

# NITROGEN

NXX

## CAUTIONARY RESPONSE INFORMATION

|  |   |     |           |          |
|--|---|-----|-----------|----------|
| <b>Common Synonyms</b><br>Liquid nitrogen    |   | Gas | Colorless | Odorless |
| Floats and boils on water.                   |   |     |           |          |
| Keep people away. Avoid contact with liquid. |   |     |           |          |
| <b>Fire</b>                                  | Not flammable.  |     |           |          |
| <b>Exposure</b>                              | Call for medical aid.<br><br>VAPOR<br>Not harmful.<br>In high concentrations may cause dizziness, difficult breathing, or loss of consciousness.<br><br>LIQUID<br>Will cause frostbite.<br>Flush affected areas with plenty of water.<br>DO NOT RUB AFFECTED AREAS. |     |           |          |
| <b>Water Pollution</b>                       | Not harmful to aquatic life.  |     |           |          |

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: N<sub>2</sub>
- 2.3 IMO/UN Designation: 2/1977
- 2.4 DOT ID No.: 1066
- 2.5 CAS Registry No.: 7727-37-9
- 2.6 NAERG Guide No.: 121
- 2.7 Standard Industrial Trade Classification: 52221

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses or face shield; insulated gloves; long sleeves; trousers worn outside boots or over high-top shoes to shed spilled liquid; self-contained breathing apparatus where insufficient air is present.
- 3.2 **Symptoms Following Exposure:** Inhalation can cause asphyxiation, if atmosphere does not contain oxygen; dizziness, unconsciousness, or even death can result. Contact of liquid with skin or eyes causes frostbite burns.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; apply artificial respiration if breathing has stopped; call physician. EYES: treat for frostbite burns caused by liquid. SKIN: treat for frostbite; soak in lukewarm water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** Frostbite
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (nonflammable compressed gas)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Heat of water will vigorously vaporize liquid nitrogen.
- 5.2 **Reactivity with Common Materials:** No chemical reaction. Low temperature may cause brittleness in rubber and plastics.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%
- 7.2 **Storage Temperature:** -320°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

|                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 28.0
- 9.3 **Boiling Point at 1 atm:** -320.1°F = -195.6°C = 77.6°K
- 9.4 **Freezing Point:** -354°F = -215°C = 58°K
- 9.5 **Critical Temperature:** -232.6°F = -147.0°C = 126.2°K
- 9.6 **Critical Pressure:** 493 psia = 33.5 atm = 3.40 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.807 at -195.5°C (liquid)
- 9.8 **Liquid Surface Tension:** 8.3 dynes/cm = 0.083 N/m at -193°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 0.965
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3962
- 9.12 **Latent Heat of Vaporization:** 95 Btu/lb = 53 cal/g = 2.2 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 6.15 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

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| 9.20<br>SATURATED LIQUID DENSITY |                       | 9.21<br>LIQUID HEAT CAPACITY |                                     | 9.22<br>LIQUID THERMAL CONDUCTIVITY |   | 9.23<br>LIQUID VISCOSITY   |            |
|----------------------------------|-----------------------|------------------------------|-------------------------------------|-------------------------------------|---|----------------------------|------------|
| Temperature<br>(degrees F)       | Pounds per cubic foot | Temperature<br>(degrees F)   | British thermal unit per<br>pound-F | Temperature<br>(degrees F)          | British thermal unit inch<br>per hour-square foot-F | Temperature<br>(degrees F) | Centipoise |
| -327                             | 51.850                | -327                         | 0.240                               | -326                                | 0.993   | -325                       | 0.170      |
| -326                             | 51.640                | -326                         | 0.240                               | -324                                | 0.993   | -320                       | 0.155      |
| -325                             | 51.440                | -325                         | 0.240                               | -322                                | 0.973   | -315                       | 0.143      |
| -324                             | 51.230                | -324                         | 0.240                               | -320                                | 0.964   | -310                       | 0.132      |
| -323                             | 51.020                | -323                         | 0.240                               | -318                                | 0.954   | -305                       | 0.123      |
| -322                             | 50.810                | -322                         | 0.240                               | -316                                | 0.944   | -300                       | 0.114      |
| -321                             | 50.600                | -321                         | 0.240                               | -314                                | 0.934   | -295                       | 0.107      |
| -320                             | 50.400                | -320                         | 0.240                               | -312                                | 0.924   | -290                       | 0.101      |
| -319                             | 50.190                | -319                         | 0.240                               | -310                                | 0.914   | -285                       | 0.095      |
| -318                             | 49.980                | -318                         | 0.240                               | -308                                | 0.904   | -280                       | 0.090      |
| -317                             | 49.770                | -317                         | 0.240                               | -306                                | 0.895   | -275                       | 0.086      |
| -316                             | 49.560                | -316                         | 0.240                               | -304                                | 0.885   | -270                       | 0.082      |
| -315                             | 49.360                | -315                         | 0.240                               | -302                                | 0.875   | -265                       | 0.078      |
| -314                             | 49.150                | -314                         | 0.240                               | -300                                | 0.865   | -260                       | 0.075      |
| -313                             | 48.940                | -313                         | 0.240                               | -298                                | 0.855   |                            |            |
| -312                             | 48.730                | -312                         | 0.240                               | -296                                | 0.845   |                            |            |
| -311                             | 48.520                | -311                         | 0.240                               | -294                                | 0.835   |                            |            |
| -310                             | 48.320                | -310                         | 0.240                               | -292                                | 0.826   |                            |            |

| 9.24<br>SOLUBILITY IN WATER |                                   | 9.25<br>SATURATED VAPOR PRESSURE |                        | 9.26<br>SATURATED VAPOR DENSITY |                       | 9.27<br>IDEAL GAS HEAT CAPACITY |                                     |
|-----------------------------|-----------------------------------|----------------------------------|------------------------|---------------------------------|-----------------------|---------------------------------|-------------------------------------|
| Temperature<br>(degrees F)  | Pounds per 100 pounds<br>of water | Temperature<br>(degrees F)       | Pounds per square inch | Temperature<br>(degrees F)      | Pounds per cubic foot | Temperature<br>(degrees F)      | British thermal unit per<br>pound-F |
|                             | I                                 | -344                             | 1.931                  | -344                            | 0.04355               | 0                               | 0.250                               |
|                             | N                                 | -342                             | 2.356                  | -342                            | 0.05223               | 20                              | 0.250                               |
|                             | S                                 | -340                             | 2.855                  | -340                            | 0.06224               | 40                              | 0.250                               |
|                             | O                                 | -338                             | 3.438                  | -338                            | 0.07372               | 60                              | 0.250                               |
|                             | L                                 | -336                             | 4.116                  | -336                            | 0.08681               | 80                              | 0.250                               |
|                             | U                                 | -334                             | 4.899                  | -334                            | 0.10170               | 100                             | 0.250                               |
|                             | B                                 | -332                             | 5.799                  | -332                            | 0.11850               | 120                             | 0.250                               |
|                             | L                                 | -330                             | 6.828                  | -330                            | 0.13740               | 140                             | 0.250                               |
|                             | E                                 | -328                             | 8.000                  | -328                            | 0.15850               | 160                             | 0.250                               |
|                             |                                   | -326                             | 9.330                  | -326                            | 0.18210               | 180                             | 0.250                               |
|                             |                                   | -324                             | 10.830                 | -324                            | 0.20820               | 200                             | 0.250                               |
|                             |                                   | -322                             | 12.520                 | -322                            | 0.23720               | 220                             | 0.250                               |
|                             |                                   | -320                             | 14.410                 | -320                            | 0.26910               | 240                             | 0.250                               |
|                             |                                   | -318                             | 16.520                 | -318                            | 0.30410               | 260                             | 0.250                               |
|                             |                                   | -316                             | 18.870                 | -316                            | 0.34250               | 280                             | 0.250                               |
|                             |                                   | -314                             | 21.470                 | -314                            | 0.38440               | 300                             | 0.250                               |
|                             |                                   | -312                             | 24.340                 | -312                            | 0.43000               | 320                             | 0.250                               |
|                             |                                   | -310                             | 27.510                 | -310                            | 0.47950               | 340                             | 0.250                               |
|                             |                                   | -308                             | 30.990                 | -308                            | 0.53300               | 360                             | 0.250                               |
|                             |                                   | -306                             | 34.800                 | -306                            | 0.59080               | 380                             | 0.250                               |
|                             |                                   | -304                             | 38.970                 | -304                            | 0.65300               | 400                             | 0.250                               |
|                             |                                   | -302                             | 43.510                 | -302                            | 0.71980               | 420                             | 0.250                               |
|                             |                                   | -300                             | 48.440                 | -300                            | 0.79130               | 440                             | 0.250                               |
|                             |                                   | -298                             | 53.790                 | -298                            | 0.86780               |                                 |                                     |
|                             |                                   | -296                             | 59.570                 | -296                            | 0.94940               |                                 |                                     |
|                             |                                   | -294                             | 65.820                 | -294                            | 1.03600               |                                 |                                     |