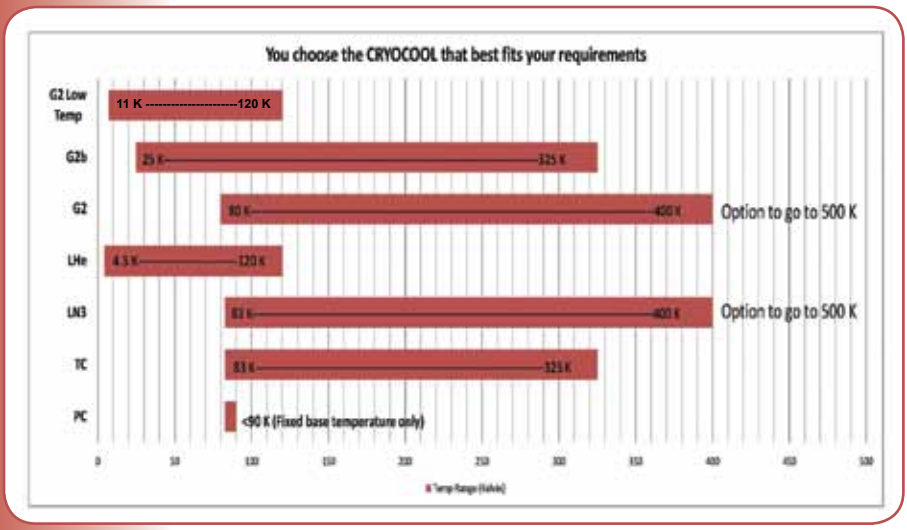
CIA Cryo Industries of America, Inc.

"performance by design"

CRYO Industries of America

CRYO Industries of America, Inc. (CIA) have been manufacturing gas cooling systems for nearly 25 years. We have an installed base of approximately 5000 units worldwide. With the CRYOCOOL family of gas stream coolers we have opened new frontiers in crystallography, allowing researchers to take advantage of a product family having the widest temperature range in the market.

The 3rd generation CRYOCOOL family of gas stream coolers all use the single-flow 'Never-Ice technology to produce the most efficient and economical stream coolers on the market. This efficiency means up to 50% lower liquid cryogen usage, with gas temperatures substantially lower than our competition can provide. Our CRYOCOOL family covers the temperatures from 4.5 K to 500 K, offering crystallographers an unequalled temperature range.



Our Products

We produce three specific product groups:

Photo of actual crystal at liquid He temperature with CRYOCOOL system. Photo courtesy of Hakon Hope.

Liquid Nitrogen Based

- ☐ CRYOCOOL - PC
- ☐ CRYOCOOL - TC
- ☐ CRYOCOOL - LN3

Liquid Helium Based

- ☐ CRYOCOOL – LHe

Cryogen Free (Closed cycle coolers using room temperature gas)

- ☐ CRYOCOOL - G2
- ☐ CRYOCOOL - G2b
- ☐ CRYOCOOL - Low Temperature

Optional Accessories:

- ☐ Nitrogen Gas Generator with Integrated Air Compressor.
- ☐ Auto refill for Liquid Nitrogen based systems.
- ☐ CRYOCONTROL II Software package for monitoring and controlling all systems from your computer.

System Operation

Liquid Nitrogen Based:

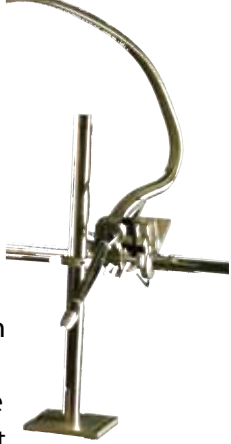
CRYO's single-flow 'CRYOCOOL' provides a continuous stream of cold nitrogen gas. Flow rates are set electronically by setting the flow power supply voltage. Simple to operate – turn on the flow power supply and the flow starts and sets instantly and automatically! The gas stream temperature is maintained automatically with the true PID cryogenic temperature controller.

The storage Dewar has TWO liquid nitrogen reservoirs. The inner reservoir is surrounded by the main outer storage reservoir. Thus it is surrounded by liquid nitrogen of same temperature; hence, heat input is zero (temperature difference is ~ 0 K). This allows setting the flow rate exactly by simply energizing a heater, as the heater is the only heat input.

The CRYOCOOOL-LN3 is modular in design with easy lift-out access to all components. Liquid nitrogen level in the gas flow generator is controlled by the electronic level controller, which is preset at the factory and does not need any adjustment. This allows conditions in the gas generator to be constant over a long period of time, resulting in constant flow, independent of the pressure or changes in the other reservoir. Refill does not disturb the temperature of the sample.

This CRYO cooler is a superior low-maintenance system - no line drier, no ice blockages, no diaphragm pumps and no shield gas! A truly low maintenance, superior, easy-to-use system! Flow throughput is high, flow control excellent. Low temperatures are quickly reached. Flash cooling is fast and easy. Temperature control is excellent. "Never-Ice" technology means no shield gas and a frost-free nozzle and sample environment!

System Operation



Liquid Helium Based:

CRYO's single-flow 'CRYOCOOL-LHE' provides a continuous stream of cold helium gas. Flow rate can be adjusted by an easy to use needle valve. 'Never-Ice' technology eliminates the need for shield gas. Samples (crystals) can be cooled to below 10 K (-263 °C), with a practical minimum of 4.5 K (-269 °C) Simple to operate – set the never-ice heater, insert the transfer line into the transport Dewar, open the needle valve, and the flow starts! Cool-down takes only a few minutes after liquid He flow starts. He flow can be completely stopped, saving He between data collection runs. Stable operation after restart can be attained in 20 minutes.

With lower temperatures you can now study crystals in a way not previously possible.

The CRYOCOOL-LHe can provide:

- ☐ Unobstructed access to the crystal for long time periods with minimal radiation damage
- ☐ Significant enhancement of the intensities for high-order data
- ☐ The lowest possible atomic displacement parameters
- ☐ Higher resolution
- ☐ Lower background noise
- ☐ Better quality crystals and longer lifetime
- ☐ More effective flash-cooling
- ☐ Temperatures down to 4.5 K
- ☐ Greater cooling power
- ☐ Better thermal interface

The gas stream temperature can be maintained automatically with the true PID cryogenic temperature controller. A heat exchanger with silicon diode temperature sensor is built into the nozzle of the cooler, providing feedback to the controller. The CRYOCOOL systems completely eliminate the complexity and difficulties in trying to rematch shield gas and inner flow velocities after a flow rate change.

Cryogen Free System

Cryogen Free (Closed cycle coolers using room temperature gas):

CRYO's closed cycle 'CRYOCOOLERS' provide a continuous cold helium or nitrogen gas stream – without using liquid helium or liquid nitrogen. The refrigerator provides the cooling needed. This technology was developed for NASA to test gas sensors and has now been transferred for use in crystallography.

The CRYOCOOL-G2 and G2b features 'Never-Ice' technology - no shield gas is needed – ever! The never-ice warm nozzle maintains an ice-free environment at low temperatures, inside and out. The cryogen-free CRYOCOOL-G2 and G2b uses a nitrogen generator to extract nitrogen from the air. The complete system provides a simple push-button operation, using room temperature air to generate cold nitrogen gas at 80 K (-193 °C.) With the use of bottled helium gas these CRYOCOOL systems can get down to temperatures around 11 K (-266 °C.)

Optional Accessories

CRYO integrates the LC/MS nitrogen generators into its special design of liquid cryogen free CRYOCOOL products. These unique generators meet the gas flow, purity and pressure requirements of our 3rd generation CRYOCOOL family.

Flow rates range from 12 L/minute to 40 L/minute and provide total flexibility to allow single or multiple coolers to be supplied. Utilizing the pressure swing adsorption technique, the generators provide a continuous stream of clean, dry nitrogen without the need for secondary purification. They are fully compatible with all known APCI and ESI interfaces. Models featuring integral oil-free compressors give increased security of supply, completely removing the reliance on external air supply.

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