

Cryogen Free Microscopy Cryogenic Workstations
Optical cryostats for use in microscopy and spectroscopy
'Performance by Design'



**CLOSED CYCLE
CRYOGEN FREE
REFRIGERATOR
SYSTEM FOR
MICROSCOPY**

Closed Cycle Refrigerator System for Microscopy

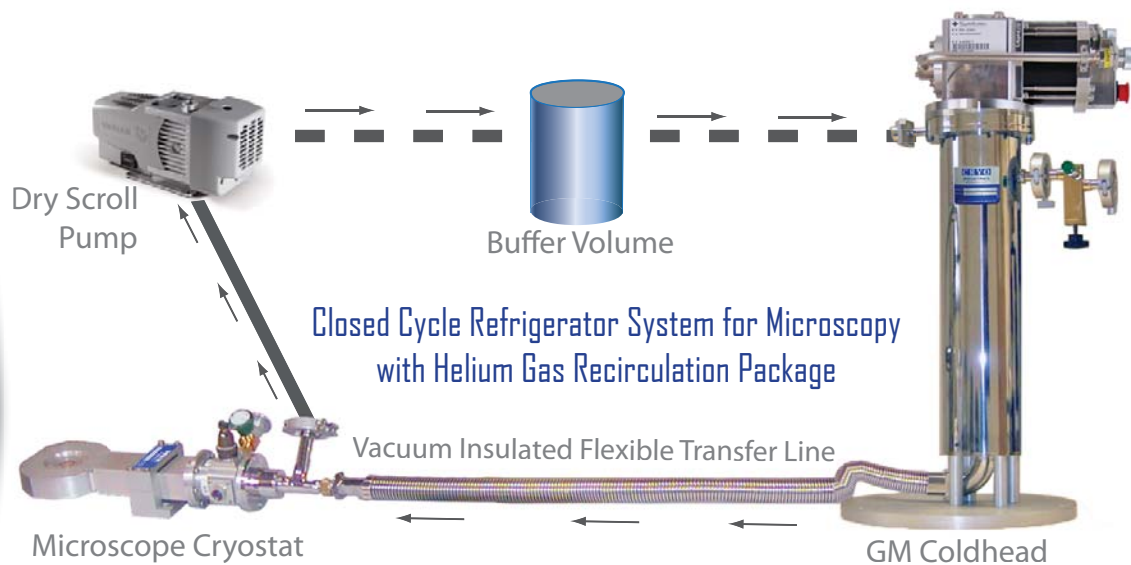
Cryo Industries pairs innovative design with leading edge technology in the Closed Cycle Refrigerator System for Microscopy. This is a true 'performance by design' and is the only system of its kind on the market.

The Closed Cycle Refrigerator System for Microscopy has **no direct mount to the refrigerator** making this system ideal for low vibration experiments. It also employs a closed loop circulation of helium gas used for sample cooling (see diagram below for recirculation schematic).

Customization is no problem! We guarantee that our systems will meet your experimental specifications. Cryo offers various temperature ranges for the Closed Cycle Refrigerator Systems for Microscopy:

- 11 K to 325 K
- 20 K to 325 K
- 28 K to 325 K
- 78 K to 325 K

You select the temperature range and cooling power need and we provide the system!



The Complete Closed Cycle Cryogen System for Microscopy Includes:

1. Refrigerator/cryostat
2. Compressor
3. High precision PID temperature controller
4. Digital power supply with 'slave' option
5. Model 34 Temperature controller
6. Diaphragm Pump
7. LHe Transfer line
8. Microscopy cryostat
9. Flow control manifold
10. Misc. - pumping lines, clamps



At 30 mm thin, the Cryo CFM Microscopy Cryostat is the thinnest available

Closed Cycle Refrigerator System for Microscopy: Mode of Operation

CRYO's closed cycle '**CRYO COOLER**' provides a continuous cold helium gas stream – without using liquid helium. The system incorporates a "closed cycle" cooler. Press the On/Off switch and the cooling begins. Warm gas enters the refrigerator cryostat where it is cooled to low temperatures. The cold gas flows through a transfer line (bellows section) to the microscopy cryostat's cold finger. The sample is attached to the cold finger, which is cooled by the cold gas stream.

The refrigerator vibration is isolated because the microscopy cryostat is separate from the refrigerator cryostat. The system is ideal for low vibration sensitive experiments.

The refrigerator operates on the Gifford-McMahon gas expansion cycle. Compressed helium gas is supplied by the compressor. The work cycle cools two heat exchangers inside the refrigerator cryostat, *two stage refrigerator*. The refrigerator's compressed gas is 'closed loop' and used over and over.

Do not confuse the refrigerator closed gas flow loop with the microscopy closed gas cooling flow loop.

1. Refrigerator gas loop: Gas flow from the compressor to the refrigerator cryostat through the stainless steel high pressure hoses. The gas is heated when cooling the two internal heat exchanger stations (*heat sinks*). The gas is returned to the compressor where it is cooled by water or an air cooled heat exchanger. The gas is then looped back into the refrigerator (*closed loop, closed cycle*).

2. Cooling gas loop: Warm helium gas flows into the refrigerator cryostat where it is cooled by two heat exchangers. This inlet helium gas flows in a tube internally attached to each 'heat station of the refrigerator. The refrigerator removes heat from the gas flowing in the tube. The gas is cooled first

by the 1st stage of the refrigerator and then by the 2nd stage. The cold gas flows from the 2nd stage heat exchanger through the transfer line into the microscopy cryostat. The 'cold finger' in the microscopy cryostat is cooled by the cold gas stream. The flow can be operated in a closed or open loop. When closed, the diaphragm pump returns the gas to the refrigerator cryostat. When 'open' flow, the gas is supplied from a 'helium gas cylinder' and vented after cooling the cold finger and sample.

A temperature controller is attached to the cold finger of the microscopy cryostat, allowing automatic continuous control of the sample temperature. The controller continuously controls and displays the temperature.

The temperature controller is also attached to the second stage of the refrigerator allowing automatic continuous control of the gas temperature. The controller continuously controls and displays the temperature.

Liquid helium is not used. The refrigerator provides the cooling needed, reliably and economically.

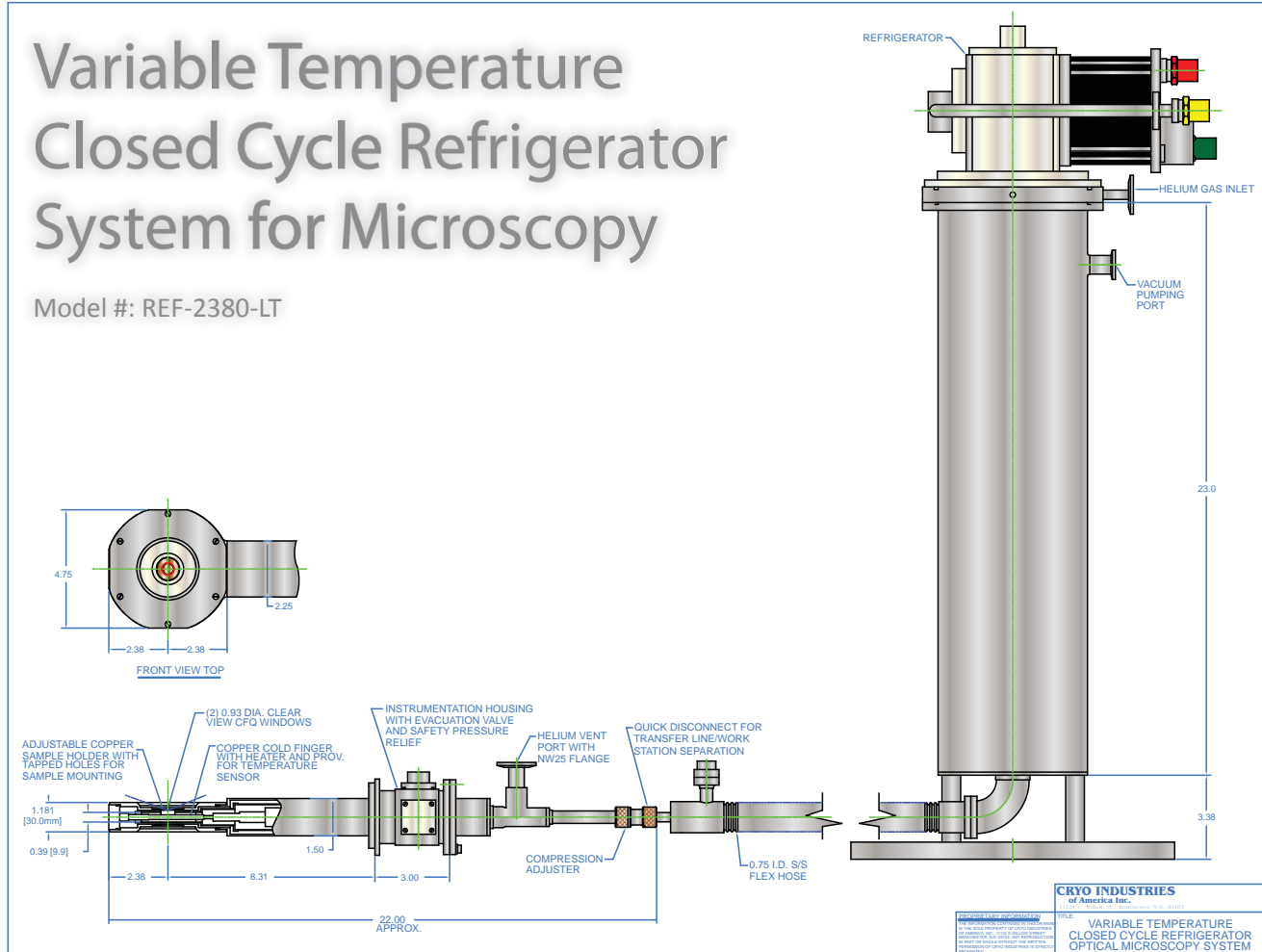
The system can be operated in a closed or open loop. In the closed loop mode, the cooling gas is recirculated by a diaphragm pump. In the open loop mode, the gas is supplied continuously from a compressed gas cylinder.

Turn on some gas flow, start the compressor, set the temperature controller and the gas flows and cools.

This microscopy cryostat exchanges directly with the standard liquid helium transfer line. This unique feature allows access to the lowest temperatures when needed, while avoiding the high cost of liquid helium for most of the operating temperature range. **This cryocooler is a superior low maintenance system!**

Variable Temperature Closed Cycle Refrigerator System for Microscopy

Model #: REF-2380-LT



All Models Feature:

- **Low vibration - no direct mount to refrigerator**
- Three operating temperature ranges to select from
- Two stage Sumitomo SHI coldhead and water cooled compressor with interconnecting refrigerator hoses
- PT100 Temperature sensor installed on 1st stage of refrigerator
- Silicon diode temperature sensor installed on 2nd stage of refrigerator
- Control heater installed on refrigerator
- Long term continuous operation

Microscopy Cryostat including:

- (2) 0.93 inch diameter x 0.062 inch (1.59 mm) thick clear optical quartz windows (optional .020 inch thick window available)
- Adjustable sample holders
 - (3) at 0.594" dia. with no hole
 - (3) at 0.594" dia. with 0.125 dia. thru hole on center
- 19-pin hermetic electrical feedthrough
- NW25 vapor pumping port

- NW25 evacuation valve with safety pressure relief
- Temperature sensor installed near sample holder
- 30 mm thin
- 'NOMOVE' support
- Sample supported on ends for thermal contraction toward center - virtually no movement

• **Welded flexible stainless steel transfer line**

Temperature Controller

- Remote interfaces include Ethernet, RS-232, and IEEE- 488.2 (GPIB)

Monitors and controls

- Sample mount temperature
- 2nd Stage refrigerator temperature
- 1st Stage refrigerator temperature

Helium Gas Recirculation Package

- Closed loop circulation of the helium gas used for sample cooling
- Complete system test and one year warranty