

	Eco toxicity	Persistence / Degradability	Bioaccumulation / Accumulation	Mobility in Environment
Sulfur Dioxide	Fish toxicity: 3000 ug/L 0.667-0.833 hour(s) (Avoidance) Atlantic menhaden (Brevoortia tyrannus) Invertebrate toxicity: Not available Algal toxicity: 500 ug/L 6 day(s) (Cellular) Green algae (Rhizoclonium hieroglyphicum) Phyto toxicity: Not available Other toxicity: >=150 ug/L NR hour(s) (Biochemical) Duckweed (Lemna minor)	Not available	Not available	Not available
Nitric Oxide	Fish toxicity: Not available Invertebrate toxicity: Not available Algal toxicity: Not available Phyto toxicity: Not available Other toxicity: Not available	Readily biodegrades	Not available	Not expected to leach through the soil or the sediment.

Nitrogen	Fish toxicity: Not available Invertebrate toxicity: Not available Algal toxicity: Not available Phyto toxicity: Not available Other toxicity: Not available	Not available	Not available	Not available
-----------------	---	---------------	---------------	---------------

Section 13: Disposal Considerations

Sulfur Dioxide	Dispose in accordance with all applicable regulations.
Nitric Oxide	Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. D003. Dispose in accordance with all applicable regulations.
Nitrogen	Dispose in accordance with all applicable regulations.

Section 14: Transportation Information

U.S. DOT 49 CFR 172.101

DOT Information For This Mixture

Shipping Name	Compressed gas, n.o.s. (Nitrogen, Nitric Oxide)
UN Number	UN1956
Hazard Class	2.2
Hazard Information	Non-Flammable Gas

Individual Component Information

	Proper Shipping Name	ID Number	Hazard Class or Division	Packing Group	Labeling Requirements	Passenger Aircraft or Railcar Quantity Limitations	Cargo Aircraft Only Quantity Limitations	Additional Shipping Description
Sulfur Dioxide	Sulfur dioxide	UN1079	2.3	Not applicable	2.3; 8	Forbidden	Forbidden	Toxic-Inhalation Hazard Zone C
Nitric Oxide	Nitric oxide, compressed	UN1660	2.3	Not applicable	2.3; 5.1; 8	Forbidden	Forbidden	Toxic-Inhalation Hazard Zone A
Nitrogen	Nitrogen, compressed	UN1066	2.2	Not applicable	2.2	75 kg or L	150 kg	N/A

Canadian Transportation of Dangerous Goods

	Shipping Name	UN Number	Class	Packing Group / Risk Group
Sulfur Dioxide	Sulfur dioxide	UN1079	2.3; 8	Not applicable
Nitric Oxide	Nitric oxide, compressed	UN1660	2.3; 5.1; 8	Not applicable
Nitrogen	Nitrogen, compressed	UN1066	2.2	Not applicable

Section 15: Regulatory Information

U.S. Regulations

	CERCLA Sections	SARA 355.30	SARA 355.40
Sulfur Dioxide	Not regulated.	500 LBS TPQ	500 LBS RQ
Nitric Oxide	10 LBS RQ	100 LBS TPQ	10 LBS RQ
Nitrogen	Not regulated.	Not regulated.	Not regulated.

SARA 370.21

	Acute	Chronic	Fire	Reactive	Sudden Release
Sulfur Dioxide	Yes	Yes	No	No	Yes
Nitric Oxide	Yes	No	No	No	Yes

Nitrogen	Yes	No	No	No	Yes
----------	-----	----	----	----	-----

SARA 372.65

Sulfur Dioxide	Not regulated.
Nitric Oxide	Not regulated.
Nitrogen	Not regulated.

OSHA Process Safety

Sulfur Dioxide	1000 LBS TQ
Nitric Oxide	250 LBS TQ
Nitrogen	Not regulated.

State Regulations

	CA Proposition 65
Sulfur Dioxide	Not regulated.
Nitric Oxide	Not regulated.
Nitrogen	Not regulated.

Canadian Regulations

	WHMIS Classification
Sulfur Dioxide	AD1
Nitric Oxide	ACD1
Nitrogen	A

National Inventory Status

	US Inventory (TSCA)	TSCA 12b Export Notification	Canada Inventory (DSL/NDSL)
Sulfur Dioxide	Listed on inventory.	Not listed.	Not determined.
Nitric Oxide	Listed on inventory.	Not listed.	Not determined.
Nitrogen	Listed on inventory.	Not listed.	Listed on inventory.

Section 16: Other Information

	NFPA Rating
Sulfur Dioxide	HEALTH=3 FIRE=0 REACTIVITY=0
Nitric Oxide	HEALTH=4 FIRE=0 REACTIVITY=1
Nitrogen	HEALTH=1 FIRE=0 REACTIVITY=0

0 = minimal hazard, 1 = slight hazard, 2 = moderate hazard, 3 = severe hazard, 4 = extreme hazard