

## SAFETY DATA SHEET

### 1. SUBSTANCE AND SOURCE IDENTIFICATION

**Product Identifier**

**SRM Number:** 3133  
**SRM Name:** Mercury (Hg) Standard Solution  
**Other Means of Identification:** Not applicable.

**Recommended Use of This Material and Restrictions of Use**

This Standard Reference Material (SRM) is intended for use as a primary calibration standard for the quantitative determination of mercury. A unit of SRM 3133 consists of five 10 mL sealed borosilicate glass ampoules of an acidified aqueous solution prepared gravimetrically to contain a known mass fraction of mercury.

**Company Information**

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

Telephone: 301-975-2200  
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 1-800-424-9300 (North America)  
 +1-703-527-3887 (International)

### 2. HAZARDS IDENTIFICATION

**Classification**

|                         |                               |             |
|-------------------------|-------------------------------|-------------|
| <b>Physical Hazard:</b> | Not classified.               |             |
| <b>Health Hazard:</b>   | Acute Toxicity, Oral          | Category 4  |
|                         | Skin Corrosion/Irritation     | Category 1B |
|                         | Serious Eye Damage/Irritation | Category 1  |
|                         | Reproductive Toxicity         | Category 1A |
|                         | STOT, Repeated Exposure       | Category 2  |

**Label Elements**  
**Symbol**



**Signal Word**  
 DANGER

**Hazard Statement(s)**

|      |   |
|------|---|
| H302 | Harmful if swallowed.   |
| H314 | Causes severe skin burns and eye damage.                      |
| H362 | May damage fertility or the unborn child.                     |
| H372 | Causes damage to organs through prolonged or repeat exposure. |

**Precautionary Statement(s)**

|      |   |
|------|---|
| P201 | Obtain special instructions before use.                                   |
| P202 | Do not handle until all safety precautions have been read and understood. |
| P260 | Do not breathe fumes, mists, vapors, spray.                               |
| P264 | Wash hands thoroughly after handling.                                     |
| P270 | Do not eat, drink or smoke when using this product.                       |
| P280 | Wear protective gloves, protective clothing, and eye protection.          |

|                    |  |
|--------------------|--|
| P301 + P330 + P331 | If swallowed: Rinse mouth. Do NOT induce vomiting.   |
| P303 + P361 + P353 | If on skin (or hair): Remove immediately all contaminated clothing. Rinse skin with water.                                       |
| P304 + P340        | If inhaled: Remove person to fresh air and keep comfortable for breathing.   |
| P305 + P351 + P338 | If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P310               | Immediately call a doctor.   |
| P363               | Wash contaminated clothing before reuse.   |
| P405               | Store locked up.   |
| P501               | Dispose of contents and container according to local regulations.  |

**Hazards Not Otherwise Classified:** Not applicable.

**Ingredients(s) with Unknown Acute Toxicity:** Not applicable.

### 3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

**Substance:** Mercury in nitric acid solution

**Other Designations:**

Nitric acid (aqua fortis; hydrogen nitrate; azotic acid; engraver's acid)

Mercury nitrate [nitric acid, mercury (II) salt; mercuric nitrate]

**NOTE:** Mercury in nitric acid solution forms a solvated mercury nitrate salt.

Components are listed in compliance with OSHA's 29 CFR 1910.1200; for the actual values see the NIST Certificate of Analysis.

| Hazardous Component(s)            | CAS Number | EC Number (EINECS) | Nominal Mass Concentration (%) |
|-----------------------------------|------------|--------------------|--------------------------------|
| Nitric acid                       | 7697-37-2  | 231-714-2          | <20                            |
| Mercury nitrate                   | 10045-94-0 | 233-152-3          | 1.6                            |
| <b>Non-Hazardous Component(s)</b> |            |                    |                                |
| Water                             | 7732-18-5  | 231-791-2          | >78                            |

### 4. FIRST AID MEASURES

**Description of First Aid Measures:**

**Inhalation:** If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

**Skin Contact:** 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.

**Eye Contact:** Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

**Ingestion:** Contact a poison control center immediately for instructions. Do not induce vomiting. Give water to rinse out mouth. Never give liquids to a person with reduced awareness or becoming unconscious. If vomiting occurs, keep head lower than hips to prevent aspiration. If not breathing, give artificial respiration by qualified personnel. Seek immediate medical attention.

**Most Important Symptoms/Effects, Acute and Delayed:** Acid burns to skin, eyes, and lungs. Harmful if swallowed.

**Indication of any immediate medical attention and special treatment needed, if necessary:** If any of the above symptoms are present, seek immediate medical attention.

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## 5. FIRE FIGHTING MEASURES

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**Fire and Explosion Hazards:** Negligible fire hazard. See Section 9, "Physical and Chemical Properties" for flammability properties.

**Extinguishing Media:**

Suitable: Use extinguishing media appropriate to the surrounding fire.

Unsuitable: None listed.

**Specific Hazards Arising from the Chemical:** Thermal decomposition will form oxides of nitrogen and mercury.

**Special Protective Equipment and Precautions for Fire-Fighters:** Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

**NFPA Ratings** (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 3

Fire = 0

Reactivity = 0

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## 6. ACCIDENTAL RELEASE MEASURES

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**Personal Precautions, Protective Equipment and Emergency Procedures:** Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

**Methods and Materials for Containment and Clean up:** Do not touch spilled material. Notify safety personnel of spills. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Isolate hazard area and deny entry.

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## 7. HANDLING AND STORAGE

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**Safe Handling Precautions:** See Section 8, "Exposure Controls and Personal Protection". Handle glass ampoules with care.

**Storage:** Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances (see Section 10, "Stability and Reactivity").

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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**Exposure Limits:**

**Component:** Nitric acid

NIOSH (REL): 5 mg/m<sup>3</sup> (2 ppm; TWA)  
10 mg/m<sup>3</sup> (4 ppm; STEL)  
65 mg/m<sup>3</sup> (25 ppm; IDLH)

ACGIH (TLV): 5 mg/m<sup>3</sup> (2 ppm; TWA)  
10 mg/m<sup>3</sup> (4 ppm; STEL)

OSHA (PEL): 5 mg/m<sup>3</sup> (2 ppm; TWA)

**Component:** Mercury nitrate

NIOSH (REL): 0.05 mg/m<sup>3</sup> [TWA, (except Organo alkyls) as Hg vapor (related to Mercury compounds)]  
NIOSH (REL): 10 mg/m<sup>3</sup> [IDLH, (except Organo alkyls) as Hg vapor (related to Mercury compounds)]  
NIOSH (REL): 0.01 mg/m<sup>3</sup> [Ceiling, (except Organo alkyls) as Hg vapor (related to Mercury compounds)]  
Potential for dermal absorption (related to Mercury compounds)

ACGIH (TLV): 0.025 mg/m<sup>3</sup> (TWA, as Hg, vapor, related to Mercury compounds)  
Skin - potential significant contribution to overall exposure by the cutaneous route  
(related to Mercury inorganic forms)

OSHA (PEL): No occupational limits established.

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

**Personal Protection:** In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

**Respiratory Protection:** If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

**Eye/Face Protection:** Wear splash resistant safety goggles with a face shield. An eyewash station should be readily available near areas of use.

**Skin and Body Protection:** Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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**NOTE:** The physical and chemical data provided are for the pure components. No physical or chemical data are available for this solution of mercury nitrate and nitric acid. The actual behavior of the solution may differ from the individual components.

| <b>Descriptive Properties:</b>                                     | <b>Nitric acid<br/>(&lt;20 % of this SRM)</b> | <b>Mercury nitrate<br/>(1.6 % of this SRM)</b>   |
|--|---|--|
| <b>Appearance<br/>(physical state, color, etc.):</b>               | colorless to yellow<br>liquid                 | white to yellow solid<br>powder  |
| <b>Molecular Formula:</b>  | HNO <sub>3</sub>                              | Hg(NO <sub>3</sub> ) <sub>2</sub>  |
| <b>Molar Mass (g/mol):</b>   | 63.01   | 324.61   |
| <b>Odor:</b>   | irritating odor                               | not available  |
| <b>Odor threshold:</b>   | not available                                 | not available  |
| <b>pH:</b>   | 1 (1 M)                                       | not available  |
| <b>Evaporation rate:</b>   | not available                                 | not available  |
| <b>Melting point/freezing point (°C):</b>                          | -42 (-43 °F)                                  | 79 (174.2 °F)  |
| <b>Relative Density (g/L) as specific gravity<br/>(water = 1):</b> | 1.5027 at 25 °C                               | 4.39   |
| <b>Vapor Pressure (mmHg):</b>                                      | 47.9 at 20 °C                                 | not available  |
| <b>Vapor Density (air = 1):</b>                                    | 3.2   | not available  |
| <b>Viscosity (cP):</b>   | not available                                 | not available  |
| <b>Solubility(ies):</b>  | miscible with water<br>and ether              | soluble in water,<br>acetone, ammonia,<br>nitric acid, dilute acids;<br>insoluble in alcohol |
| <b>Partition coefficient (n-octanol/water):</b>                    | not available                                 | not available  |
| <b>Thermal Stability Properties:</b>                               |   |  |
| <b>Autoignition Temperature (°C):</b>                              | not applicable                                | not applicable   |
| <b>Thermal Decomposition (°C):</b>                                 | not applicable                                | not available  |
| <b>Initial boiling point and boiling range<br/>(°C):</b>           | 83 (181 °F)                                   | not available  |
| <b>Explosive Limits, LEL (Volume %):</b>                           | not applicable                                | not available  |
| <b>Explosive Limits, UEL (Volume %):</b>                           | not applicable                                | not available  |
| <b>Flash Point (°C):</b>   | not applicable                                | not available  |
| <b>Flammability (solid, gas):</b>                                  | not applicable                                | not available  |

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## 10. STABILITY AND REACTIVITY

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**Reactivity:** Stable at normal temperatures and pressure.

**Stability:**   X   Stable        Unstable

**Possible Hazardous Reactions:** None listed.

**Conditions to Avoid:** Contact with combustible or incompatible materials.

**Incompatible Materials:** Acids, combustible materials, halo carbons, amines, bases, oxidizing materials, metals, halogens, metal salts, metal oxides, reducing agents, peroxides, metal carbide, cyanides.

**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Thermal decomposition will produce oxides of nitrogen and mercury.

**Hazardous Polymerization:** \_\_\_\_\_ Will Occur       X  Will Not Occur

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## 11. TOXICOLOGICAL INFORMATION

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

**Symptoms Related to the Physical, Chemical and Toxicological Characteristics:** Burning pain and severe skin corrosion, eye, lung, and blood damage, and cancer.

### Potential Health Effects (Acute, Chronic and Delayed):

**Inhalation:** Inhalation of nitric acid can damage the mucous membranes and upper respiratory tract. Short term exposure may cause irritation and inflammation of the upper respiratory tract, coughing, choking, sore throat, shortness of breath, headache, dizziness, and nausea. Long term exposure to acid fumes may cause damage to teeth, bronchial irritation, chronic cough, bronchial pneumonia, and gastrointestinal disturbances. Inhalation of high levels of mercury vapor may cause almost immediate dyspnea, cough, fever, nausea, vomiting, gingivitis, and metallic taste. Long term inhalation may result in mercury poisoning characterized by fine tremors and erethism.

**Skin Contact:** Nitric acid can cause severe skin burns. Severity of the damage depends on the concentration and duration of exposure. Effects of acid burns may be delayed. Mercury nitrate exposure to intact skin may result in redness, pain, skin burns, and sensitization.

**Eye Contact:** Nitric acid and mercury nitrate can cause severe eye irritation, corneal burns, permanent eye damage, or blindness. Severity of the damage depends on the concentration and duration of exposure.

**Ingestion:** Ingestion of this material is unlikely under normal conditions of use. If ingested, nitric acid can cause severe burns and damage to the gastrointestinal tract. Ingestion of mercury nitrate may lead to abdominal pain, burning mouth, sore throat vomiting, fatigue, and colitis.

### Numerical Measures of Toxicity:

**Acute Toxicity:** Category 4, Oral.

Nitric acid, Rat, Inhalation LC50: 130 mg/m<sup>3</sup> (4 h)

Mercury nitrate, Rat, Oral LD50: 26 mg/kg

Mercury nitrate, Rat, Dermal LD50: 75 mg/kg

**Skin Corrosion/Irritation:** This SRM contains >1 % of nitric acid and it is classified as Category 1B.

**Serious Eye Damage/Irritation:** This SRM contains >1 % nitric acid and it is classified as Category 1.

**Respiratory Sensitization:** Classification not possible.

**Skin Sensitization:** Classification not possible.

Mercury nitrate exposure may cause sensitization, however since this mixture is corrosive, classification is not possible.

**Germ Cell Mutagenicity:** Not classified; no data available.

**Carcinogenicity:** Not classified.

**Listed as a Carcinogen/Potential Carcinogen**      \_\_\_\_\_ Yes       X  No

Nitric acid is not listed by NTP, IARC or OSHA as a carcinogen.

Inorganic mercury compounds are listed by IARC as Group 3 (not classifiable).

**Reproductive Toxicity:** Category 1A; mercury can cross the placenta, reduce male sex drive; cause male and female infertility, spontaneous abortions, birth defects, growth retardation, and contaminate breast milk.

Nitric acid, Rat, Oral TDLo: 21 150 mg/kg (pregnant 1 d to 21 d)

Nitric acid, Rat, Oral TDLo: 2345 mg/kg (pregnant 18 d)

**Specific Target Organ Toxicity, Single Exposure:** Not classified.

**Specific Target Organ Toxicity, Repeated Exposure:** Category 2; mercury can accumulate in body tissues.

**Aspiration Hazard:** No data available.

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## 12. ECOLOGICAL INFORMATION

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### Ecotoxicity Data:

Nitric acid: Starfish (*Asterias rubens*) LC50 [renewal/aerated water]: 100 mg/L to 300 mg/L (48 h)  
Mercury nitrate: No data available.

**Persistence and Degradability:** No data available.

**Bioaccumulative Potential:** No data available.

**Mobility in Soil:** No data available.

**Other Adverse effects:** No data available.

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## 13. DISPOSAL CONSIDERATIONS

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**Waste Disposal:** Dispose of waste in accordance with all applicable federal, state, and local regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262, Waste Numbers: nitric acid - D001, D002; mercury nitrate - D001, D009, concentrations at or above the regulatory level of 0.2 mg/L.

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## 14. TRANSPORTATION INFORMATION

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**U.S. DOT and IATA:** UN1760, Corrosive liquid, n.o.s. (contains nitric acid), Hazard Class 8, Packing Group II, Excepted Quantities E2.

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## 15. REGULATORY INFORMATION

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### U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Nitric acid, 1000 lbs (454 kg) final RQ  
Mercury nitrate, 10 lbs (4.54 kg) final RQ  
SARA Title III Section 302 (40 CFR 355.30): Nitric acid, 1000 lbs (454 kg) final TPQ  
SARA Title III Section 304 (40 CFR 355.40): Nitric acid, 1000 lbs (454 kg) EPCRA RQ  
SARA Title III Section 313 (40 CFR 372.65): Mercury compounds, 1 % Supplier notification limit  
Nitric acid, 1 % de minimis concentration  
OSHA Process Safety (29 CFR 1910.119): Nitric acid, regulated 500 lbs TQ ( $\geq 94.5$  % by weight)  
SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

|                 |      |
|-----------------|------|
| ACUTE HEALTH:   | Yes. |
| CHRONIC HEALTH: | Yes. |
| FIRE:           | No.  |
| REACTIVE:       | No.  |
| PRESSURE:       | No.  |

### State Regulations:

California Proposition 65: Warning! This material contains a chemical (mercury) known to the state of California to cause reproductive/developmental effects.

**U.S. TSCA Inventory:** Nitric acid and mercury nitrate are listed.

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

### Canadian Regulations:

WHMIS Information: Not provided for this material.

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## 16. OTHER INFORMATION

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**Issue Date:** 12 August 2016

**Sources:** ChemAdvisor, Inc., SDS *Nitric Acid*, 09 December 2015.

ChemAdvisor, Inc., SDS *Mercuric Nitrate*, 09 December 2015.

Hazardous Substances Data Bank (HSDB), National Library of Medicine's TOXNET system, *Nitric Acid* CAS No. 7697-37-2; available at <http://toxnet.nlm.nih.gov> (accessed Aug 2016).

### Key of Acronyms:

|        |   |       |  |
|--------|---|-------|--|
| ACGIH  | American Conference of Governmental Industrial Hygienists             | NRC   | Nuclear Regulatory Commission                    |
| ALI    | Annual Limit on Intake  | NTP   | National Toxicology Program                      |
| CAS    | Chemical Abstracts Service  | OSHA  | Occupational Safety and Health Administration    |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act | PEL   | Permissible Exposure Limit                       |
| CFR    | Code of Federal Regulations   | RCRA  | Resource Conservation and Recovery Act           |
| DOT    | Department of Transportation  | REL   | Recommended Exposure Limit                       |
| EC50   | Effective Concentration, 50 %   | RM    | Reference Material                               |
| EINECS | European Inventory of Existing Commercial Chemical Substances         | RQ    | Reportable Quantity                              |
| EPCRA  | Emergency Planning and Community Right-to-Know Act                    | RTECS | Registry of Toxic Effects of Chemical Substances |
| IARC   | International Agency for Research on Cancer                           | SARA  | Superfund Amendments and Reauthorization Act     |
| IATA   | International Air Transport Association                               | SCBA  | Self-Contained Breathing Apparatus               |
| IDLH   | Immediately Dangerous to Life and Health                              | SRM   | Standard Reference Material                      |
| LC50   | Lethal Concentration, 50 %  | STEL  | Short Term Exposure Limit                        |
| LD50   | Lethal Dose, 50 %   | STOT  | Specific Target Organ Toxicity                   |
| LEL    | Lower Explosive Limit   | TLV   | Threshold Limit Value                            |
| MSDS   | Material Safety Data Sheet  | TPQ   | Threshold Planning Quantity                      |
| NFPA   | National Fire Protection Association                                  | TSCA  | Toxic Substances Control Act                     |
| NIOSH  | National Institute for Occupational Safety and Health                 | TWA   | Time Weighted Average                            |
| NIST   | National Institute of Standards and Technology                        | UEL   | Upper Explosive Limit                            |
| n.o.s. | Not Otherwise Specified   | WHMIS | Workplace Hazardous Materials Information System |

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

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail [srmmsds@nist.gov](mailto:srmmsds@nist.gov); or via the Internet at <http://www.nist.gov/srm>.