Polycold® PFC

Fast Cycle Water Vapor Cryopump

CRYOGENICS

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

Benefits

- -90˚ to -140˚C (183 to 133 K)
- Heat Removal to 1500 Watts
- Cryocondenses Water Vapor in Vacuum Systems with Speeds to 70,000 l/sec Vacuum Levels to 1.5 x 10^{-9} torr (2 x 10^{-9} mbar)
- Provides very fast pumping speeds for water vapor, which is typically 65% to 95% of the gas load in high vacuum systems.
- Green refrigerant charge is globally compliant, non-toxic, and non-flammable
- Based on Polycold's proven, innovative, dependable mixed-gas cryogenics
- ISO 9001:2008 certified manufacturer
- CE Marked to the PED

The Polycold Fast Cycle Water Vapor Cryopump (PFC) 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 PFC system, you can expect to increase product throughput in your existing system 20% to 100% and improve quality of deposition.

The PFC Advantage

- High-vacuum pumpdown time cut by 25% to 75%
- High-speed pumping of water vapor: up to 70,000 l/sec in the workspace
- Increased product throughput of 20% to 100%
- Typical payback times of less than one year
- 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

When added to your vacuum system, the PFC Cryopump can dramatically reduce pumpdown times and increase product throughput. The PFC 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. Pumpdown times are typically reduced by 25% to 75%, and increases in product throughput are 20% to 100%.

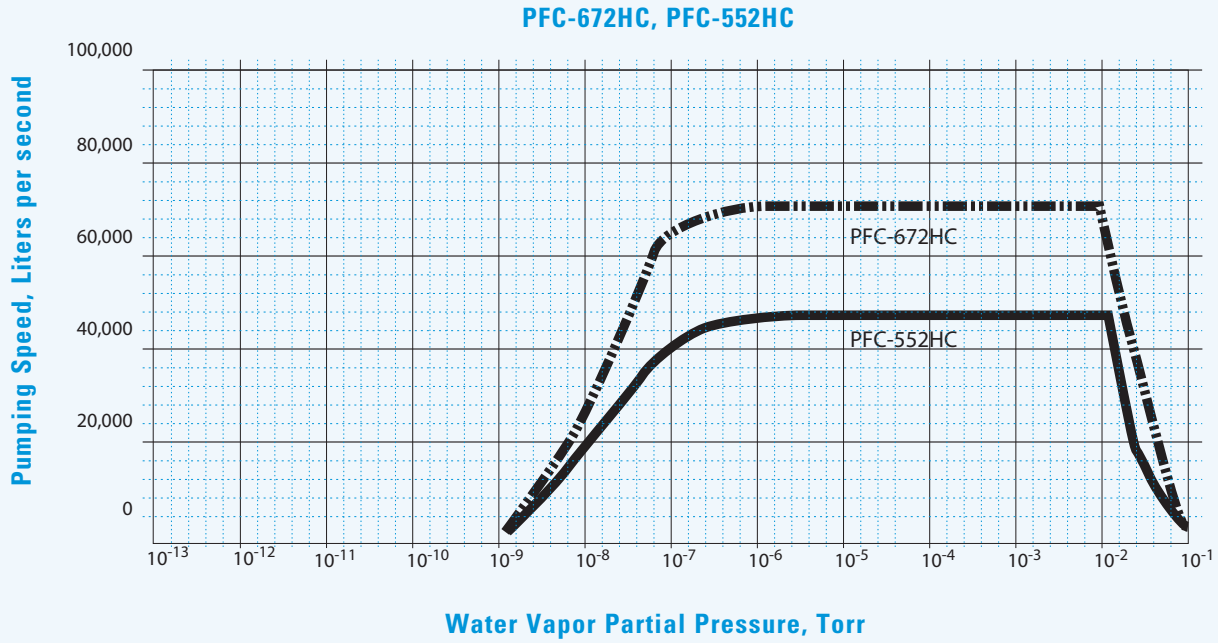
Using Polycold's patented cryogenic refrigeration process, and patented refrigerant mixtures, the PFC works on the principle of Meissner trapping. Water vapor is captured by condensation on a cryogenically cooled surface, called a Meissner coil. The Meissner (cryocoil) is mounted directly in the vacuum 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.

PFC Cryopumps are the most cost-effective pumping upgrade you can add to any diffusion-pumped, turbo-pumped or helium-cryopumped system. A control module allows you to have either local or remote operation, enabling you to operate the PFC from your existing controller or processor.

The PFC is available in a variety of capabilities and cryocoil configurations. Models are available that control two cryocoils or the combination of a cryocoil and a baffle. Please refer to Product Specifications and to our PFC Price List for price and option details.

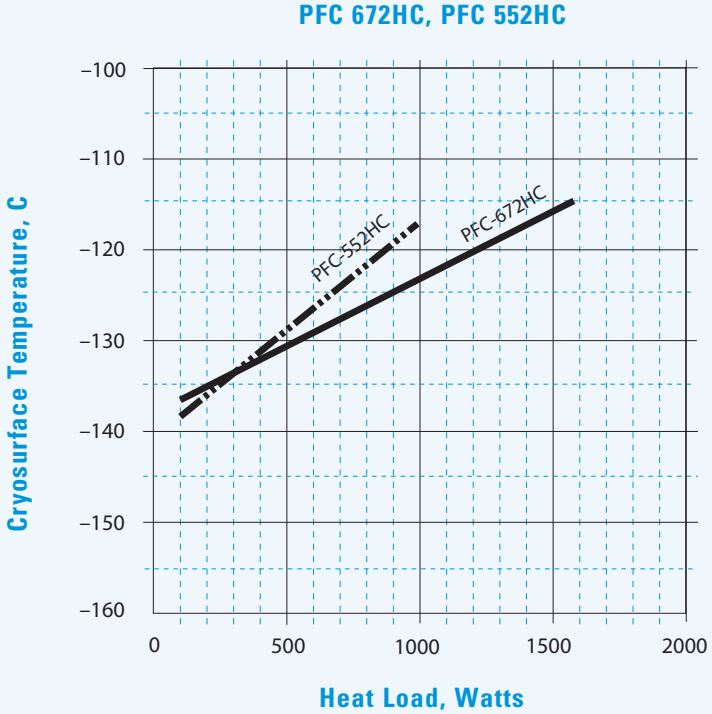
Polycold® PFC system

Comparison of Cryopumping Speed and Pressure - 60hz



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

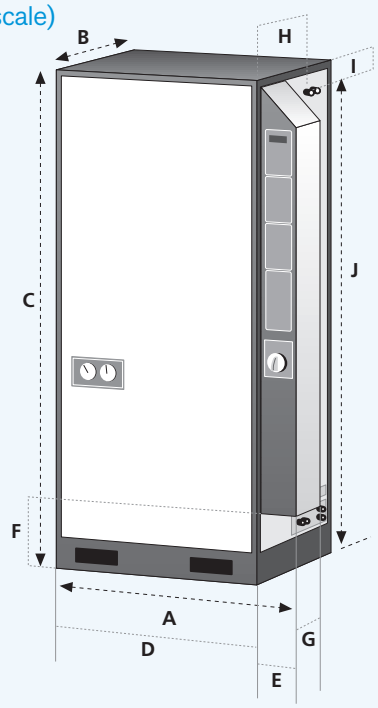
Comparison of Average Temperature (A) and Cryosurface Temperature vs. Heat Load (B) - 60hz



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

PFC Dimensions and Weight (not to scale)

PFC 672, PFC 552



Model	A mm/Inches	B	C	D	E	F	G	H	I	J	Weight kg./lb.	Standard Refrigerant Line
PFC 672	953	660	1842	812	140	254	203	432	114	1727	476	8 ft.
	37.5	26	72.5	32	5.5	10	8	17	4.5	68	1050	2.44m
PFC 552	953	660	1842	812	140	254	203	432	114	1727	408	8 ft.
	37.5	26	72.5	32	5.5	10	8	17	4.5	68	900	2.44m

"Combination" or "Multi-Purpose" PFC Models have the same dimensions as the "Standard PFC" Models in the equivalent size unit. (For example, a PFC/PFC 552 has the same dimensions as a PFC 552).

For PFC 552 and PFC 672 (and corresponding "Combination" or "Multi-Purpose" PFC Models) allow 45 cm (18 inches) clearance for utilities, refrigerant line connection and controls on the right hand panel as seen viewing the front of the unit.

Options for PFC Systems

Temperature Setpoint Relay

Indicates that the selected temperature is colder than the predetermined setpoint. Inside the module, the setpoint can be adjusted between -80C and -160C. When the temperature from the input thermocouple drops below the defined setpoint, a thermocouple limit switch lights a lamp on the panel and closes a relay contact which completes a circuit to the remote connector. Customer decides at time of purchase which location is to be dedicated to the setpoint.

Second Temperature Meter with Setpoint Relay

Provides continuous readout of temperature and setpoint status for a second thermocouple position in a location of customer's choice.

Remote Meter with 50 foot electrical cable

Isolated Electrical Interface for User's Controller

If you want to control the PFC unit remotely with other than switch closures, your control voltage and the PFC unit must be electrically isolated. To meet this requirement, the optional isolated relay interface is available in 6, 12, or 24 volts, 50/60 HZ AC or DC. (Specify desired voltage at time of order.)

Remote Temperature Indicator Meter

This is a separate digital meter that is not installed in the PFC unit. It allows the user to read the analog output signal from the installed temperature meter at a remote control panel up to 50 feet away.

PFC Specifications

	552HC	672HC
Typical Performance[a]		
Maximum Load (Watts at warmest temperature)	1000	1500
Theoretical max pumping speed l/sec[b]	74,500	104,300
Conservative pumping speed (in chamber) l/sec[b]	50,000	70,000
Ultimate Operating Pressure, torr[c]	2×10^{-9}	6×10^{-9}
Ultimate Operating Pressure, mbar	3×10^{-9}	8×10^{-9}
Maximum pump start pressure, atm[d]	1.0	1.0
Time to defrost, minutes	4.0	4.0
Cryocoils and Refrigerant Lines		
Total Cryocoil Surface area m^2 ($ft.^2$)	0.5 (5.4)	0.7 (7.5)
Single Circuit (PFC)		
Tube O.D., mm (in.)	12 (1/2)	16 (5/8)
Tube Length m (ft.)	13.3 (41.1)	14 (46)
Dual Circuit (PFC/PFC)		
Tube O.D., mm (in.)	12 (1/2)	12 (1/2)
Tube Length per coil, m (ft.)	6.6 (20.6)	9.28 (29)
Standard refrigerant line lengths m (ft.)	2.44 (8)	2.44 (8)
Utilities		
Cooling water, flow rate l/min. (gal./min.)		
at 13C (55F)	4.9 (1.3)	6.8 (1.8)
at 26C (79F)	12.3 (3.2)	17.3 (4.6)
at 29C (85F)	19.7 (5.2)	27.6 (7.3)
Power Input, at maximum load, kW	6.0	8.3
Nominal Power Requirements[e]	200/3/50-60 230/3/60 380/3/50 400/3/50 460/3/60 480/3/60	200/3/50-60 230/3/60 380/3/50 400/3/50 460/3/60 480/3/60
Max Operating Sound Level, dB(A)[f]	71	72
Minimum Room Volume m^3 ($ft.^3$)[g]	13 (460)	16 (570)

Footnotes: (a) Standard conditions for performance testing. (1) Cryocoil environment at 20˚C (2) Recommend cryocoils and line lengths (3) Cooling water temperature between 25˚C and 28˚C. (4) Operation at 60 Hz. (b) Larger cryocoils may give greater pumping speeds, and can be used in some applications. Contact your sales representative or the factory for application details. (c) Standard cryocoil at twenty five percent (25%) of maximum pumping speed. (d) Recommended cryopump start pressure is near normal “crossover.” Mechanical roughing pumps and blowers are generally more effective for moisture removal above 1torr. (e) For nominal power requirements not on the table, please contact the factory. Please refer to the manual for operational voltage ranges. For 480 volt operation the maximum voltage is 506. (f) Units were tested in a manufacturing environment while under maximum load in the COOL mode. (g) 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. (h) 7.0 minute maximum defrost is for a 2 m2 coil. Most applications use smaller coils and achieve shorter defrost times. A 1 m^2 coil with standard refrigerant lines will defrost in less than 4 minutes.

Notes: All units have cryocoils that may be decoupled from the refrigerant lines and remote control capability with built-in remote connector. Maximum angle of inclination for shipping or handling all units is forty-five degrees (45˚)

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

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