PRODUCT DATA SHEET

POLYCOLD® MAXCOOL 2000 CRYOCHILLER

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The Polycold® MaxCool 2000 Cryochiller is a closed loop cryogenic refrigeration system that provides up to 2,000 watts of cooling. It can be used to capture water vapour and other condensable substances by freezing them onto a cold surface such as a cryocoil or chevron baffle. MaxCool 2000 Cryochiller is also used to cool objects to cryogenic temperatures such as electrostatic chucks used in semiconductor wafer processing.

Water vapour pumping

The Polycold® MaxCool 2000 Cryochiller effectively captures water vapour, which comprises 65% to 95% of the residual gas in high vacuum systems. Water vapour is typically the most reactive contaminant present. With our MaxCool Cryochiller you can expect an increase in product throughput in your existing system of 20% to 100% and an improvement in the quality of deposition.

The MaxCool advantage

- High-vacuum pumpdown time cut by up to 75%
- High-speed pumping of water vapour: 10,000 to 164,000 l/sec in the workspace
- Increased product throughput of 20% to 100%
- Lower water vapour partial pressure during processing for higher film quality, better adhesion and more reproducible deposition
- Superior in cost/performance to liquid nitrogen cooled Meissners
- Minimise cost of ownership with power management
- High capacity cooling and heating 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 vapour within minutes from start and can defrost in less than four minutes, giving true fast-cycle capability. It also has an option called Rapid Cool to Cool, which eliminates the waiting period after defrost, enabling your system to perform more production cycles per shift.

Using patented Polycold® refrigerant mixtures, the MaxCool works on the principle of Meissner trapping. Water vapour 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.

The Polycold® MaxCool 2000 Cryochiller is compliant with European Application Refrigerants (EC 1005/2009) and the US EPA SNAP

Features and Benefits

- -111° to -142°C (162 to 131K)
- Heat removal to 2,000 watts
- Cryocondenses Water vapour in vacuum systems with speeds to 164,000 l/sec vacuum levels to 3 x 10^{-9} torr (4 x 10^{-9} mbar)
- Option for power management to minimise 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, MD and ROHS. Certified by an Independent Third Party
- TÜV Rheinland Listed to NRTL/CANADA Safety Standards
- ISO 9001:2015 certified manufacturer

MaxCool 2000 Specifications

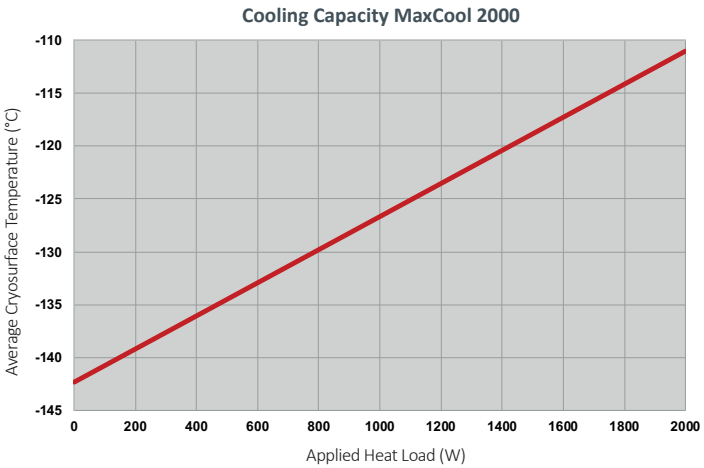
Typical Performance [a]	
Maximum Load	2000 W
Average Temperature at Maximum Load	-111°C
Coldest Temperature at No Load	-142°C
Typical Water Vapor Pumping Speed (from Typical Cryocoil Surface Area)	163,900 l/s
Maximum Pump Start Pressure[b]	1 atm
Ultimate Operating Pressure [c]	3E-9 torr 4E-9 mbar 4E-7 Pa
Time To Defrost [d]	4 minutes
Cryocoils and Refrigerant Lines	
Typical Cryocoil Surface Area	1.1 m^2 (11.8 ft^2)
Conservative Maximum Cryocoil Surface Area [e]	1.5 m^2 (16.1 ft^2)
Typical Refrigerant Line Length	2.4 m (8 ft)
Typical Single Circuit Cryocoil Tube OD	16 mm (5/8 in)
Typical Single Circuit Cryocoil Tube Length	21.9 m (72.4 ft)
Typical Dual Circuit Cryocoil Tube OD	12 mm (1/2 in)
Typical Dual Circuit Cryocoil Tube Length	14.6 m (45.2 ft)
Utilities	
Cooling water flow for 13 °C (55 °F)	6.8 l/min
Cooling water flow for 18 °C (65 °F)	9.1 l/min
Cooling water flow for 24 °C (75 °F)	13.6 l/min
Cooling water flow for 29 °C (85 °F)	27.6 l/min
Power Input (Standby Mode)	5.5 kW
Power Input (Cool Mode, Low Load)	6.2 kW
Power Input (Cool Mode, Maximum Load)	8.8 kW
Nominal Power Requirements [f]	200-3-50 208-3-60 230-3-60 380-3-50 400-3-50 460-3-60 480-3-60
Safety and Compliance	
Certified by an Independent Third Party for European PED-Compliance	Yes
Nontoxic Refrigerant Blends	Yes
Nonflammable Refrigerant Blends	Yes
Minimum Room Volume per EN 378 [g]	37 m^3 (1307 ft^3)
Minimum Room Volume per ASHRAE-15 [g]	25 m^3 (900 ft^3)
Maximum Operating Sound Level [h]	72 dB(A)
Maximum Operating Sound Level with Sound Attenuation Option [h]	64 dB(A)

Footnotes: a) Under standard test conditions with a single-circuit model, 25°- 28°C cooling water, a 2.4m refrigerant line, a typical cryocoil surface area, 25°C temperature in the line of sight with the cryocoil, and 60Hz operation. b) Recommended cryopump start pressure is near normal "crossover." Mechanical roughing pumps and blowers are generally more effective for moisture removal above 1torr. c) Typical cryocoil at twenty five percent (25%) of maximum pumping speed. d) Many applications use smaller cryocoils and achieve significantly shorter defrost times. e) Larger cryocoils give greater pumping speeds, and can be used in some applications. Contact Edwards Vacuum for application details. f) For nominal power requirements not in the table, please contact Edwards Vacuum. Please refer to the manual for allowable voltage ranges. For 480 volt operation the maximum voltage is 506V. g) To comply with EN-378 or ASHRAE-15, the cryochiller should be located in a room no smaller than listed. h) Units were tested in a manufacturing environment while under maximum load in the COOL mode.

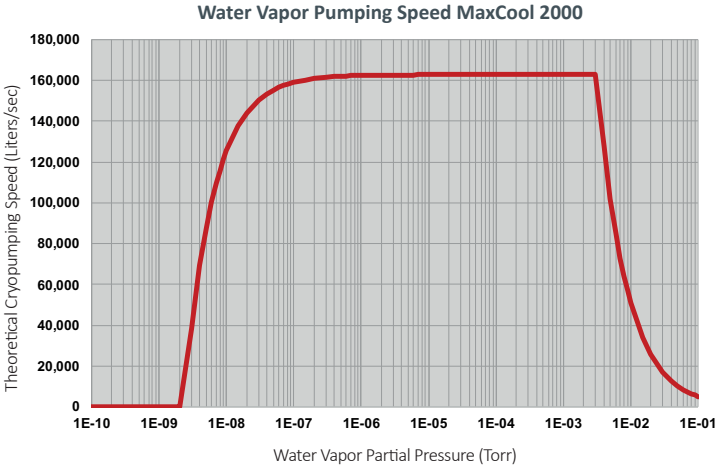
Helpful Information for Sizing Systems

- Radiation Heat Load on Cryocoil At 25°C
- At 25°C Ambient Conditions: 376.6 watts/m^2 (35 watts/ft^2)
- Refrigerant Line Heat Load: 26.3 watts/m (8 watts/ft)
- Vacuum Jacketed Line Heat Load: 1.0 watts/m (0.3 watts/ ft)
- Water Vapour Pumping Speed: 149,000 l/s/m^2 (13,842 l/s/ft^2)
- Liquid Nitrogen Cooling: approximately 45 watts/litre/hour

MaxCool 2000 Performance



Single-circuit model; temperature shown is average of inlet and outlet temperature using typical cryocoil size; temperature difference between inlet and outlet at maximum load is typically 20°C; end point of curve is maximum load; performance at 50Hz can be 3- 5°C warmer than 60Hz performance shown; 25- 28°C cooling water.



Single-circuit model; 2.4m refrigerant line; typical cryocoil surface area only; larger cryocoils will give greater pumping speeds and can be used in some applications; 25°C chamber temperature in line of sight with cryocoil; 60Hz; 25- 28°C cooling water.

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