

PORTAGAS

Material Safety Data Sheet

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing Hexane (< 1.1%) and Air (Balance) or

Methane (< 5.0%) and Air (Balance) or

Propylene (< 2.0%) and Air (Balance) or

Toluene (< 1.2%) and Air (Balance)

SYNONYMS: Not Applicable

CHEMICAL FAMILY: Not Applicable

FORMULA: Not Applicable

Document Number: MSDS1037

PRODUCT USE: For general analytical/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME: Portagas

ADDRESS: 1202 E. Sam Houston Pkwy S.
Pasadena, TX 77503

BUSINESS PHONE: General MSDS Info:

(713) 928-6477

EMERGENCY PHONE:

INFOTRAC: (800) 535-5053

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		IDLH	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
This gas mixture consist of one of the following components in an Air balance.								
n-Hexane	110-54-3	< 1.1%	50 (skin)	NE	500 50 (Vacated 1989 PEL)	NE	1100 (Based on 10% of the LEL)	NIOSH REL: TWA = 50 DFG MAKs: TWA = 50 (Danger of Cutaneous Absorption) PEAK = 2•MAK 30 min., average value DFG MAK Pregnancy Risk Classification: C
Methane	74-82-8	< 5.0%	There are no specific exposure limits for Methane. Methane is a simple asphyxiant (SA).					
Propylene	115-07-1	< 2.0%	A4 (Not Classifiable as Human Carcinogen)	There are no specific exposure limits for Propylene. Propylene is a simple asphyxiant (SA).			Carcinogen: IARC-3, TLV-A4	
CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		IDLH	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Toluene	108-88-3	< 1.2%	50 (skin), A4 (Not Classifiable as Human Carcinogen)	NE	200 100 (Vacated 1989 PEL)	300 (ceiling) 500 (10 min. peak per 8-hr shift) 150 (Vacated 1989 PEL)	500	NIOSH REL: TWA = 50 DFG MAKs: TWA = 50 (Danger of Cutaneous Absorption) PEAK = 2•MAK 30 min., average value DFG MAK Pregnancy Risk Classification: C Carcinogen: EPA-D, IARC-3, TLV-A4
Air (compressed, atmospheric)	132259-10-0	Balance	There are no specific exposure limits applicable to air.					
Air is a mixture of gases. The primary components of air, and the approximate concentration of each component, are listed below.								
Oxygen	7782-44-7	21%	There are no specific exposure limits for Oxygen.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

This material is classified as hazardous under OSHA regulations in the United States and the WHMIS in Canada.

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NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-2004 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a colorless, non-flammable gas mixture. This gas mixture may be odorless or have a mild, gasoline-like odor, depending on the composition of the product. When this gas mixture contains n-Hexane, adverse anesthetic or peripheral neuropathy effects can occur. If this gas mixture contains Toluene, eye irritation and central nervous system effects can occur within the ranges present in this gas mixture. This gas mixture is generally considered non-flammable, however, this gas mixture will support combustion.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: When this gas mixture contains Methane or Propylene, it is non-toxic and has the oxygen content necessary to support life. When this product contains n-Hexane, there is a potential for anesthetic and peripheral neuropathy effects. Specific humans over-exposure data are available for n-Hexane, as follows:

n-HEXANE

CONCENTRATION

Brief (10 minute) at 1,500 ppm:

5000 ppm:

Long term at 500 ppm:

OBSERVED EFFECT

Irritation of the respiratory tract, nausea and headache.

Dizziness and drowsiness can occur.

Can affect the nerves in the arms and legs. Effects include numbing or tingling sensations in the fingers and toes, tiredness, muscle weakness, cramps and spasms in the leg, difficulty in holding objects or walking, abdominal pains, loss of appetite, weight loss.

CONCENTRATION

Long term at 500 ppm:

Eyes and Vision:

Blood Cells:

When this gas mixture contains Toluene, the following effects may occur if high concentration of the mixture are inhaled:

TOLUENE

CONCENTRATION

~50 ppm:

50-100 ppm:

Above 100 ppm:

Over 200 ppm:

Over 500 ppm:

10,000 ppm (est)

SYMPTOM OF EXPOSURE

Slight drowsiness and headache.

Irritation of the nose, throat and respiratory tract.

Fatigue and dizziness.

Symptoms similar to drunkenness, giddiness, numbness, and mild nausea.

Mental confusion and incoordination, loss of appetite, a bad taste.

At this concentration Toluene causes visual disturbances and further depression of the central nervous system which can result in unconsciousness and death.

OTHER HEALTH EFFECTS: Very short exposure (3-5 minutes) of the eyes of vapors to Toluene at a concentration of 300 ppm causes slight irritation. Longer exposures (6-7 hours) to levels above 100 ppm will cause irritation.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects.

ACUTE: When this product contains n-Hexane, there is a potential for adverse anesthetic and peripheral neuropathy effects if high concentrations are inhaled. When this gas mixture contains Toluene, there is a potential for adverse effects on the central nervous system, and irritation of eyes and respiratory system

CHRONIC: Abnormal color perception and pigment changes in the eyes have been reported among persons exposed to 420 -1300 ppm of n-Hexane (a potential component of this gas mixture) for five years. Additionally, long-term exposure to low levels of n-Hexane can affect the nerves in the arms and legs.

Effects include numbing or tingling sensation, tiredness, cramps, spasms in legs, difficulty holding objects or walking, loss of appetite and weight loss. In rare cases, chronic over-exposure to Toluene (a potential component of this gas mixture) has led to anemia and other problems with the blood and bone marrow. Animal studies indicate Toluene may have adverse reproductive effects. Refer to Section 11 (Toxicology Information) for additional information on the components of this gas mixture.

TARGET ORGANS: ACUTE: Eyes, respiratory system. CHRONIC: Eyes, reproductive system.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH	(BLUE)	1	
FLAMMABILITY	(RED)	0	
REACTIVITY	(YELLOW)	0	
PROTECTIVE EQUIPMENT	B		
EYES	RESPIRATORY	HANDS	BODY
See Section 8			
For routine industrial applications			

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4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus may be needed. Remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardiopulmonary resuscitation if necessary. Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions and disorders involving the "Target Organs" (see Section 3, Hazard Identification) and cardio-vascular conditions may be aggravated by overexposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen if necessary. Treat symptoms and eliminate overexposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

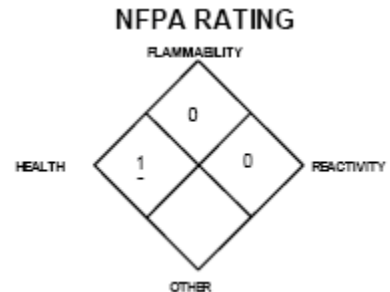
FIRE EXTINGUISHING MATERIALS: Non-flammable. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture will not burn; however, it will support combustion of flammable materials. Cylinders, when involved in a fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, shut off the flow of this gas mixture supporting the fire. Immediately cool the cylinders with water spray from a maximum distance. When cool, move cylinders from fire area if this can be done without risk to firefighters.



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Evacuate immediate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a gas release, clear the affected area, protect people, and respond with trained personnel. Minimum Personal Protective Equipment should be **Level B: Self-Contained Breathing Apparatus**. Locate and seal the source of the leaking gas. Allow the gas to dissipate. Monitor the surrounding area for the levels of components. The levels of components must be below those listed in Section 2 (Composition and Information on Ingredients) and the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area, away from sources of ignition, and allow the gas to be released there.

If gas is leaking incidentally from the cylinder or its valve, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Though this gas mixture contains sufficient oxygen to sustain life, it must be treated as unfit for human consumption and should not be used in applications requiring breathing air.

STORAGE AND HANDLING PRACTICES: Compressed gases can present significant safety hazards. Store cylinders away from heavily trafficked areas and emergency exits. Cylinders should be stored upright (with valve protection cap in place) and firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition, and direct sunlight. Keep storage area clear of materials that can burn. Do not allow area where cylinders are stored to exceed 52°C (125°F). Store containers away from heavily trafficked areas and emergency exits. Store away from process and gas production areas, elevators, building and room exits, or main aisles leading to exits. Protect cylinders against physical damage.

Keep the smallest amount on-site as is necessary. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time.

Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in valves and cylinders.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Use piping and equipment adequately designed to withstand pressures to be encountered. Do not heat cylinder by any means to increase the discharge rate of the gas mixture from the cylinder. Do not use oils or grease on gas-handling fittings or equipment. Leak check system with leak detection solution, never with flame. Immediately contact the supplier if there are any difficulties associated with operating cylinder valve. Never insert an object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap wrench to remove overly tight or rusted caps. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electric circuit.

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After Use: Close main cylinder valve. Valves should be closed tightly. Replace valve protection cap. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code cylinders designed for compressed gas storage. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas before attempting repairs. Always use this gas mixture in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents chemical dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the levels of components, as listed in Section 2 (Composition and Information on Ingredients).

RESPIRATORY PROTECTION: Maintain component levels below exposure level listed in Section 2 (Composition and Information on Ingredients) in the workplace. Use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards, and the Canadian CSA Standard Z94.4-93. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Safety glasses.

HAND PROTECTION: Wear gloves when handling cylinders of this gas mixture. Otherwise, wear glove protection appropriate to the specific operation for which this gas mixture is used.

BODY PROTECTION: Use body protection appropriate for task. Safety shoes are recommended when handling cylinders.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Air, the main component of this gas mixture.

GAS DENSITY @21.1°C (70°F) and 1 atm: 0.07493 lb/ ft³ (1.2 kg/m³)

BOILING POINT: -194.3°C (-317.8°F)

FREEZING/MELTING POINT (@ 10 psig): -216.2°C (-357.2°F)

SOLUBILITY IN WATER, Vol/Vol at 0°C (32°F): 0.0292

SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 1

EVAPORATION RATE (nBuAc = 1): Not applicable.

VAPOR PRESSURE @ 21.1°C (70°F): Not applicable.

SPECIFIC VOLUME (ft³/lb): Not applicable for Air; 13.8 (for Nitrogen)

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

MOLECULAR WEIGHT: 28.975

pH: Not applicable.

EXPANSION RATIO: Not applicable.

ODOR THRESHOLD: Not applicable.

The following information is for this gas mixture.

APPEARANCE AND COLOR: Colorless gas mixture, which is odorless or has gasoline-like odor, depending on the composition of the mixture.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The n-Hexane, Methane, Propylene and Toluene that may be present in this gas mixture will decompose into carbon dioxide and carbon monoxide at extremely high temperatures. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Fuels may form explosive mixtures in air. n-Hexane are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Methane is incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride). Propylene is incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Toluene is incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride) and can react with nitric acid, sulfur dichloride, and sulfuric acid.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the possible components of this gas mixture:

HEXANE:

Eye effects-Rabbit, adult 10 mg Mild irritation effects

LC₅₀ (Inhalation-Rat) 48,000 ppm/4 hours

LCLo (Inhalation-Mouse) 120 g/m³

LCLo (Inhalation-Mouse) 10000 ppm/6 hours/13 weeks-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Behavioral: changes in motor activity (specific assay); Blood: changes in other cell count (unspecified)

LD₅₀ (Oral-Rat) 28,710 mg/kg

TCLo (Inhalation-Human) 190 ppm/8 weeks: Peripheral nervous system effects

TCLo (Inhalation-Rat) 10,000 ppm/7 Hours (female 15 days pre): Reproductive effects

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TCLo (Inhalation-Rat) 5000 ppm/20 hours (female 6-19 days post): Teratogenic effects
 TCLo (Inhalation-Rat) 2000 ppm/12 hours/24 weeks-intermittent: Spinal Cord: other degenerative changes; Peripheral Nerve and Sensation: recording from peripheral motor nerve; Biochemical: Metabolism (Intermediary): other proteins
 TCLo (Inhalation-Rat) 1000 ppm/24 hours/11 weeks-continuous: Brain and Coverings: recordings from specific areas of CNS; Behavioral: muscle weakness; Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TCLo (Inhalation-Rat) 1 pph/6 hours/13 weeks-intermittent: Brain and Coverings: changes in brain weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TCLo (Inhalation-Rat) 476 ppm/6 hours/4 weeks-intermittent: Lungs, Thorax, or Respiration: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels-phosphatases, Enzyme inhibition, induction, or change in blood or tissue levels-dehydrogenases
 TCLo (Inhalation-Rat) 3000 ppm/6 hours/2 years-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TCLo (Inhalation-Rat) 500 ppm/24 hours/9 weeks-continuous: Peripheral Nerve and Sensation: spastic paralysis with or without sensory change; Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TCLo (Inhalation-Rat) 1000 ppm/6 hours: female 8-16 day(s) after conception: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain)
 TCLo (Inhalation-Rat) 1200 ppm/12 hours/16 weeks-intermittent: Peripheral Nerve and Sensation: recording from peripheral motor nerve; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Biochemical: Metabolism (Intermediary): other proteins
 LDLo (Intraperitoneal-Rat) 9100 mg/kg
 LDLo (Intraperitoneal-Rat) 18900 mg/kg/35 days-intermittent: Peripheral Nerve and Sensation - recording from afferent nerve, recording from peripheral motor nerve; Nutritional and Gross Metabolic: weight loss or decreased weight gain
 LDLo (Intraperitoneal-Rat) 4788 mg/kg/7 days-intermittent: Liver: other changes; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects
 LDLo (Intravenous-mouse) 831 mg/kg: Behavioral: altered sleep time (including change in righting reflex)
 LDLo (Intravenous-rabbit) 132 mg/kg
 TDLo (Oral-Rat) 40 gm/kg/4 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TDLo (Oral-mouse) 238 gm/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)
 TDLo (Intraperitoneal-chicken) 18 gm/kg/90 days-intermittent: Peripheral Nerve and Sensation: structural change in nerve or sheath; Behavioral: ataxia; Related to Chronic Data: death
 Sex chromosome loss and nondisjunction (Yeast-Saccharomyces cerevisiae) 132 mmol/L
 Cytogenetic Analysis (Hamster-fibroblast) 500 mg/L

METHANE:

There are no specific toxicology data for Methane. Methane is a simple asphyxiant (SA), which acts to displace oxygen in the environment.

PROPYLENE:

Effects on Short-Term Inhalation:

In all species tested, propylene is an anesthetic, being approximately twice as toxic as ethylene. A concentration of 40% produced light anesthesia in rats, with no toxic effects within 6 hours of exposure. Exposure to 55% for 3 to 6 minutes, 65% for 2 to 5 minutes, and 70% for 1 to three minutes caused deep anesthesia with no central nervous system disturbances.

PROPYLENE (continued):

Effects on Short-Term Inhalation (continued): In cats, no toxic signs were observed when anesthesia was induced with propylene concentrations of 20-30%. However, at higher concentrations, toxic effects were seen. Some subtle effects were seen from 40-50%, a drop in blood pressure and increased pulse rate at 70%, and an unusual heart beat from 50-80%. Propylene has been found to be a cardiac sensitizer in dogs. After 4 hours of inhalation exposure to 50,000 ppm propylene, rats pretreated with Aroclor 1254 (a hepatic mixed-function, oxidase inducer) showed liver toxicity. No liver toxicity was observed in control rats or rats pretreated with phenolbarbital or beta-naphthoflavone. This evidence suggests that Aroclor pre-treatment is a prerequisite for propylene liver toxicity.

Effects of Long-Term Inhalation: Chronic exposure to mice to concentrations causing central nervous system depression resulted in moderate to very slight fatty degeneration of the liver.

TOLUENE:

Eye effects-Human 300 ppm
 Skin-Rabbit, adult 435 mg Mild irritation effects
 Skin-Rabbit, adult 500 Moderate irritation effects
 Eye effects-Rabbit, adult 870 mg Mild irritation effects
 Eye effects-Rabbit, adult 2 mg/24 hours Severe irritation effects
 Eye effects-Rabbit, adult 100 mg/30 seconds rns Mild irritation effects
 LDLo (Oral-Human) 50 mg/kg
 LD₅₀ (Oral-Rat) 5000 mg/kg
 LD₅₀ (Intraperitoneal-Rat) 1332 mg/kg
 LD₅₀ (Intraperitoneal-Mouse) 640 mg/kg
 LD₅₀ (Unreported-Rat) 6900 mg/kg
 LD₅₀ (Intraperitoneal-Mouse) 59 mg/kg
 LD₅₀ (Subcutaneous-Mouse) 2250 mg/kg
 LD₅₀ (Intravenous-Rat) 1960 mg/kg
 LD₅₀ (Unreported-Mouse) 2 g/kg

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LD₅₀ (Skin-Rabbit, adult) 12,124 mg/kg
 LC₅₀ (Inhalation-Mouse) 400 ppm/24 hours
 LCLo (Inhalation-Rat) 4000 ppm/4 hours
 LCLo (Inhalation-Rabbit, adult) 55,000 ppm/40 minutes
 TCLo (Inhalation-Human) 200 ppm: BRN, Central nervous system effects, Blood effects
 TCLo (Inhalation-Man) 100 ppm: Central nervous system effects
 TCLo (Inhalation-Rat) 1000 mg/m³/24 hours: female 7-14 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system
 TCLo (Inhalation-Rat) 1500 mg/m³/24 hours: female 1-8 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: musculoskeletal system
 TCLo (Inhalation-Rat) 2000 ppm/6 hours: female 7-17 day(s) after conception: Reproductive: Maternal Effects: other effects
 Reproductive: Effects on Newborn: physical
 TCLo (Inhalation-Rat) 800 mg/m³/6 hours: female 14-20 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), Effects on Newborn: behavioral
 TCLo (Inhalation-Rat) 1200 ppm/6 hours: female 9-12 day(s) after conception: Reproductive: Effects on Newborn: delayed effects
 TCLo (Inhalation-Mouse) 400 ppm/7 hours (female 716 days post): Reproductive effects
 TCLo (Inhalation-Mouse) 500 mg/m³/24 hours female 6-13 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TOLUENE (continued):

TCLo (Inhalation-Mouse) 1000 ppm/6 hours: female 2-17 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system
 TCLo (Inhalation-Mouse) 400 ppm/7 hours: female 7-16 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system, Effects on Newborn: biochemical and metabolic
 TCLo (Inhalation-Mouse) 200 ppm/7 hours: female 7-16 day(s) after conception: Reproductive: Specific Developmental Abnormalities: urogenital system
 TCLo (Inhalation-Rabbit) 1 gm/m³/24 hours: female 7-20 day(s) after conception: Reproductive: Fertility: abortion
 TCLo (Inhalation-Rabbit) 100 ppm/6 hours: female 6-18 day(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system
 TCLo (Inhalation-Hamster) 800 mg/m³/6 hours: female 6-11 day(s) after conception: Reproductive: Effects on Newborn: behavioral
 TDLo (Oral-Rat) 7280 mg/kg: female 6-19 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TOLUENE (continued):

TDLo (Oral-Mouse) 9 g/kg (female 615 days post):Teratogenic effects
 TDLo (Oral-Mouse) 9 gm/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetal death
 TDLo (Oral-Mouse) 15 gm/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)
 TDLo (Oral-Mouse) 30 gm/kg: female 6-15 day(s) after conception: Reproductive: Specific Developmental Abnormalities: craniofacial (including nose and tongue)
 Unscheduled DNA synthesis (Bacteria-Escherichia coli) 1 pph
 Unscheduled DNA synthesis (Microorganism-not otherwise specified) 1 pph/15 minutes-continuous
 Sex chromosome loss and nondisjunction (Oral-Drosophila melanogaster) 1 pph
 Mutation Test Systems (Inhalation-Grasshopper) 20 pph/16 hours
 DNA damage (Rat-Liver) 30 µmol/L
 Cytogenetic analysis (Inhalation-Rat) 5400 µg/m³/16 weeks-intermittent
 Cytogenetic analysis (Subcutaneous-Rat) 9600 mg/kg/12 days-intermittent
 oms-grasshopper-Inhalation 562 mg/L
 Cytogenetic Analysis (Rat-Subcutaneous) 12 g/kg/12 days
 Micronucleus test (Oral-Mouse) 200 mg/kg
 Micronucleus test (Intraperitoneal-Mouse) 433 µg/kg/24 hours

SUSPECTED CANCER AGENT: Components of this product are listed as follows:

PROPYLENE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

TOLUENE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); EPA-D (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

The remaining components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC and therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: If this gas mixture contains Toluene, mild irritation to the eyes and respiratory system may occur.

SENSITIZATION TO THE PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensitizers. Due to the presence of Toluene in some mixtures, cardiac sensitization to stimulants (i.e. epinephrine, ephedrine) is a possible result of severe or chronic over-exposure to this gas mixture.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for this gas mixture. There is some evidence that Toluene (a possible component in these mixtures) can cause chromosome damage in vivo when administered to mice by injection, although conflicting results have been obtained. Animal mutation data are available for n-Hexane (a possible component in these mixtures) obtained during clinical studies on specific animal tissues exposed to high doses of this compound.

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Embryotoxicity: No embryotoxic effects have been described for this gas mixture. There is some evidence of embryotoxic effects in animals during clinical studies of Toluene exposures.

Teratogenicity: No teratogenicity effects have been described for this gas mixture. Toluene (a possible component of this gas mixture) did not cause birth defects, but exposures of pregnant rats to concentrations greater than 500 ppm resulted in fetotoxicity effects (i.e., reduced birth weights, delay in bone formation).

Reproductive Toxicity: No reproductive toxicity effects have been described for gas mixture. Data on reproductive effects are available from clinical studies involving test animals exposed to relatively high doses of n-Hexane and Toluene (possible components of these gas mixtures).

*A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An **embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance which interferes in any way with the reproductive process.*

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) have been established for possible components of these gas mixtures.

BIOLOGICAL EXPOSURE INDICES (BEIs)		
CHEMICAL DETERMINANT	SAMPLING TIME	BEI
TOLUENE • o-Cresol in urine • Hippuric acid in urine • Toluene in blood	• End of shift • End of shift • Prior to last shift of workweek	• 0.5 mg/L • 1.6 g/g creatinine • 0.05 mg/L

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

n-HEXANE:

Water solubility = 9.5 mg/L (25°C)

Log Kow = 3.90-4.11

Bioconcentration Factors = 2.24-2.89

Bioconcentration: Based upon a water solubility of 9.5 mg/L at 25°C and a log Kow of 4.11, the bioconcentration factor (log BCF) for n-hexane has been calculated to be 2.24 and 2.89, respectively, from recommended regression-derived equations (3). These bioconcentration factor values are not indicative of important bioconcentration in aquatic organisms.

Biodegradation: A variety of microorganisms degrade hexane by oxidation mechanisms similar to those that involve the lower homologues. Hexane is also utilized by various microorganisms, such as *Mycobacterium vaccae* and *Mycobacterium phlei*.

Persistence: Does not biodegrade well, but volatility should cause it to disperse rapidly.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65

TOLUENE:

Octanol/Water Partition Coefficient: Log Kow = 2.69

Water Solubility = 534 mg/L

Persistence: Biodegrades with acclimated seed. half-life in less than saturated solution (top meter) in 30.6-minutes as a result of evaporation. 70% evaporates with first 0.01% of water. Sewage seed has no effect.

Biological Half-Life = 0.083 days.

Biodegradation: Toluene is readily degradable in a variety of standard biodegradability tests using sewage seed or sludge inoculums. Degradation has been observed in several die-away tests using seawater or estuarine water. The degradation rate is much faster in systems that have been contaminated by oil. Complete degradation has been observed in 4 days and 22 days in a marine mesocosm with summer and spring conditions respectively, and 10 days in a 1% gas oil mixture in a North Sea coast water inoculum. A 90-day half-life in uncontaminated estuarine water was reduced in 30 days in oil-polluted water. The half-life in water collected near Port Valdez, Alaska was 12 days. 1.5 mm, and 3 mm ring-labeled toluene added to a methanogenic inoculum, originally enriched from sewage sludge and incubated at 35°C for 60 days resulted in 3.6 and 4.5% 14C final activity, respectively.

Bioconcentration Factors = 13.2 (*Anguilla japonica*, eels); 1.67 (*Tapes semidecussata*, Manila clam); 4.2 (*Mytilus edulis*, mussel); 380 (*Chorella fusca*, algae); 90 (golden ide fish). Toluene is rapidly volatilized from water and undergoes moderate biodegradation. The half-life in water is on the order of days to weeks.

Major Species Threatened: Waterfowl.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No adverse effect is anticipated to occur to animal or plant-life, except for frost produced in the presence of rapidly expanding gases.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence of an adverse effect of this gas mixture on aquatic life is currently available.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual gas mixture to Portagas. Do not dispose of locally.

Material Safety Data Sheet

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors, away from all sources of ignition.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Air, n-Hexane) *or*

Compressed gases, n.o.s. (Air, Methane) *or*

Compressed gases, n.o.s. (Air, Propylene) *or*

Compressed gases, n.o.s. (Air, Toluene) *or*

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Non-Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: These gas mixtures are considered as dangerous goods, per regulations of Transport Canada. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The potential components of these gas mixtures are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows.

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
n-Hexane	No	Yes	Yes
Propylene	No	No	Yes
Toluene	No	Yes	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITIES (RQ): A statutory 1 pound RQ is applicable to n-Hexane until this quantity is adjusted (as a Clean Air Act, Section 112(b) hazardous air pollutant). Toluene = 1000 pounds (454 kg)

U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS:

- n-Hexane is subject to the reporting requirements of CFR 29 1910.1000. n-Hexane is listed on Table Z.1.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Methane, Propylene are subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for Methane, Propylene and Toluene is 10,000 pounds (4540 kg)
- Toluene is a toxic pollutant under Section 307(a)(1) of the Clean Water Act and is subject to effluent limitations.
- Nitrogen, and Oxygen (the components of Air) are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Methane and Propylene are listed under this regulation in Table 3 as a Regulated Substance (Flammable Substance), in quantities of 10,000 lb. (4,553 kg) or greater.
- The regulations of 29 CFR 1910.119 (Process Safety Management of Highly Hazardous Chemicals) are not applicable to this gas mixture.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Toluene (a potential component of these gas mixtures) is listed on the California Proposition 65 Lists. WARNING: Toluene is known to the State of California to cause birth defects or other reproductive harm.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: n-Hexane, Methane, Propylene, Toluene.

California - Permissible Exposure Limits for Chemical Contaminants: n-Hexane, Methane, Propylene, Toluene.

Florida - Substance List: n-Hexane, Propylene, Toluene.

Illinois - Toxic Substance List: n-Hexane, Methane, Propylene, Toluene.

Kansas - Section 302/313 List: Propylene, Toluene.

Massachusetts - Substance List: n-Hexane, Methane, Toluene.

Michigan - Critical Materials Register: Toluene.

Minnesota - List of Hazardous Substances: n-Hexane, Methane, Propylene, Toluene.

Missouri - Employer Information/Toxic Substance List: n-Hexane, Methane, Propylene, Toluene.

New Jersey - Right to Know Hazardous Substance List: n-Hexane, Methane, Propylene, Toluene.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Toluene.

Pennsylvania - Hazardous Substance List: n-Hexane, Methane, Propylene, Toluene.

Rhode Island - Hazardous Substance List: n-Hexane, Methane, Propylene, Toluene.

Material Safety Data Sheet

Texas - Hazardous Substance List: No.

West Virginia - Hazardous Substance List: n-Hexane, Toluene.

Wisconsin - Toxic and Hazardous Substances: n-Hexane, Toluene.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components of these gas mixtures are listed on the Canadian DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Toluene, a potential component of these gas mixtures, is on the CEPA Priorities Substances Lists

CANADIAN WHMIS SYMBOLS: These gas mixtures are categorized as a Controlled Product, Hazard Classes A and D2A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Disclaimer: To the best of Portagas's knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product. Data may be changed from time to time. Be sure to consult the latest edition.