

2-Stage 4 K Closed Cycle Refrigerator Systems



Variable Temperature Closed Cycle Refrigerator Systems

Cryo Industries manufactures closed cycle cryogenic workstations for a large variety of experimental requirements. Described below are three different standard styles. Systems can be provided with special sample 'T' style mounts, temperature controllers and sensors. **Custom systems are no problem!**

Style 1: Sample in Vacuum Mounting

The **Sample in Vacuum Model** are designed for 'cold finger' sample mounting. Easy sample access is allowed through a quick connect vacuum shroud and single thread radiation shield. The temperature sensor is installed at the coldfinger to offer accurate temperature readings at the sample mount.



Style 2: Sample in Exchange Gas, Refrigerator on Bottom Style

Samples are 'Top Loading' and can be changed in seconds without shutting off or warming the refrigerator. Interchange samples in seconds without thermal or vacuum cycling of the system. Exchange gas cooling of low thermal conductive samples. Independent sample mount heater results in fast thermal response. Ultra-stable variable temperature operation. Independent temperature control of sample mount and refrigerator cold finger. The model REF-452-D22 is ideal for materials



characterization, while model REF-399-D222 (Mossbauer) features low vibration through bellows, spacer and exchange gas isolation. Vibration isolation stand available for Mossbauer and other sensitive experiments.

Style 3: Sample in Exchange Gas, Refrigerator on Top Style

- *Accepts variety of bolt in/out experimental inserts*
- *Removable Refrigerator*

Style 3 has all the features of Style 2 plus more! Accepts a large variety of easy to 'bolt-on' inserts. No indium or solder seals. One system can accept many different removable inserts, such as compact 'mail' for magnet gap experiments. In addition, the refrigerator can be removed for 'cold finger' or other applications. Samples are **top-loading** quick sample changes while operating. Samples are located in 'static' exchange gas for efficient cooling.



If your experiments require frequent sample changes and/or your samples are difficult to cool when mounted to a cold finger in vacuum then Top Loading cryostats are the answer! The sample inserts from the top and goes in and out easily.

Variable Temperature Closed Cycle Refrigerator Systems

Cryo Industries has 34 years experience in designing and manufacturing Closed Cycle Refrigerator Systems. This has resulted in a high level of expertise and hundreds of field tested and proven designs.

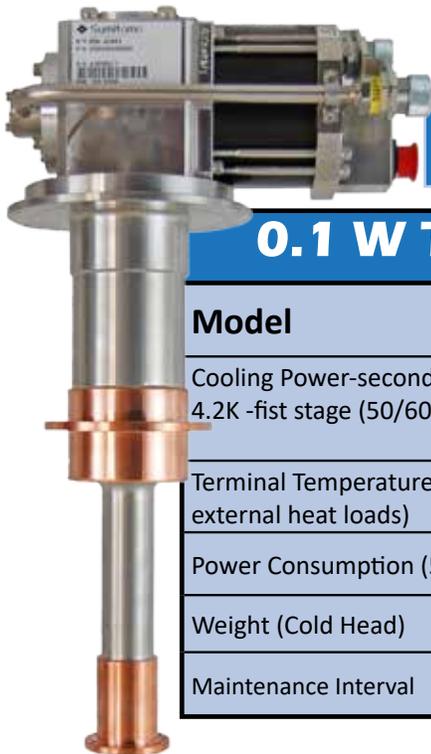
Cryo Industries pairs innovative design with leading edge technology, by integrating cryocoolers that offer the most reliable and longest track records on the market into the Closed Cycle Refrigerator Systems.

The REF4K models are available with a One or Two-Stage Gifford-McMahon (GM) refrigerator from Sumitomo Industries (SHI). The user is able to **select the cooling power needed at 4.2 K: 0.1, 0.5, 1.0 or 1.5 Watts!**

The REF 4K systems have an operating temperature range of <4 K to 325 K, with **optional high or low temperature** stages available. The systems are available in numerous configurations, including:

- Optical or Non-Optical
- Standard, Compact and Sub Compact sizes
- High or Low Temperature Stages
- Low Vibration version for IR arrays or other vibration sensitive experiments

Cryo Industries is able to design any 4 K refrigerator system to meet your experimental needs. Custom jobs are our specialty! We guarantee that our custom designed system will meet your specifications.

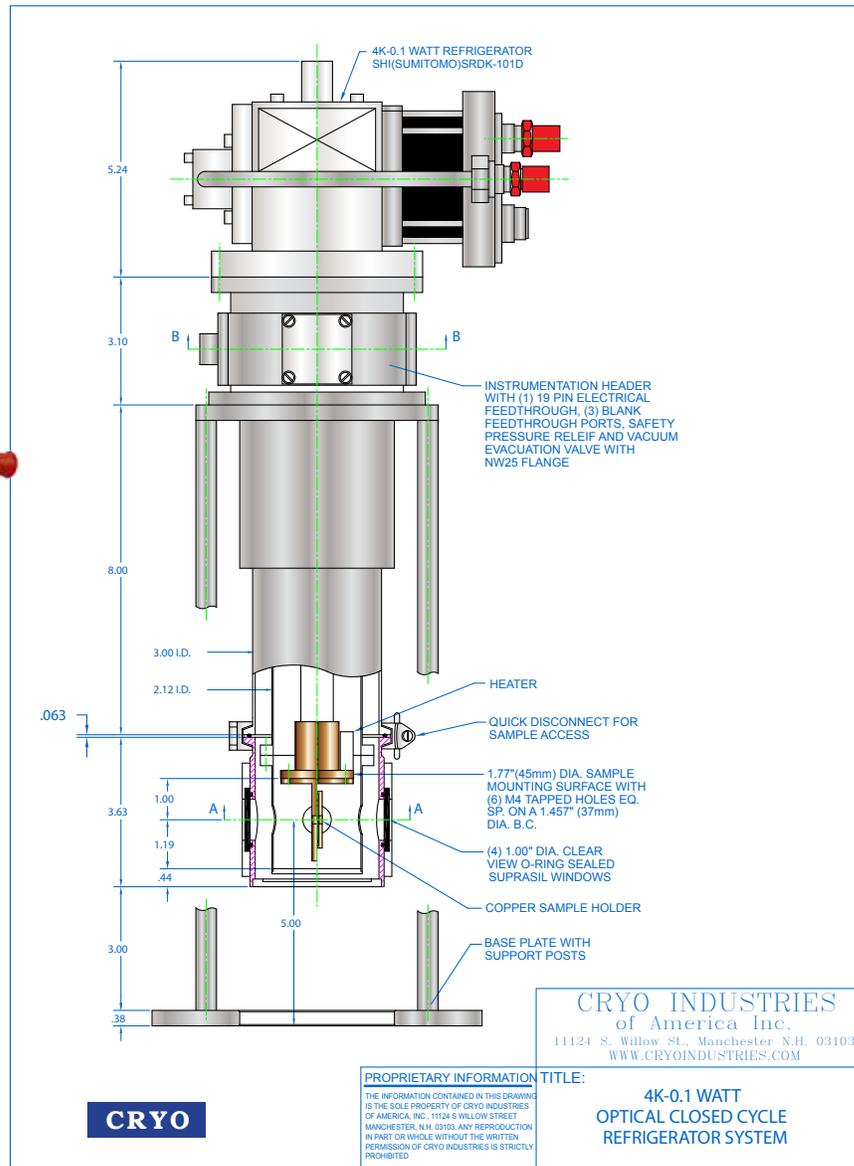


Sumitomo 4 K Refrigerator Options

0.1 W TO 1.5W -Cooling Power at 4.2 K

Model	REF-4K-0.2W	REF-4K-0.4W20	REF-4K-1W	REF-4K-1.5W
Cooling Power-second stage at 4.2K -first stage (50/60Hz)	0.2W 3/5W at 60K	0.4W 15/20W at 40K	1.0W 31/37W at 40K	1.5W 35/45W at 50K
Terminal Temperature (No external heat loads)	<3.0 K	<3.5 K	<3.5 K	<3.5 K
Power Consumption (50/60Hz)	1.2/1.3kW	3.8/4.5kW	6.5/7.5kW	7.5/8.5/kw
Weight (Cold Head)	7.2kg	16kg	18kg	18.5kg
Maintenance Interval	10,000 hours	10,000 hours	10,000 hours	10, 000 hours

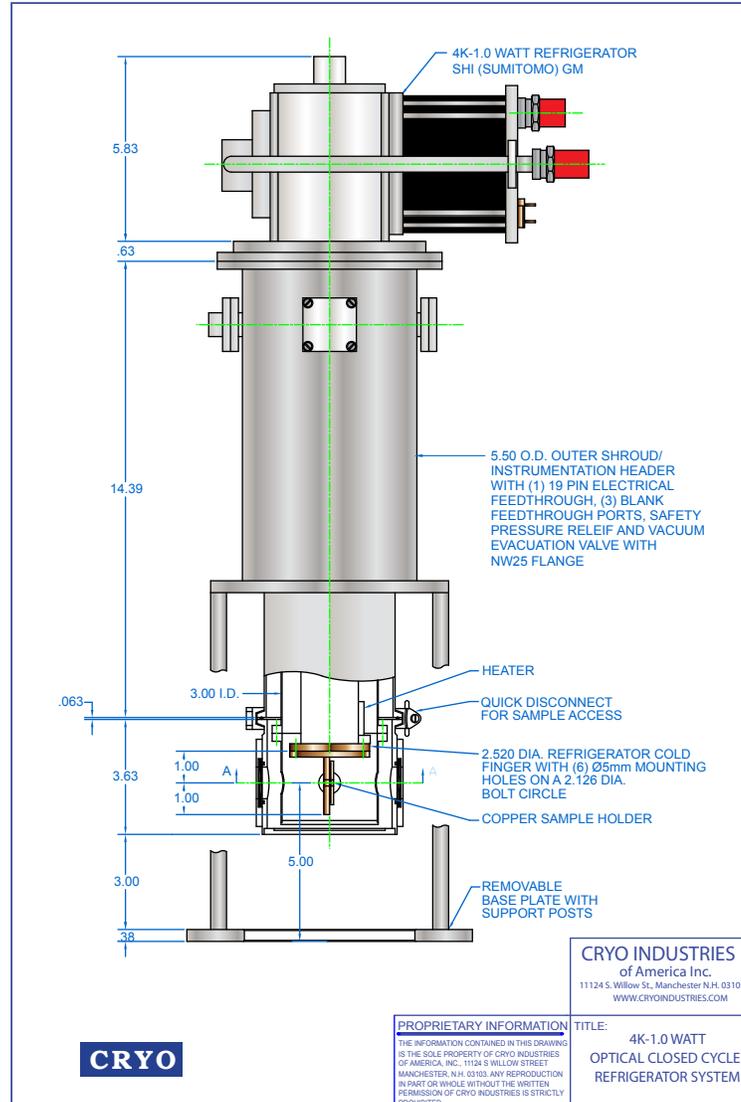
Variable Temperature Optical Closed Cycle Refrigerator System (0.2Watt @ 4 K SHI Refrigerator)



System Features

- 4 K to 325 K operating temperature range
- Sumitomo Model SRDK 101DK coldhead
- Cooling power:
 - 3.0W/5.0W (50/60Hz) @ 45 K
 - 0.2 W (60Hz)/0.17 W(50 Hz) @ 4.2 K
- Sumitomo water cooled compressor (air-cooled compressor upgrade available)
- Interconnecting hoses and control cable
- (4) 1.0 inch diameter clear view optical quartz windows
- Demountable optical first-stage radiation shield
- Demountable optical outer vacuum shroud
- 45mm diameter coldhead sample mount
- High power heater installed
- (2) 10-pin electrical feedthroughs with mates
- (2) Spare blank feedthrough ports
- Reliable bellows style evacuation valve
- Vacuum shroud safety pressure relief
- Gold plated OFHC copper optical sample holder
- (2) matching silicon diode temperature sensors
- Startup toolkit with operational manuals

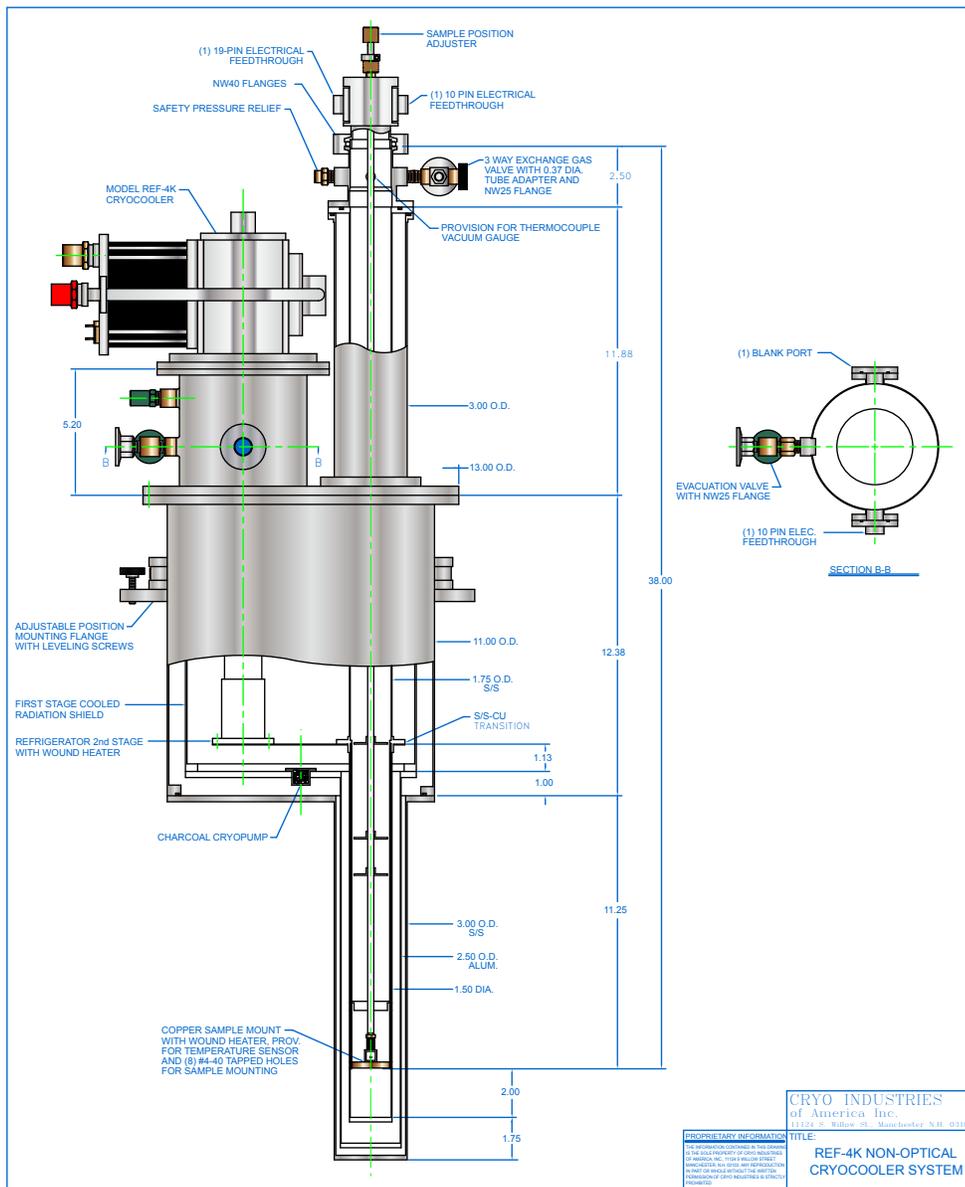
Variable Temperature Optical Closed Cycle Refrigerator System (1.0Watt @ 4 K SHI Refrigerator)



System Features

- 4 K to 325 K operating temperature range
- Two stage Sumitomo SRDK-408D2 GM (Gifford-McMahon) refrigerator coldhead
- 1.0W @ 4 K coldhead second stage cooling power.
- 31W/37W (50/60Hz) @ 40 K coldhead first stage cooling power
- Sumitomo Water cooled compressor (air cooled optional)
- Interconnecting hoses and control cable
- (4) 1.00 inch diameter clear optical quartz windows
- Demountable optical first-stage radiation shield
- Demountable optical outer vacuum shroud
- 2.520 inch (64 mm) diameter sample mount
- High power heater
- (1) 19-pin electrical feedthrough port
- (2) Blank feedthrough ports
- Reliable bellows style evacuation valve
- Vacuum shroud safety pressure relief
- Support base with support rods
- (2) Silicon diode temperature sensors
- OFHC copper optical "T" style sample mount
- Startup toolkit with operational manuals

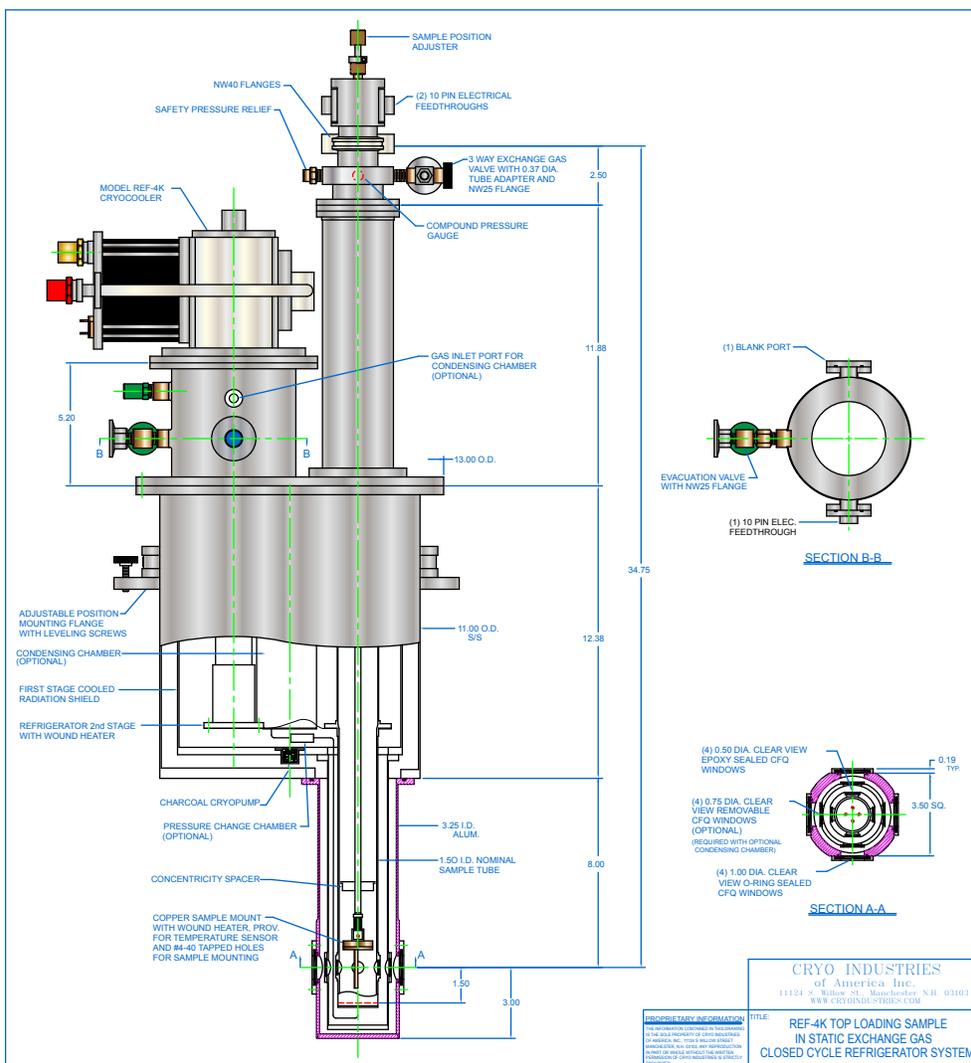
Top Loading Sample in Exchange Gas Non-Optical



System Features

- Refrigerator cooling power: 0.4 to 1.5 watt at 4.2 K available Sumitomo brand refrigerator
- Operating temperature range: 4 K to 325 K (standard unit), with optional 1.5 K low end temperature using one shot operating mode below 4.2 K, and 500 - 800 K high temperature ranges available
- Air or water cooled compressor
- Various size sample tubes available with larger sample tubes optional
- Top loading sample positioner assembly with vertical and rotational adjustment
- Two 10-pin electrical connectors with mates for sample tube
- "T" style copper sample holder
- Silicon diode temperature sensors installed or Cernox sample sensors for use in magnetic fields
- Three way exchange gas valve
- Optional gate valve for sample exchange/isolation
- Cryostat and sample tube safety pressure reliefs

Top Loading Sample in Exchange Gas Optical



System Features

- You select the refrigerator cooling power
- Operating temperature range: 4 K to 325 K (standard unit), with optional 1.5 K low end temperature using one shot operating mode below 4.2 K, and 500 - 800 K high temperature ranges available
- Air or water cooled compressor
- Various size sample tubes available with larger sample tubes optional
- Top loading sample positioner assembly with vertical and rotational adjustment
- Two 10-pin electrical connectors with mates for sample tube
- “T” style copper sample holder
- Silicon diode temperature sensors installed or Cernox sample sensors for use in magnetic fields
- Optional gate valve for sample exchange/isolation
- Cryostat and sample tube safety pressure reliefs
- Reliable bellows style evacuation valve
- (4) 0.50” diameter clear view epoxy sealed CFQ windows
- (4) 0.75” diameter clear view removable CFQ windows (Optional) (Required with optional condensing chamber)
- (4) 1.00” diameter clear view O-Ring sealed CFQ windows

Custom 4 K Closed Cycle Refrigerator Systems

Cryo Industries is able to **custom design** a system that will meet all of your experimental needs. You supply us with you experimental specifications and we will provide you with a system that is guaranteed to meet those needs!



Custom 4K Sample in Vacuum Refrigerator System with Compact, Rectangular Optical Tail for Electromagnet



Custom 4K 1.0 W UHV Rubber Bellows Refrigerator System with Sample in Vacuum & Bellows Vibration Isolated Coldfinger



Custom 4K 1.0 W Sample in Vacuum Optical Refrigerator System with Bottom Window



Special Sample in Exchange Gas Optical Refrigerator System



4K 0.5W Sample in Exchange Gas Optical 4.2 K Pulse Tube Refrigerator System



Custom 4 K 1.0 W Sample in Vacuum Tubular Refrigerator System