

Water Vapor Cryochiller

Fast pump down, with the efficient trapping of water vapor in the chamber, is a key requirement for maximum efficiency in thin film coating. Telemark cryochillers provide the best available technology:

- **Fast “Cool Down” for shorter cycle times**
- **More Efficient Water Vapor Pumping**
- **Small Footprint**
- **Fast Defrost**
- **Comprehensive Digital Control Package with Digital Communication Connectivity**

Water Vapor Cryotraps:

- **Decrease Pump down Times by 25% to 90%**
- **Attain Deeper Vacuum**
- **Improve Deposition Quality**
- **Eliminate Costly LN₂ Usage For Fast Payback**



Model 1200/1800/2400/3000/3600/4800 Water Vapor Cryochiller

Drawing on our leadership in the field of vacuum PVD coating, Telemark has developed improved cryochillers, which deliver enhanced performance and reliability.

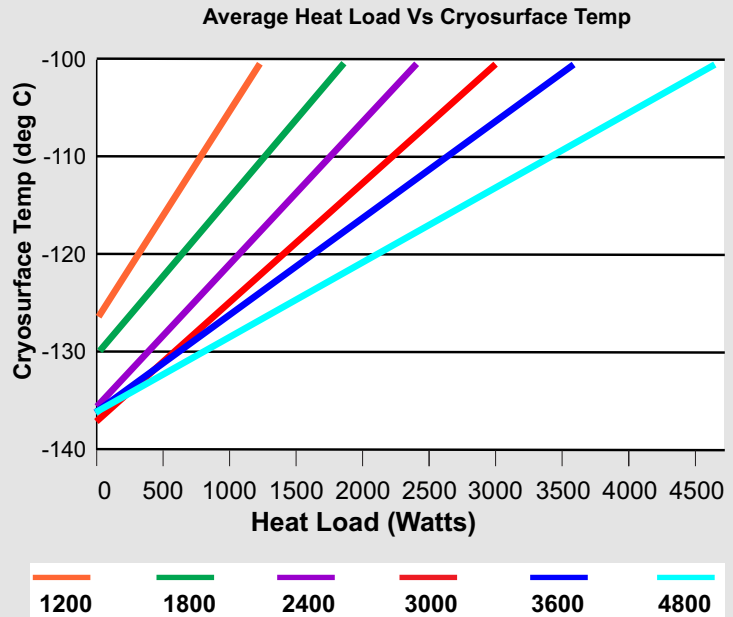
These models are fully compatible with your existing vacuum system installation. Careful attention has been paid to support a wide variety of interfaces between the system's process controller and the cryochiller. These include Ethernet (TCP/IP), RS-232, RS-485, and an analog remote. Optional Profibus and EtherCAT interfaces are available.

An advanced digital control system allows the cryochiller system operation to be monitored. The on-board system enables several user adjustable conditions to optimize process control. All models are available with a Dual Independent Circuit option.

Our cryochillers offer differing refrigerant blends to meet all applicable national/regional environmental requirements (including US EPA, CE, and the Kyoto Accords International Agreement).

Cryosurface Temperature vs. Cryopumping Efficiency and Water Vapor Partial Pressure

Efficiency	98%	95%
Water Vapor Partial Pressure, Torr	Cryosurface Temperature Needed (Degrees C)	
5×10^{-3}	-89.6	-84.3
2×10^{-3}	-94.6	-89.6
1×10^{-3}	-98.2	-93.4
5×10^{-4}	-101.6	-97.0
2×10^{-4}	-106.0	-101.6
1×10^{-4}	-109.1	-104.9
5×10^{-5}	-112.2	-108.1
2×10^{-5}	-116.0	-112.2
1×10^{-5}	-118.8	-115.1
5×10^{-6}	-121.5	-117.9
2×10^{-6}	-125.0	-121.5
1×10^{-6}	-127.5	-124.1
5×10^{-7}	-129.9	-126.7
2×10^{-7}	-132.9	-129.9
1×10^{-7}	-135.2	-132.2
5×10^{-8}	-137.3	-134.5
2×10^{-8}	-140.1	-137.3
1×10^{-8}	-142.1	-139.5



Selection of Appropriate Model

When determining the optimum vapor trapping capability to significantly improve pump-down times, a preliminary goal should be to achieve at least four times the current water vapor trapping capability of your high vacuum pump. Selection of the correct model cryotrap depends upon two primary factors: the amount of water vapor that needs to be trapped, and the total heat load the system needs to manage. Total heat load is a combination of: 35 watts/square ft. of cryosurface, 8 Watts per linear ft. of insulated refrigerant line, "latent" heat loads which are extensive at shallow vacuum depth but can be ignored at 10^{-4} or below, and in-chamber heating of:

deg C	black body load in W/sq ft	shielded load in W/sq ft
50	55	42
100	100	75
150	167	125
200	262	197

The overall heat load on the Cryochiller system is the combination of all of the above.

Low Temperature Operation

An important feature of Telemark's cryochillers is the ability to achieve low temperature operation, as low as -160 C, by modifying the refrigerant charge; no hardware changes are required. There will be a 40-50 percent reduction in heat load capacity, when operating at such low temperatures, the actual reduction being dependent on the cryochiller model and operating conditions.

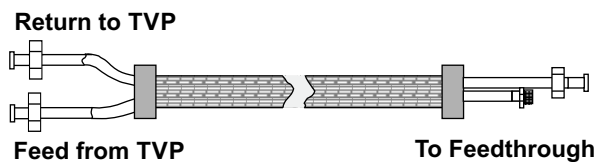
Digital Control

The advanced digital control package operates at 24V, has battery back-up, and is fully CE compliant. Two 20 character 1/2" high backlit read-outs allow for easy reading and rapid scrolling through all available monitor points.

Convenient interface capability for RS-232, RS-485 or Ethernet (TCP/IP) allows for easily adapted system controls or external data-logging. This advanced control package is placed inside the main unit housing creating a smaller overall system footprint. The flexible capabilities of the controller remove the need for additional and costly system control options or specialized interface modules. A 37 pin remote connector is included for those wishing remote manual or analog system control.

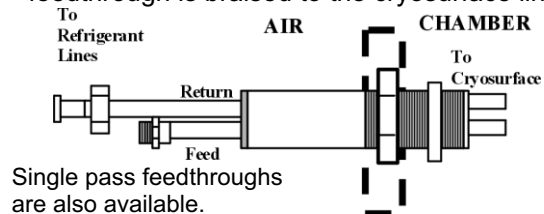
Refrigerant Line

The "refrigerant line" contains both a feed line and a return line of copper tubing with stainless steel couplings to mate with the cryochiller and with the feedthrough. The refrigerant line is protected with foam type thermal insulation to minimize heat loss and protect against exposure to open air.



Feedthroughs

(Available separately or as part of the cryocoil) The dual pass feedthrough gives access to the chamber while maintaining the thermal isolation between the feed and return tubing. On the external side, couplings mate directly with the refrigerant line. On the chamber side, the feedthrough is braised to the cryosurface lines.

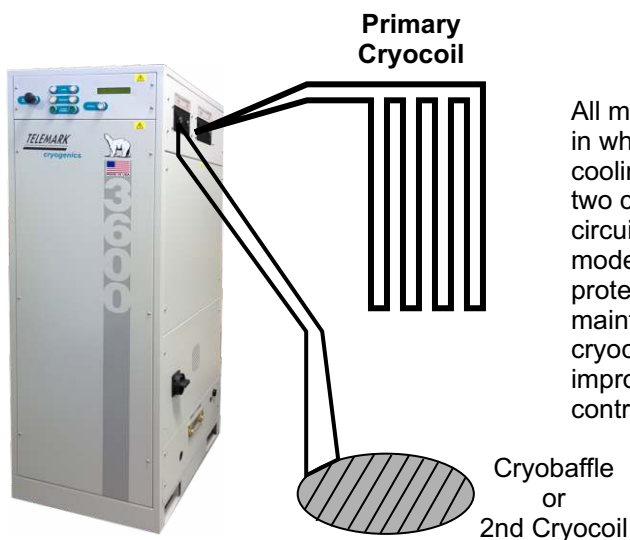


Cryocoils

Working from Chamber drawings or specification, a custom designed cryocoil can be fabricated to perfectly fit your chamber and deliver optimal vapor trapping and heat removal performance

Cryocoils are made from copper tubing (stainless steel is also available) and constructed with a stainless steel feedthrough.

Many different coil shapes and configurations allow for optimum efficiency of your cryosurface.



Dual Circuit Cryochillers

All models are available in a dual circuit configuration, in which the systems provide independent control and cooling of two surfaces. Common configurations are two cryocoils or a cryocoil and a cryobaffle. Each circuit can cool or defrost independently with only a modest effect on the other circuit. For cryobaffles protected by a gate valve, the baffle can be constantly maintained at cryo-temperature while the in-chamber cryocoil is cycled for expected process time improvements. Each circuit is independently controlled and monitored.

Specifications

	1200	1800	2400	3000	3600	4800
Maximum Load (Watts)	1,200	1,800	2,400	3,000	3,600	4,800
Typical Pumping Speed l/sec	65,000	100,000	135,000	165,000	200,000	270,000
Weight	425 lbs. 193 kg	485 lbs. 243 kg	485 lbs. 243 kg	845 lb. 384 kg	930 lb. 412 kg	990 lb. 449 kg
Power supply	380 - 440VAC 3 ph 50/60 Hz or 460VAC 3 ph 60 Hz or 200 - 230VAC 3 ph 50/60 Hz					
Full load Current Draw @ 60Hz @200-230V @380-440V	20 Amps 10 Amps	30 Amps 15 Amps	40 Amps 20 Amps	50 Amps 25 Amps	60 Amps 30 Amps	96 Amps 48 Amps
Start Up Max Current Draw @ 60Hz @200-230V @380-440V	30 Amps 15 Amps	60 Amps 30 Amps	60 Amps 30 Amps	60 Amps 30 Amps	85 Amps 45 Amps	110 Amps 60 Amps
Water requirement (Maximum)	5 lt/min @ 15°C 10 lt/min @ 25°C 20 lt/min @ 32°C	5 lt/min @ 15°C 10 lt/min @ 25°C 20 lt/min @ 32°C	6 lt/min @ 15°C 12 lt/min @ 25°C 30 lt/min @ 32°C	6 lt/min @ 15°C 12 lt/min @ 25°C 30 lt/min @ 32°C	8 lt/min @ 15°C 16 lt/min @ 25°C 30 lt/min @ 32°C	10 lt/min @ 15°C 18 lt/min @ 25°C 32 lt/min @ 32°C
Max Coil Length (Meters) Using ½" Cu tube	20 (65.6 ft)	25 (82 ft)	35 (114.8 ft)	40 (131.2 ft)	50 (164.0 ft)	50 (164.0 ft)

Dimensions



Water connections: 3/4" NPT female
Refrigeration Connections: ½" UltraSeal