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Title: <b>MATERIAL SAFETY DATA SHEET (for Flammable HC POLYCOLD® Refrigerant)</b>	
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REVISIONS				
Approved/Date	Rev	Description	Date	ECO No.
	00	New	RD	
TA 3/04/05	01	Updated corporate identity	JLM 2/28/05	4955
TA 3/30/05	02	Update updated corporate identity	JLM 3/29/05	4972
TA 6/30/05	03	Add preparation date and revision date	JLM 6/28/05	5052
TA 8/03/05	04	Many changes	JLM 8/3/05	5078
BQ 8/15/05	05	Add PT-13, PT-14, PT-16 and PT-30 in product name	BDH 8/15/05	5093
TA 9/08/05	06	Add PCC to data sheet	DWF 9/8/05	5108
TA 11/28/05	07	Updated corporate identity	DWF 11/14/05	5146
BQ 2/21/06	08	Add 500-CC cylinders	DWF 2/21/06	5209
DWF 10/09/06	09	General update and review for conformance with EEC Directive changes 2004/66/EC and 2006/8/EC. Correct error on CAS # for nitrogen. Change disposal considerations.	BQ 10/9/06	5349
DH 3/24/2010	A	Updates per inputs from Praxair Manager of Transport Regulations & current Praxair MSDS	DH 3/24/2010	50141

ADDITIONAL INFORMATION:

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**Last Date of Revision March 24, 2010**



# Material Safety Data Sheet

## 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

<b>Product Name:</b>	Compressed Gas, flammable, n.o.s (Propane, Ethane) (Flammable HC POLYCOLD® Refrigerant: PT-13, PT-14, PT-16 and PT-30)
<b>Chemical Classification:</b>	Hydrocarbon and Inert Gas Mixture
<b>Product Use:</b>	Refrigerant Gas for PCC, CRYOTIGER® and AquaTrap® Cooling Systems
<b>Chemical Names:</b>	Mixture of: Argon, Ethane, Methane, Neon, Nitrogen, Propane (Ar, C <sub>2</sub> H <sub>6</sub> , CH <sub>4</sub> , Ne, N <sub>2</sub> and C <sub>3</sub> H <sub>8</sub> )
<b>Company Identification</b>	Brooks Automation, Inc.
<b>Address:</b>	3800 Lakeville Highway, Petaluma, CA 94954
<b>Business Phone:</b>	(707) 769-7000
<b>Emergency Phone: Chemtrec North America:</b>	1-800-424-9300 or 1-703-527-3887
<b>Preparation Date:</b>	April 3, 2003
<b>Revision Date:</b>	March 24, 2010

## 2. COMPOSITION AND INFORMATION/ INGREDIENTS

Component	Weight by %	CAS Number	EINECS Number	Symbols	R Phrases
Argon	0 - 25	7440-37-1	231-147-0		
Ethane	5 - 25	74-84-0	200-814-8	F+	R12
Methane	1 - 15	74-82-8	200-812-7	F+	R12
Neon	0 - 10	7440-01-9	231-110-9		
Nitrogen	0 - 30	7727-37-9	231-783-9		
Propane	25 - 70	74-98-6	200-827-9	F+	R12

For occupational exposure limits, please refer to **Section 8: Exposure Controls- Personal Protection.**

## 3. HAZARD IDENTIFICATION

This MSDS is for refrigerant gas mixtures (PT-13, PT-14, PT-16 and PT-30) contained in the PCC, CRYOTIGER® and AquaTrap® cooling systems and individual component pieces. These systems and components contain extremely flammable gasses under pressure! Improper operation of component couplers can result in the rapid release of gas. Refer to the Operation Manual, or contact the manufacturer or a certified technician, to insure safe and proper assembly, operation and maintenance of the cooler system.

### Emergency Overview

**Danger! Flammable, high pressure gas. Mixture with air may constitute an explosion hazard. Can cause suffocation. May cause dizziness and drowsiness. Do not perform maintenance or component connections in confined areas or where sources of ignition may exist.**



<b>Inhalation:</b>	High concentrations may cause asphyxiation. Low concentrations may cause narcotic effects with symptoms that may include drowsiness, dizziness, weakness and headaches.
<b>Skin Contact:</b>	Contact with rapidly released gas or liquid product may cause frostbite.
<b>Eye Contact:</b>	Eye contact with rapidly released gas or liquid product may cause severe frostbite damage to eyes and lids.
<b>Ingestion:</b>	This product is a gas at room temperature; therefore, this is not a likely route of exposure. However, frostbite of lips, mouth and throat would likely result from ingestion of the liquid product.

**CAUTION:** Connection of self-sealing couplers should only be performed in well-ventilated areas away from sources of heat or ignition. Improper operation of self-sealing couplers can result in gas leakage. This flammable gas mixes well with air and explosive atmospheres are easily formed. As a result of flow or agitation, electrostatic charges can be generated. Take precautionary measure to prevent static discharges during connection of system components. System components that are exposed to heat from a fire may explode. Refer to Cooling System Operating Manual for safe operation, storage and handling procedures.

#### 4. FIRST-AID MEASURES

<b>Inhalation:</b>	Remove victim to uncontaminated area and administer fresh air immediately. Perform artificial respiration if needed. Get medical attention immediately.
<b>Skin Contact:</b>	Rinse area with plenty of water, do not remove clothes. If frostbite, freezing, or cryogenic burns occur, warm affected area in warm water. If this is not available, gently wrap affected parts in blankets. Allow circulation to return naturally. Get medical attention immediately.
<b>Eye Contact:</b>	Wash with large amounts of water or normal saline until no evidence of chemical remains (at least 15-20 minutes). Get medical attention immediately. Remove contact lenses if easily possible.
<b>Ingestion:</b>	This product is a gas at room temperature; therefore, this is not a likely route of exposure. However, frostbite of lips, mouth and throat would likely result from ingestion of the liquid product.

#### 5. FIRE-FIGHTING MEASURES

<b>Exposure to Fire:</b>	May cause equipment to rupture/explode
<b>Fire Extinguishing Media:</b>	Use media appropriate for surrounding materials.



<b>Special Fire Fighting Procedures:</b>	Use self-contained breathing apparatus. Move cooling systems and/or components away from fire if possible without personal risk. Keep units cool using a water spray from a maximum distance. Continue cooling well after fire is out. Stay upwind and keep out of low areas. Ventilate closed spaces prior to entry.
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## 6. ACCIDENTAL RELEASE MEASURES

<b>Spill and Leak Response:</b>	Evacuate Area. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Ensure adequate air ventilation. Eliminate ignition sources. Stop leak immediately if possible without personal risk. Prevent from entering sewers, basements and work pits or any low lying place where accumulation is probable. Ventilate area to clean up. <b>CAUTION:</b> Gasses may be heavier than air and may travel along the ground; reaching sources of ignition and/or collecting in low or confined areas (sewers, basements, tanks). Stay upwind and avoid low areas and sources of ignition. Ventilate and test oxygen levels in closed spaces prior to entry. Water spray may be used to reduce vapor cloud drift.
<b>Environmental Precautions:</b>	Do not allow product to enter drains or watercourses.

## 7. HANDLING AND STORAGE

<b>Storage and Handling Practices:</b>	Cooling systems and components contain extremely flammable gas products under pressure. System components that are exposed to heat from a fire may explode. Refer to Cooling System Operating Manual for safe operation, storage and handling procedures.
<b>Special Precautions for Handling Gas Cylinders:</b>	Protect cooling systems against physical damage. Do not allow temperature of storage areas to exceed 52° C (125° F). Keep in a well ventilated space. Segregate from oxidant gases and other oxidants during storage.
<b>Handling</b>	Keep away from ignition sources including static discharges. Do not smoke while handling product.

## 8. EXPOSURE CONTROLS – PERSONAL PROTECTION

<b>Ventilation and Engineering Controls:</b>	Ensure adequate ventilation.
<b>Respiratory Protection:</b>	The gas product is distributed in a contained system and exposures will only occur as a result of an accidental release. In the event of an accidental release of gasses, the most significant concern for respiratory exposure to this product is related to oxygen deficiency. Therefore, if a significant



	worker exposure to this gas is going to occur, then supplied air should be provided.
<b>Eye Protection:</b>	Splash goggles, face shields, or safety glasses should be used for protection from rapidly expanding gas.
<b>Hand Protection:</b>	Wear Viton or rubber gloves if contact with product may occur.
<b>Body Protection:</b>	A protective suit should be worn to prevent frostbite if skin contact with liquid or gas may occur.

Hygiene standards and exposure limits may differ from country to country. Check those that currently apply in your country to ensure compliance. The table below is a limited listing of some of the exposure limits that have been established for chemicals in this gas mixture:

Component	Examples of Established Exposure Limits
Argon	Simple asphyxiant
Ethane	<b>ACGIH TLV (United States, 2005)</b> TWA: 1000 ppm 8 hour(s) Simple asphyxiant
Methane	<b>ACGIH TLV (United States, 2005)</b> TWA: 1000 ppm 8 hour(s) Simple asphyxiant
Neon	Simple asphyxiant
Nitrogen	Simple asphyxiant
Propane	<b>ACGIH TLV (United States, 2005)</b> TWA: 1000 ppm 8 hour(s) <b>OSHA PEL (United States, established 1998)</b> TWA: 1000 ppm 8 hour(s) <b>NIOSH REL (United States, 1997)</b> TWA: 1000 ppm 8 hour(s) Simple asphyxiant

**THRESHOLD LIMIT VALUE-TIME-WEIGHTED AVERAGE:** TLV-TWA Data from 2005 Guide to Occupational Exposure Values published by the American Conference of Governmental Industrial Hygienists (ACGIH). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous conditions

## 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Physical State:</b>	Gas at room temperature
<b>Vapor Density (range of individual components at standard temperature and pressure):</b>	Greater than 1.0 (Heavier than air)
<b>Specific Gravity:</b>	Not applicable
<b>Evaporation Rate:</b>	Not available
<b>Vapor Pressure:</b>	Not available
<b>Odor Threshold:</b>	The product is odorless
<b>Appearance and Color:</b>	Colorless gas in normal conditions.
<b>How to Detect This Substance (Warning Properties):</b>	The gas has no odor and is not visible; however, rapidly released gasses may cause the formation of a vapor cloud.



<b>pH:</b>	Not applicable
<b>Freezing Point :</b>	Less than -200°C
<b>Boiling Point:</b>	Less than -100 ° C
<b>Flash Point:</b>	The lowest known value is Closed cup: -187°C (-306°F) (Tag.) (Methane).
<b>Flammability:</b>	Highly Flammable
<b>Auto Flammability:</b>	The lowest known value is 450°C (842°F) (Propane)
<b>Explosive Properties:</b>	Can form explosive mixture with air
<b>Oxidizing Properties:</b>	None

### 10. STABILITY AND REACTIVITY

<b>Stability:</b>	Stable at normal temperatures and pressures.
<b>Hazardous Decomposition Products:</b>	None
<b>Materials to Avoid:</b>	<b>OXIDIZERS</b> may produce fire and explosion hazards.
<b>Hazardous Polymerization:</b>	Will not polymerize.

### 11. TOXICOLOGICAL INFORMATION

General No known toxicological effects from this Product

### 12. ECOLOGICAL INFORMATION

General No known ecological damage caused by this Product

### 13. DISPOSAL CONSIDERATIONS

<b>Preparing Wastes for Disposal:</b>	Dispose in accordance with all applicable regulations. Avoid discharge to atmosphere, particularly in confined areas where there is a risk of forming an explosive mixture with air. Waste gas should be glared through a suitable burner with flash back arrestor. Do not discharge into any place where its accumulation could be dangerous. Contact manufacturer if guidance is required. "Empty" cylinders can contain flammable vapour. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.
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#### 14. TRANSPORTATION INFORMATION

<p><b>Proper Shipping Names:</b></p>	<p>Exceptions from hazardous material transportation requirements for shipments of the PCC, CRYOTIGER® and AquaTrap® cooling systems and components are allowed depending upon (1) the amount of refrigerant gas in the package and (2) the mode of transportation by which the package is being offered for shipment. Based on the aggregate quantity of gas in a package, exceptions are allowed for air shipments under IATA and ICAO Dangerous Goods Regulations (DGRs) and surface shipments (rail, road and maritime) under US DOT Hazardous Material Regulations (HMRs). The quantity restrictions and basis for these exceptions are detailed on the following page.</p>
<p><b>For Complete Cooler System Shipments having greater than 100-grams of gas mixture:</b></p>	<p>Surface Shipments: <i>Refrigerating machines, 2.1, UN 3358, containing flammable, non-toxic liquefied gas</i> <b>ERG Code: 10L</b></p> <p>Air shipments of systems with &gt;100 g of gas mixture are <b>FORBIDDEN from air transport.</b> System must be disassembled so that single unit packages contain less than 100 grams of gas mixture.</p>
<p><b>Air Shipments of Components Having Less Than 100 grams of Gas Mixture: Applicability of IATA Special Provision 103</b></p>	<p>Refrigerating machine component(s) containing less than 100 grams of flammable, non-toxic liquefied gases are not subject to Dangerous Goods Regulations in accordance with IATA Special Provision A103. This would include any single unit packages of Compressors, Cold Ends, 10'-100'ft. Flex Hoses or Copper Lines and External Filter Dryers for PCC, CRYOTIGER® and AquaTrap® Cooling Systems.</p>
<p><b>Surface Shipments of Components Having Less Than 12-kg of Gas Mixture:</b></p>	<p>Refrigerating machine component(s) containing less than 12 kg of flammable, non-toxic liquefied gases are not subject to US HMR under 49 CFR 173.307 (a)(4)(iii). This would include a PCC, CRYOTIGER® or an AquaTrap® Cooling Systems containing a PCC Compressor, a CryoTiger® or Aquatrap® Cold End, a pair of 10'-100'ft. Flex Hoses or Copper Lines and an External Filter Dryers in a single package.</p>
<p><b>For 20-lb (21.6 L) and 500-cc (.5 L) Charge Cylinders</b></p>	<p><i>Compressed gas, flammable, n.o.s. (Propane, Ethane), 2.1, UN 1954</i></p> <p><b>Packing Instruction: 200</b> <b>ERG Code: 10L</b> <b>Forbidden on passenger aircraft without satisfying special provisions.</b></p>
<p><b>U.N. Hazard Class Number:</b></p>	<p><b>2.1</b></p>
<p><b>U.N. Identification</b></p>	<p><b>UN 3358</b> for charged systems and components</p>



<b>Number:</b>	<b>UN 1954</b> for 20-lb (21.6 L) and 500 cc (0.5 L) charge cylinders
<b>Packing Group:</b>	Not Applicable NOTE: There are no packing groups for Division 2 dangerous goods.
<b>North American Emergency Response Guidebook Number (2000):</b>	<b>115</b>
<b>Marine Pollutant:</b>	Not applicable
<b>Other Transport:</b>	Transport in accordance with local regulations

### 15. REGULATORY INFORMATION

**NUMBER IN ANNEX 1 OF DIRECTIVE 67/548:** This Mixed Gas is not listed; see Section 2 for individual gas numbers.

**ADR/RID (EU Only):** Class 2F

**EC CLASSIFICATION:** F+; R12

<b>Labeling of Components, Systems and Cylinders:</b>	
<b>All Gas-containing Cylinders, Units and Components:</b>	<p><b>“EXTREMELY FLAMMABLE gases under pressure”</b></p> <p><b>CAUTION: THIS UNIT CONTAINS EXTREMELY FLAMMABLE GASES UNDER PRESSURE.</b> Keep away from sources of ignition. <b>NO SMOKING.</b> Store and use in a well-ventilated area where temperatures will not exceed 52°C (125° F). Take precautionary measures against static discharges. Keep out of reach of children. Refer to the Operation Manual, or contact the manufacturer or a certified technician, to insure safe and proper assembly, operation and maintenance of the cooling system.</p> <p><b>FIRST AID:</b> If inhaled, administer fresh air immediately. Administer oxygen if breathing is difficult. Contact a physician. In case of frostbite, obtain immediate medical attention. <b>DO NOT REMOVE THIS PRODUCT LABEL.</b></p>
<b>R phrases:</b>	<b>R12: (EXTREMELY FLAMMABLE GAS)</b>
<b>S phrases:</b>	<p><b>2, 9, 15, 16, 33, 35</b></p> <p>S2: Keep out of reach of children.            S9: Keep cooler system in a well-ventilated place.            S15: Keep away from heat.            S16: Keep away from sources of ignition (NO SMOKING).            S33: Take precautionary measures against static discharges.            S35: This material and its container must be disposed of in a safe way.</p>



<b>Symbols</b>	<b>F+</b>
<b>EINECS Number:</b>	Refer to Page 1, Section 2.

#### OTHER INFORMATION

<b>Uses and Restrictions:</b>	Only use product in accordance with its intended use.
<b>U.K. Legislation:</b>	Control of Substances Hazardous to Health as amended.
<b>Transport of Charged Cylinders, Cooler Systems and Components</b>	Charged items, including cylinders, full systems and components, should be transported in a secure position, in a well-ventilated vehicle. Charged items transported in an enclosed non-ventilated compartment of vehicle can present a safety hazard.
<b>Applicable Regulations</b>	It is intended that this safety data sheet conforms to US and EEC regulations. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.
<b>Changes with this Revision</b>	October 9, 2006 revision was a general update and review for conformance with EEC Directive 2004/66/EC and 2006/8/EC. No substantial changes in information were made except CAS number for nitrogen and Disposal Consideration.

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