

# MATERIAL SAFETY DATA SHEET

## 1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology  
Standard Reference Materials Program  
100 Bureau Drive, Stop 2300  
Gaithersburg, Maryland 20899-2300

SRM Number: 2660a  
MSDS Number: 2660a  
SRM Name: Total Oxides of Nitrogen (NO<sub>x</sub>) in  
Air (Nominal 100 µmol/mol)

Date of Issue: 13 June 2011

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**Description:** This SRM mixture is supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psig), which provides the user with 0.73 m<sup>3</sup> (25.8 ft<sup>3</sup>) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-660 stainless steel valve, which is the recommended outlet for this total oxides of nitrogen mixture. This SRM mixture has been certified for the total oxides of nitrogen (NO<sub>x</sub>) concentration which is defined as the sum of the nitrogen dioxide (NO<sub>2</sub>) concentration plus the contaminant gaseous nitric acid (HNO<sub>3</sub>) concentration. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psig).

**Substance:** Nitrogen Dioxide/Air Compressed Gas Mixture.

**Other Designations:** Nitric dioxide (nitrogen dioxide)/Nitrogen (dinitrogen) compressed gas mixture.

## 2. HAZARDS IDENTIFICATION

**NFPA Ratings (Scale 0–4):** Health = 2                      Fire = 0                      Reactivity = 0

**NOTE:** The health and physical hazard information provided in this MSDS are for nitrogen dioxide and compressed air. No physical or chemical data are listed for this nitrogen dioxide/compressed air mixture. The actual effects of the solution may differ from the individual components.

**Physical Hazards:** Cylinder may rupture or explode if exposed to heat.

**Major Health Hazards:** Potentially fatal if inhaled and may be corrosive to respiratory tract, skin and eyes.

**Target Organ:** Respiratory tract.

### Potential Health Effects

**Inhalation:** Short term inhalation may cause nausea, stomach pain, difficulty breathing, irregular heartbeat, headache, dizziness, bluish skin color, lung damage and death. Long term, chronic exposure may cause tooth decay, digestive disorders, and lung damage.

**Skin Contact:** Short term or long term contact may cause irritation, possibly severe.

**Eye Contact:** Short term or long term contact may cause irritation, possibly severe.

**Ingestion:** Ingestion of a gas is unlikely. If ingested, nitrogen dioxide can cause frostbite and digestive disorders.

### Listed as a Carcinogen/Potential Carcinogen

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u>  X  </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u>  X  </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u>  X  </u>

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### 3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

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Component	CAS Number	EC Number (EINECS)	Nominal Concentration <sup>(a)</sup>
Nitrogen dioxide <sup>(b)</sup>	10102-44-0	233-272-6	100 µmol/mol
Compressed Air	132259-10-0	not assigned	balance

<sup>(a)</sup> The concentrations listed above apply the identified NIST cylinder.. This material contains various other components (see Certificate of Analysis), which have been reported to have toxic, mutagenic, and/or carcinogenic properties, and should be handled with care. The concentration of the ones not listed above are below the reportable limit: hazardous components (1 %); carcinogens (0.1 %), required by OSHA, 29 CFR 1910.1200 (g)(2)(i)(C)(1), for MSDS information.

<sup>(b)</sup> The concentration of nitrogen dioxide is based off the estimation of Total NOx as described in the Certificate of Analysis. The concentration listed is above the OSHA Permissible Exposure Limits (PEL) for nitrogen dioxide.

**EC Classification:** No published information for the mixture.

**EC Risk (R No.):** No published information for the mixture.

**EC Safety (S No.):** No published information for the mixture.

**EC Risk/Safety Phrases:** See Section 15, "Regulatory Information".

NOTE: The EC classification for nitrogen dioxide varies based on the concentration. There is no classification available for concentrations below 0.1 %, the concentration in this SRM.

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### 4. FIRST AID MEASURES

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**Inhalation:** If adverse effects occur, remove to well ventilated (uncontaminated) area. If breathing is difficult, qualified personnel may administer oxygen. If not breathing, qualified personnel should give artificial respiration. Seek immediate medical attention.

**Skin Contact:** Not applicable.

**Eye Contact:** Flush eyes with plenty of water.

**Ingestion:** Ingestion of gas is unlikely.

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### 5. FIRE FIGHTING MEASURES

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**Fire and Explosion Hazards:** Negligible fire hazard applicable to the identified NIST cylinder. Cylinder may rupture or explode if exposed to heat.

**Extinguishing Media:** Carbon dioxide or regular dry chemical; large fires use regular foam or flood with fine water spray.

**Fire Fighting:** Move cylinder from fire area if it can be done without personal risk. Avoid inhalation of material or combustion by-products. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

**Flash Point (°C):** Not applicable.

**Method:** Not applicable.

**Autoignition (°C):** Not applicable.

**Flammability Limits in Air (Volume %)**

**Upper Explosive Limits (UEL):** Not applicable.

**Lower Explosive Limits (LEL):** Not applicable.

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### 6. ACCIDENTAL RELEASE MEASURES

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**Occupational Release:** Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas. Refer to Section 13, "Disposal Considerations".

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### 7. HANDLING AND STORAGE

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**Storage:** Store and handle in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep valve protective cap on cylinder when not in use. Keep separated from incompatible substances. Store in a well-ventilated area. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.

**Safe Handling Precautions:** See Section 8, "Exposure Controls and Personal Protection".

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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**Note:** There is no OSHA PEL listed for this nitrogen dioxide – compressed air mixture. The amount of nitrogen dioxide in this cylinder exceeds the OSHA PEL listed for nitrogen dioxide and is listed below.

### Exposure Limits

**Component:** Nitrogen Dioxide

NIOSH (STEL):	1.8 mg/m <sup>3</sup> (1 ppm)
NIOSH (IDLH):	37 mg/m <sup>3</sup> (20 ppm)
ACGIH (TWA):	5.6 mg/m <sup>3</sup> (3 ppm)
ACGIH (STEL):	9 mg/m <sup>3</sup> (5 ppm)
OSHA (Ceiling):	9 mg/m <sup>3</sup> (5 ppm)

**Component:** Compressed Air

No occupational limits established.

**Ventilation:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Respirator:** If workplace conditions warrant a respirator, a respiratory protection plan that meets OSHA 29 CFR 1910.134 must be followed. Refer to the “NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84” for applicable certified respirators.

**Eye Protection:** Wear safety goggles. An eye wash station and quick drench shower should be readily available near of handling and use areas.

**Personal Protection:** Safety goggles are recommended. Wear gloves to prevent skin exposure. Wear safety shoes when moving cylinders.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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Property	Nitrogen Dioxide (gas)	Compressed Air (gas)
Appearance and Odor	reddish brown and pungent odor	colorless and odorless
Molar Mass	46.00 g/mol	not applicable
Molecular Formula	NO <sub>2</sub>	not applicable
Water Solubility	decomposes	slightly soluble
Boiling Point	21 °C (70 °F)	not applicable
Vapor Density (Air=1)	1.58	1.0

**NOTE:** The physical and chemical data provided are for the pure components. Physical and chemical data for this nitrogen dioxide/compressed air gas mixture are not available. The actual behavior of the mixture may differ from the individual components.

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## 10. STABILITY AND REACTIVITY

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**Stability:**  Stable  Unstable

Stable at normal temperature and pressure. Stability classification applies to the identified NIST cylinder.

**Conditions to Avoid:** Avoid inhalation of material or combustion by-products. Protect from physical damage. Cylinder may rupture or explode if exposed to heat.

**Incompatible materials:** Combustible materials, reducing agents, metals, bases, metal oxides, metal carbide, halocarbons, oxidizing materials, metal salts, amines, and acids.

**Fire/Explosion Information:** Refer to Section 5, “Fire Fighting Measures”.

**Hazardous Decomposition:** Miscellaneous thermal decomposition or combustion produces oxides of nitrogen.

**Hazardous Polymerization:**  Will Occur  Will Not Occur

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## 11. TOXICOLOGICAL INFORMATION

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**Route of Entry:**      X   Inhalation          X   Skin                           Ingestion

### Toxicity Data

**Mixture:** Nitrogen dioxide/compressed air  
No toxicity data listed.

**Component:** Compressed air (gas)  
No toxicity data listed.

**Component:** Nitrogen dioxide (gas)  
LC<sub>50</sub> (inhalation-rat): 165 mg/m<sup>3</sup> (4 h)  
LC<sub>50</sub> (inhalation-rat): 220 mg/m<sup>3</sup> (1 h)

**Health Effects (Acute Exposure):** See Section 2 "Hazard Identification"

**Medical Conditions Generally Aggravated by Exposure:** Respiratory disorders.

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## 12. ECOLOGICAL INFORMATION

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### Ecotoxicity Data

No ecotoxicity data listed for nitrogen dioxide/compressed air gas mixture.

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## 13. DISPOSAL CONSIDERATIONS

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**Waste Disposal:** Dispose in accordance with all applicable federal, state, and local regulations. RCRA waste number P078.

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## 14. TRANSPORTATION INFORMATION

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**U.S. DOT and IATA:** Compressed gases, n.o.s. (total oxides of nitrogen in air); UN1956; Hazard Class 2.2.

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## 15. REGULATORY INFORMATION

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### U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4): Not applicable to the identified NIST cylinder.  
SARA Title III Section 302 (40 CFR 355.30): Not applicable to the identified NIST cylinder.  
SARA Title III Section 304 (40 CFR 355.40): Not applicable to the identified NIST cylinder.  
SARA Title III Section 313 (40 CFR 372.65): Not applicable to the identified NIST cylinder.  
OSHA Process Safety (29 CFR 1910.119): Not applicable to the identified NIST cylinder.  
SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21)

ACUTE HEALTH:	Yes
CHRONIC HEALTH:	No
FIRE:	No
REACTIVE:	No
PRESSURE:	Yes

### STATE REGULATIONS

California Proposition 65: Not regulated.

### CANADIAN REGULATIONS

WHMIS Information: Not provided for this material.

### EUROPEAN REGULATIONS

**EC Classification:** No classification assigned for Nitric Dioxide (100 ppm) – Air (balance) mixture.  
**EC Risk Phrases:** No classification assigned for Nitric Dioxide (100 ppm) – Air (balance) mixture.  
**EC Safety Phrases:** No classification assigned for Nitric Dioxide (100 ppm) – Air (balance) mixture.

### NATIONAL INVENTORY STATUS

**U.S. Inventory (TSCA):** Listed on inventory.

**TSCA 12(b), Export Notification:** Not listed.

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## 16. OTHER INFORMATION

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**Sources:** ChemADVISOR, Inc., MSDS *Air, Compressed*, 23 June 2009.

ChemADVISOR, Inc., MSDS 2 *Comp. Mix Nitrogen Dioxide <3 % Bal. Air*, 06 April 2011.

ChemADVISOR, Inc., MSDS *Nitrogen Dioxide*, 06 April 2011.

EC; European Chemical Substance Information System (ESIS), *Nitrogen Dioxide*, CAS No. 10102-44-0; available at <http://ecb.jrc.ec.europa.eu/esis/> (accessed June 2011).

ChemIDplus Advanced; US National Library of Medicine, *Air Compressed* CAS No. 132259-10-0; available at <http://chem.sis.nlm.nih.gov/chemidplus/> (accessed June 2011).

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.