

Compliant with European Application Refrigerants (EC 1005/2009), the Montreal Protocol, and the US EPA SNAP

Benefits

- 4000 H : -98 to -133C (183 to 140K)
- 2500 L : -120 to -145C (153 to 128K)
- Heat Removal up to 4000 watts
- Cryocondenses Water Vapor in Vacuum Systems with Speeds up to 220,000 l/sec Vacuum levels to 8×10^{-10} torr (1×10^{-9} mbar)
- Theoretical maximum pumping speed 328,000 l/s
- Option for power management to minimize cost of ownership
- Patented Green refrigerant charge is globally compliant, non-toxic, and non-flammable
- Based on Polycold's proven, innovative, dependable mixed gas refrigeration
- Compliant to EU PED and MD
- TUV Rheinland Listed to NRTL/CANADA Safety Standards
- ISO 9001:2008 certified manufacturer

The MaxCool cryochiller is a closed loop cryogenic refrigeration system that provides up to 4,000 watts of cooling. It can be used to capture water vapor and other condensable substances by freezing them onto a cold surface such as a cryocoil or chevron baffle. The MaxCool cryochiller is also used to cool objects such as electrostatic chucks used in semiconductor wafer processing.

Water Vapor Pumping

The Polycold® MaxCool cryochiller effectively captures water vapor, which comprises 65% to 95% of the residual gas in high vacuum systems. Water vapor is typically the most reactive contaminant present. With the MaxCool Cryochiller, you can expect to increase product throughput in your existing system 20% to 100% and improve quality of deposition.

The MaxCool Advantage

- High-vacuum pumpdown time cut by up to 75%
- High-speed pumping of water vapor: 10,000 to 220,000 l/sec in the workspace
- Increased product throughput of 20% to 100%
- Lower water vapor partial pressure during processing for higher film quality, better adhesion and more reproducible deposition
- Superior in cost/performance to liquid nitrogen cooled Meissners
- Minimize cost of ownership with power management
- High capacity cooling for a wide variety of processes

When added to your vacuum system, the MaxCool Cryochiller can dramatically reduce pumpdown times and increase product throughput. The MaxCool will pump water vapor within minutes from "start" and can defrost in less than four minutes, giving true fast-cycle capability. For your system, this means more production cycles per shift.

Using patented Polycold® refrigerant mixtures, the MaxCool works on the principle of Meissner trapping. Water vapor is captured by condensation on a cryogenically cooled surface, called a Meissner coil. The Meissner (cryocoil) is mounted directly in the vacuum chamber so conductance is not limited by ports, manifolds, valves, and baffles. The cryocoil is easy to install and can be adapted to fit any system. It does not need a high vacuum valve.

MaxCool Cryochillers are the most cost effective upgrade that you can add to any diffusion-pumped, turbo-pumped, or helium-cryopumped system.



Features

The MaxCool Cryochiller has the following features common to all models.

Ethernet and USB 2.0

HMI: Includes a manual human machine interface, with a display and a keypad for navigation and selection.

Rapid Balance Pressure Check: With this feature, the MaxCool unit can give a balance pressure reading in about 20 minutes, rather than the 48-hour warm-up required by the previous PFC models. This improvement maximizes tool uptime.

Self-Diagnostics: All models of the MaxCool Cryochiller include self-diagnostics to assist the user.

Footprint: Minor service access is needed from only the front, and major service access is needed from only the front and back, making the unit easier to position.

Compliance: The MaxCool Cryochiller is compliant to EU PED and MD. TUV Rheinland listed to NRTL/Canada safety standards. Semi S2 and Semi F47 compliance are dependent on system configuration.

Options

Dual Circuit: Enables the MaxCool to cool two cryosurfaces (two cryocoils, coil and baffle, or two baffles) which can be cooled or defrosted separately.

Power Management: This Power Management option allows additional savings up to 15% in standby and 25% while cooling, as long as the full cooling capacity is not needed.

24V Remote: The MaxCool has an option for a 24V remote, which allows for direct wiring of inputs to and outputs from the MaxCool Cryochiller in a manner similar to earlier PFC models. The 24V remote may be Isolated or Non-Isolated and may be for a Single Circuit or Dual Circuit system. Two set point relays are included.

Advanced IO: EtherCAT, PROFINET, Profibus or DeviceNet.

Casters: Allows for ease of unit installation and removal.

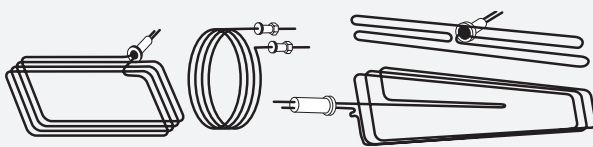
Lifting rings: Allows for ease in moving the unit.

Sound Reduction

SEMI S2/F47: Includes remote EMO and DC Contactor.

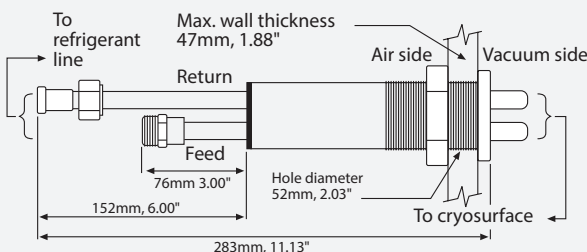
System Accessories

1 CRYOCOIL



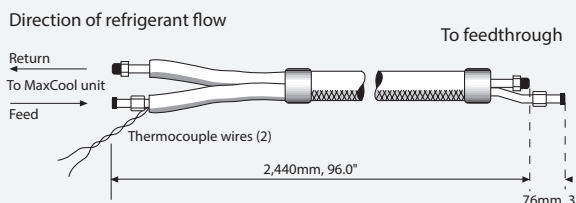
The cryocoil will be designed to fit the specific vacuum chamber, based on information you supply, or you may choose to design and build your own cryocoil. Typical cryocoils have helical, spiral, serpentine or other simple shapes. We do not recommend cryopanel, due to slow cool/defrost times as a result of their increased mass and ineffective cryopumping on the rear side when positioned near the chamber wall. A stainless steel cryocoil, a complex cryocoil design or an adapter flange, may require additional costs.

2 FEEDTHROUGH



The standard cryogenic feedthrough provides thermal isolation between the feed/return tubes and the O-ring seal. The dual-pass feedthrough requires a two-inch diameter hole in the vacuum chamber. Couplings on the feed through mate with the refrigerant line. Optional feedthroughs fit one-inch diameter holes, but two are required (one for each tube). Custom feedthroughs are available.

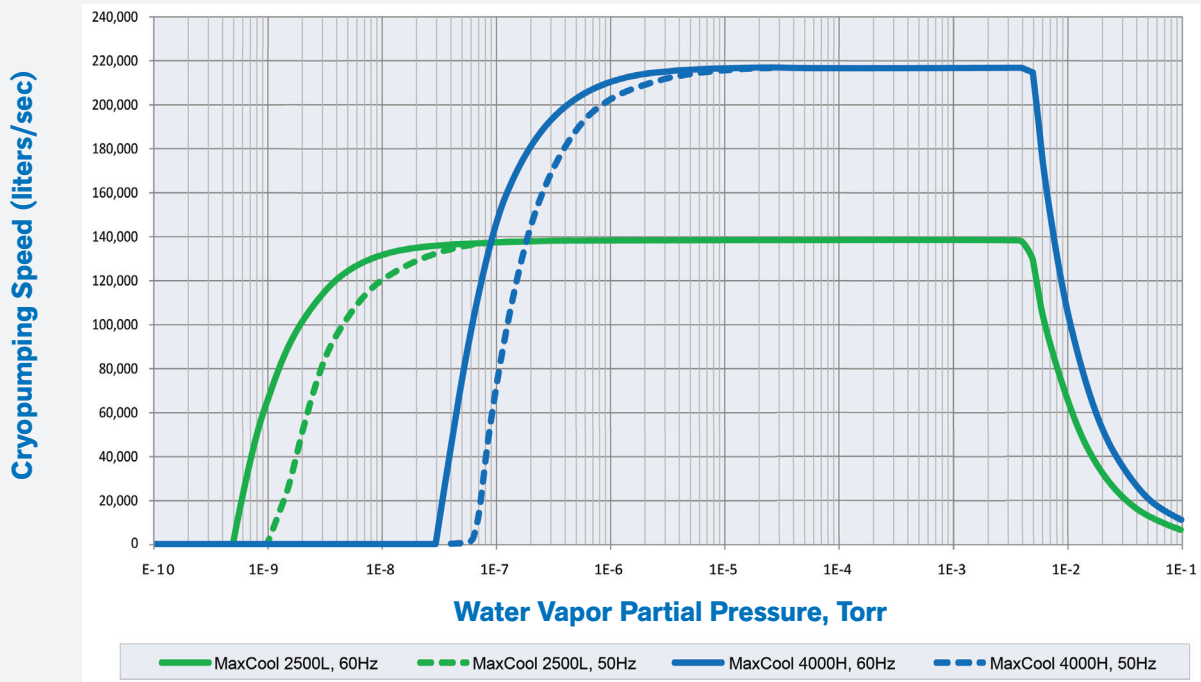
3 REFRIGERANT LINE



A standard refrigerant line set consists of a copper feed and return line, each with stainless steel couplings on both ends for connection to the XC unit and to the feedthrough. Longer lengths of refrigerant line (more than the standard 8 feet (2.44m)) can be ordered from the factory, but will require our applications review.

Pumping Speeds from Standard Cryocoil Sizes

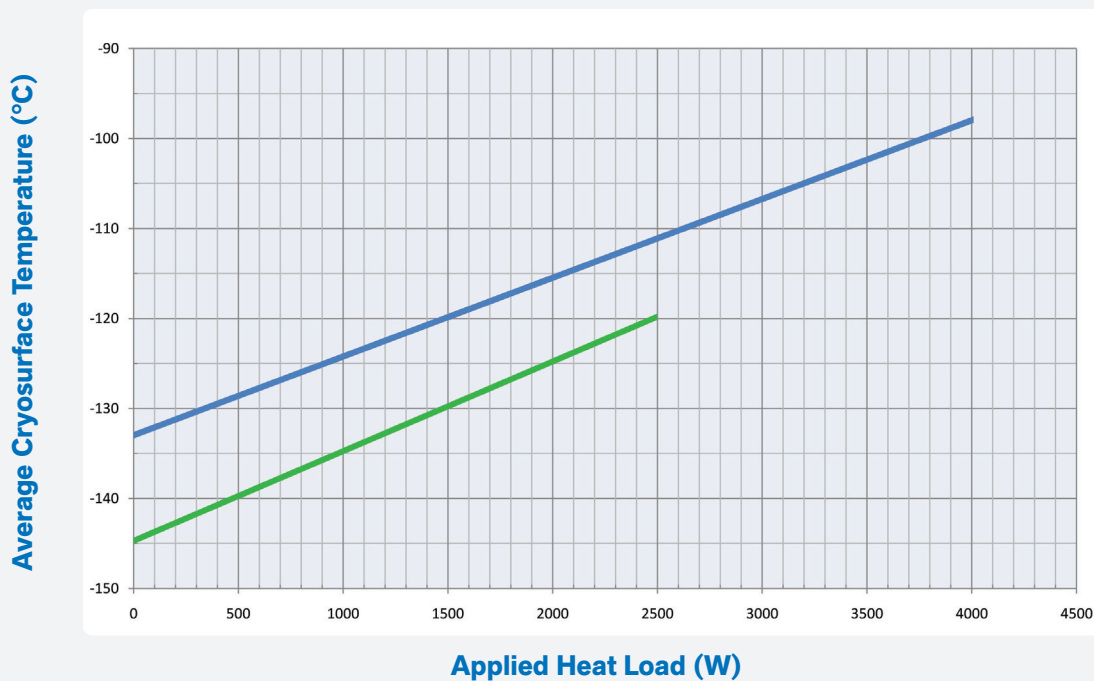
MaxCool 4000 H (Blue) MaxCool 2500 L (Green)



NOTE: For some operating conditions the cryocoils may be enlarged to provide greater pumping speeds

Average Cryosurface Temperature as a Function of Applied Heat Load

MaxCool 4000 H (Blue) MaxCool 2500 L (Green)



NOTE: 1. Temperatures shown are the average of the inlet and outlet using recommended cryocoil size. The temperature differences between inlet and outlet are typically 20°C at Maximum load.
 2. The end point of each curve is the maximum load for that model.
 3. Performance at 50 Hz is typically 3 to 5°C warmer than the 60 Hz performance shown

MaxCool Specifications

Typical Performance

Using standard test conditions with cryochiller environment at 20°C, cooling water temperature between 25°C and 28°C, 16mm (5/8 in.) O.D. cryocoil tubing, 2.44m (8 ft) refrigerant line lengths, and operation at 60 Hz.

Model	2500 L	4000 H
Total Cryocoil Surface area m ² (ft. ²)	1.4 (15.1)	2.2 (23.7)
Maximum Load (Watts at warmest temperature)	2500	4000
Theoretical max pumping speed l/sec ^a	208,600	327,800
Conservative pumping speed (in chamber) l/sec ^a	140,000	220,000
Ultimate Operating Pressure, torr ^b	8 x 10 ⁻¹⁰	5.0 x 10 ⁻⁸
Ultimate Operating Pressure, mbar	1 x 10 ⁻⁹	7 x 10 ⁻⁸
Maximum pump start pressure, atm ^c	1.0	1.0
Time to defrost, minutes	4.0 ^g	5.0 ^g

System and Utilities

Cooling water, flow rate l/min. (gal./min.)		Power Input, at maximum load, kW	19.2
at 13°C (55F°)	13.6 (3.6)	Nominal Power Requirements ^d	200/3/50
at 26°C (79F°)	27.3 (7.2)		208/3/60
at 29°C (85F°)	54.1 (14.3)		230/3/60
Max Operating Sound Level, dB(A) ^e - Base Model	78		380/3/50
Max Operating Sound Level, dB(A) ^e - Sound Reduction	70		400/3/50
Minimum Room Volume m ³ (ft. ³) ^f	34 (1200)		460/3/60
Weight, kg (lb)	533 (1175)		480/3/60
H x W x D, mm (inches)	1791 x 813 x 663 (70.5 x 32 x 26.1)		

Footnotes: (a) Larger cryocoils may give greater pumping speeds, and can be used in some applications. Contact your sales representative or the factory for application details. (b) Standard cryocoil at twenty five percent (25%) of maximum pumping speed. (c) Recommended cryopump start pressure is near normal "crossover." Mechanical roughing pumps and blowers are generally more effective for moisture removal above 1torr. (d) For nominal power requirements not in the table, please contact the factory. Please refer to the manual for operational voltage ranges. For 480 volt operation the maximum voltage is 506. (e) Units were tested in a manufacturing environment while under maximum load in the COOL mode. (f) To comply with the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE-15-1994, the following units should be located in a room no smaller than listed. (g) 5.0 minute maximum defrost is for a 2 m² coil. Most applications use smaller coils and achieve shorter defrost times. A 1 m² coil with standard refrigerant lines will defrost in less than 2 minutes. (h) This product(s) contain fluorinated greenhouse gases with a global warming potential of 150 or more.

For more information, please contact your local Brooks Automation sales representative or visit www.brooks.com.

