CRYO

RC102 & RC110 Sample in Vacuum Continuous Flow Cryogenic Workstation Cryostats

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INDUSTRIES

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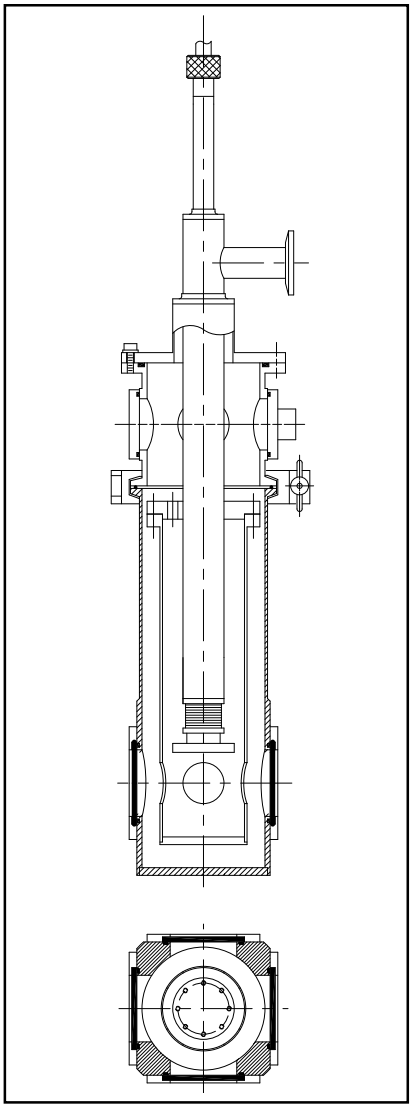
Designed by the inventor of the original SuperTran, CryoTran and RC110 continuous flow cryostats. The RC102 and the RC110 are the superior, versatile flow cryostats. These systems offer the fastest cooldown, highest efficiency and greatest stability in the industry – compare! PLUS, our outstanding accomplishments extend into efficient manufacturing – offering the best technology at the lowest price!

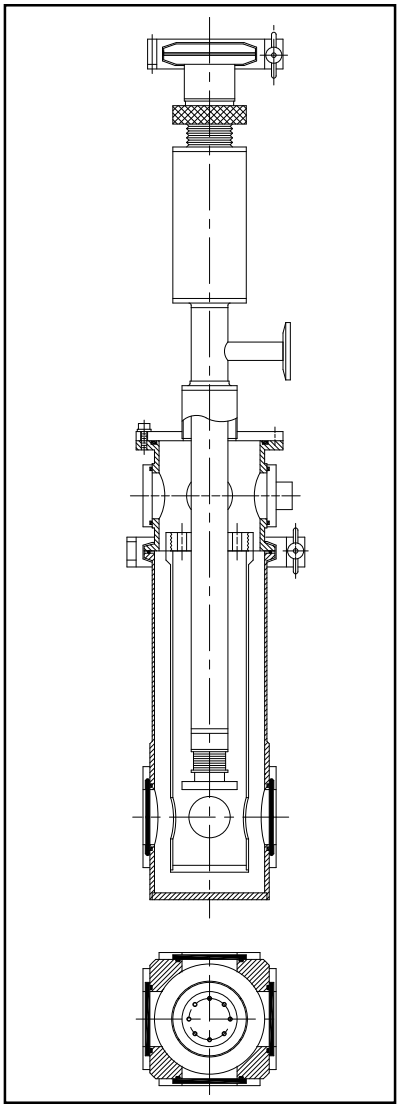
These high-tech systems are easy to operate – SOPHISTICATED SIMPLICITY, VERSATILITY and "**PERFORMANCE BY DESIGN**". The highly efficient detachable stainless steel flexible transfer line connects the cryostat to the dewar. A needle valve allows fine adjustment of flow. A heater attached to the sample mount supplies the additional heat required to obtain higher temperatures. Uses either liquid helium or nitrogen. Super variable temperature operation from <2 K to 325 K (up to 1000 K extended temperature range available).

The standard system includes a 6 foot (8 foot optional) transfer line with a 48 inch (60 inch optional) storage dewar leg.

RC102



RC110



Designed by the inventor of the original SupeTran, CryoTran and RC110 continous flow cryostats.

- Full $1^{1/2}$ inch diameter sample mounting surface
- More rigid 1 inch diameter support
- No special pumps needed to maintain cryogen flow
- Highest efficiency
- 4 window optical access
- Outstanding temperature stability
- Super variable temperature

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Drawings CRC-110-2 and CR-102 show the standard models RC102 and RC110. The following underlined phrases are cited in the drawings.

The typical experimental arrangement will consist of the RC102 or RC110 system, a liquid helium (or nitrogen) storage dewar, helium gas cylinder with pressure regulator, and a vacuum pump.

The transfer line is supplied with the system.

The storage dewar insert leg will be inserted into the liquid cryogen. A small pressure is used to transfer the liquid out of the storage dewar into the transfer line and directly to the sample mount. Pressure inside the storage dewar is adjusted using a helium gas cylinder containing helium gas. The flow control valve regulates the flow; fine control can be made by turning the valve control knob. The transfer line storage dewar insert leg seals to the standard 0.5 inch quick connect on the top of most storage dewars. The 48 inch length fits storage dewars up through 100 liters. An activated charcoal cryopump built into the transfer leg will automatically pump when inserted into liquid helium or nitrogen maintaining excellent vacuum operation during extended periods of operation.

The transfer line inserts into the cryostat from the top and quick disconnect for transfer line/WORKSTATION separation is standard.

Electrical connections to the sample are made through the O-ring sealed ports located on the instrumentation housing. Provisions are provided for future requirements with each port large enough to accept standard 61-pin connectors. Easy vacuum shroud removal or quick disconnect for sample access is provided. The top of the instrumentation housing is positive bolt sealed to prevent accidental tearing of the wiring from the system. Other systems use quick connects on the top and bottom of their instrumentation housing and if the wrong clamp is removed the wiring will be abruptly torn from the system.

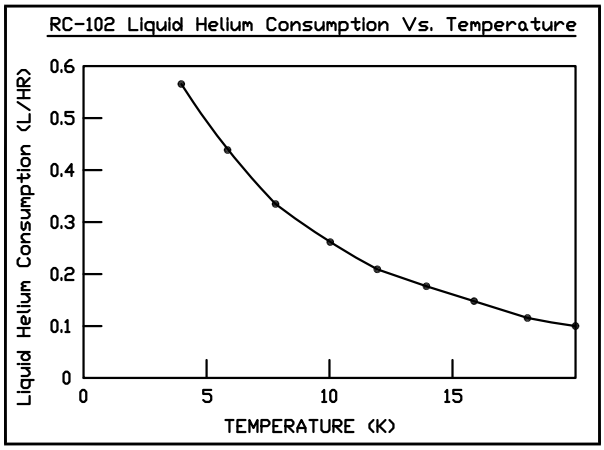
The evacuation valve for the transfer system is located above the valve control knob. The evacuation valve for the sample region is on the instrumentation housing. The vacuums are completely independent. The systems feature a large 1.50 diameter copper mount with wound heater, provision for temperature sensor and (8) #4-40 tapped holes for attaching your samples. Stable higher temperatures can be attained by using the heat obtained from the wound heater. Operation below 4.2 K is achieved by reducing the pressure at the helium vent.

A shorter 1 inch diameter support tube offers a more stable sample mount. Four window optical access standard; optional bottom window is available. The vacuum shroud can be rigidly mounted before using four (4) ¼ -20 mounting holes.

System specifications listed below are for a standard upright tubular cryostat.

Specifications

Temperature Range:	<1.8-300K (up to 1,000 K optional)
Cooldown Time:	10 minutes typical from 300 to 4.2 K (helium) 8 minutes typical from 300 to 77 K (nitrogen)
Cooldown Consumption:	0.20 liters typical from 300 to 4.2 K
Cryogen Consumption:	0.55 liters/hour (helium) at 4.2 K for RC102 0.75 liters/hour (helium) at 4.2 K for RC110 Lower at higher temperatures (see graph) 0.075 liters/hr (nitrogen) at 77 K
Refrigeration Capacity:	Over 2 watts at 4.2 K
Temperature Stability:	0.05 K for RC102 0.005 K for RC110
Orientation:	Any Position



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RC110

What is two-phase flow? Flow systems deliver liquid helium continuously over a long distance. During this transfer process, some liquid helium is vaporized. This gas cannot vent or escape from the transfer line so it flows with the liquid, two phase flow. This vapor-liquid flow cools the sample mount. When the vapor impinges on the sample mount, the temperature rises; when the liquid hits, the temperature drops; the result is temperature instability.

One solution to this problem is to surround and shield the sample cooling flow with another flow of liquid helium. Consequently, this added shield flow increase greatly the total liquid helium consumption.

The **RC110** uses the newest most advanced solution. An internal metallized phase separator eliminates all temperature fluctuations. Revolutionary temperature stability is obtained in the most difficult to control temperature region between 6 and 20 K, where two-phase flow causes problems.

Two-phase flow ceases to be a problem typically above 15 to 20 K where the flow can be reduced so that only gaseous helium exits the transfer line. At this point, all the liquid helium in the transfer line is vaporized; only gas (single phase) cools the sample mount.

The model **RC110** features convenient single thread radiation shield attachment. The most efficient use of available space is possible, shown in the 3 inch wafer cooler. The transfer line connects to the model RC110 WORKSTATION in an extra sturdy clamp arrangement, preventing undesirable bending of transfer line insert leg.

U.H.V.

RC102 and RC110 Ultra High Vacuum models feature rotatable “Conflat” interface flanges, your choice of 2.75, 4.50 or 4.62, etc. Distance from chamber interface to cold finger can be selected to fit exactly your chamber. Construction is all welded stainless steel with low vapor pressure silver brazed copper joints.

The model **RC110-UHV** has a heater assembly built on the end of the transfer line. This heater is not exposed to vacuum and is instantly accessible. (Note: The phase separator is not installed in this model). An optional heater that mounts directly to the inside of the sample mount is available for the model RC102; this heater is accessible through a mini “Conflat” flange.

COMPACT
COMPACT-SX TUBULAR

Many configurations are standard and available to meet your needs. The models **CRC-102C** and **CRC-110C** are standard compact versions. Extra compact models specifically designed for narrow gap magnetic studies are models **CRC-102SX** and **CRC-110SX**. The models **CRC-102-DT** and **CRC-110T** are tubular (non optical) cryostats. Other models are available **and *custom systems are no problem.***

INTEGRATED SYSTEMS

Turn-key integrated systems that include the Cryogenic WORKSTATION with thermometry or automatic temperature controller are available. Systems are fully tested with liquid helium to ensure complete integrated performance.

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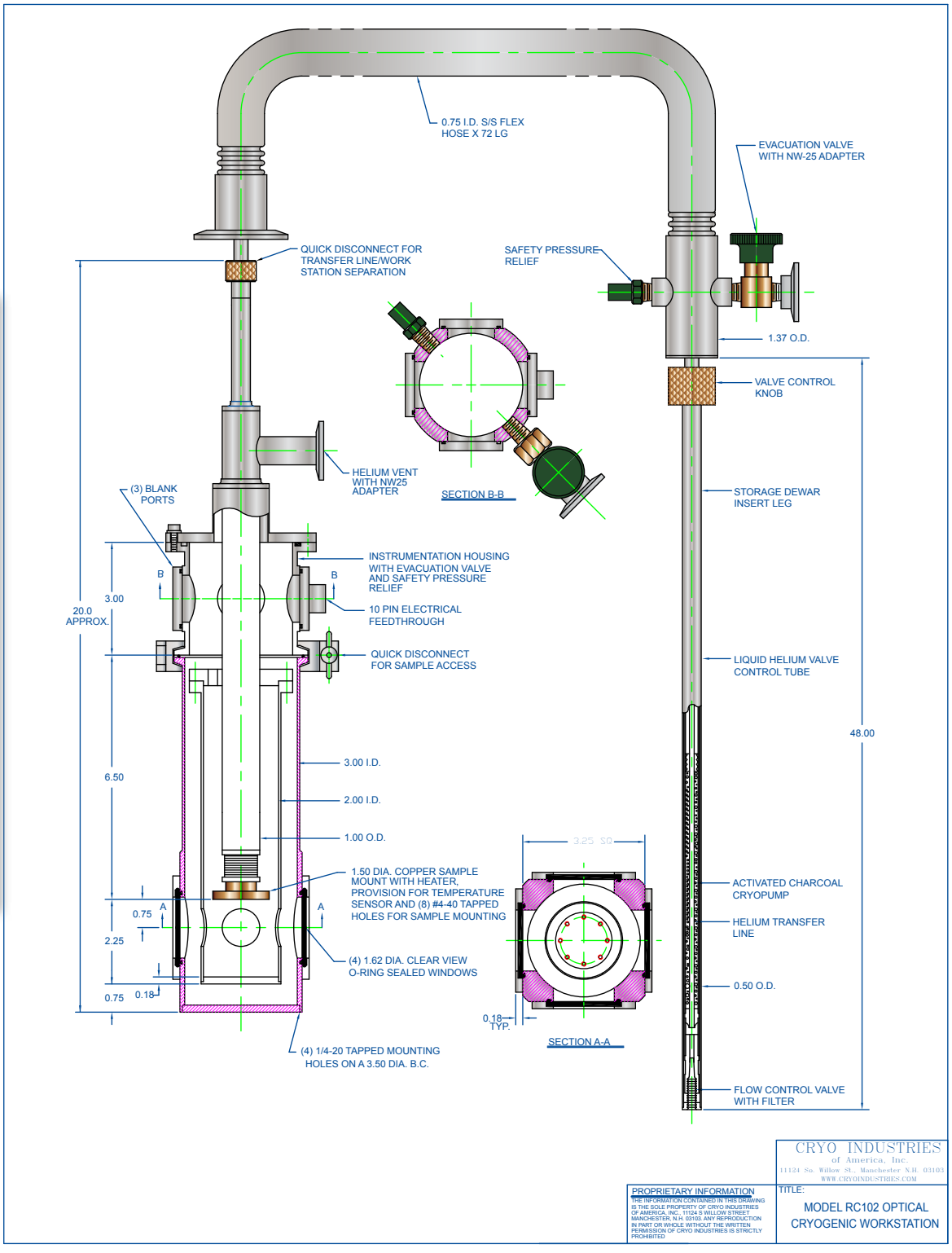
Standard Model RC-102 Optical Workstation



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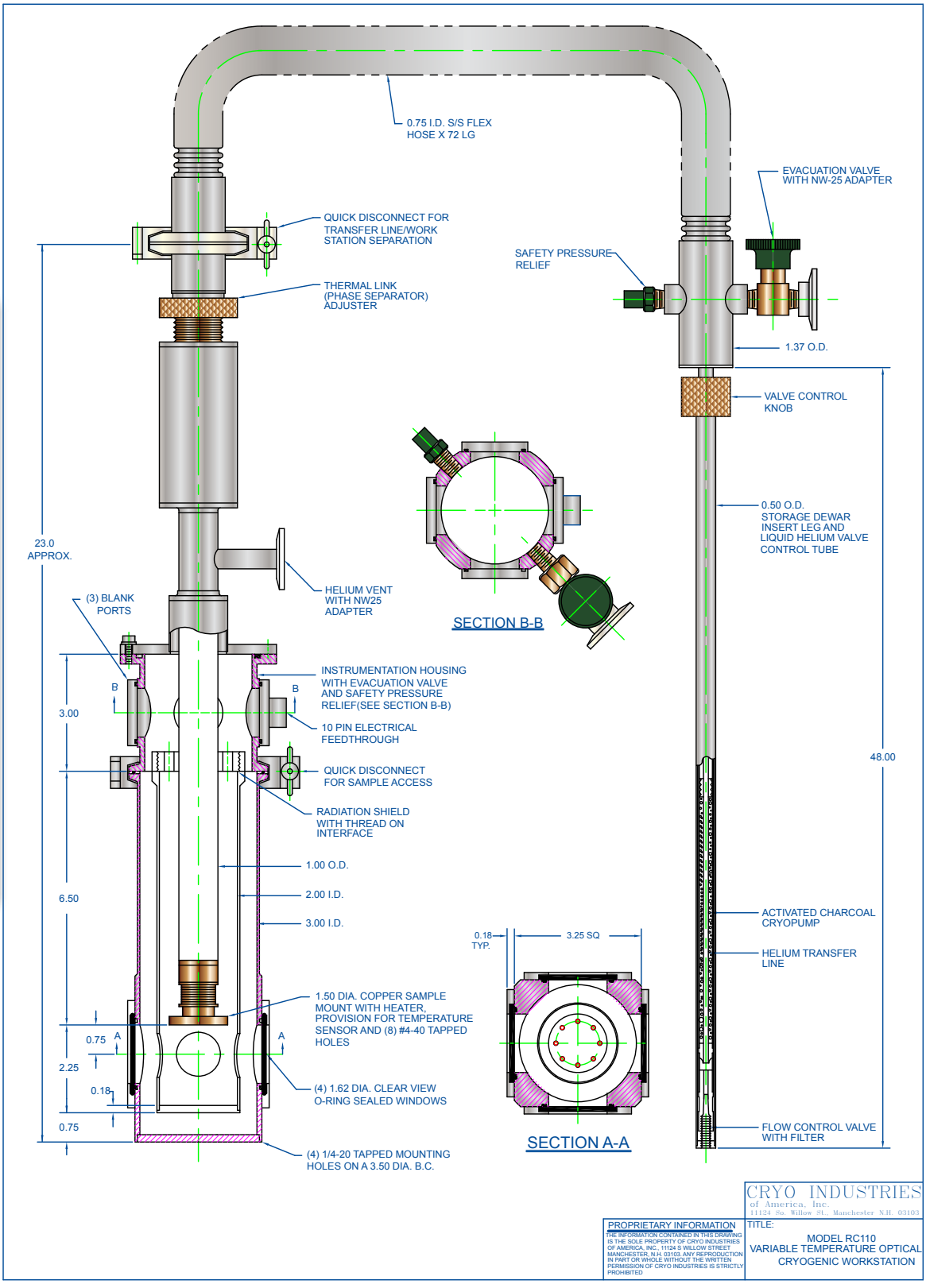
Standard Model RC-110 Optical Workstation



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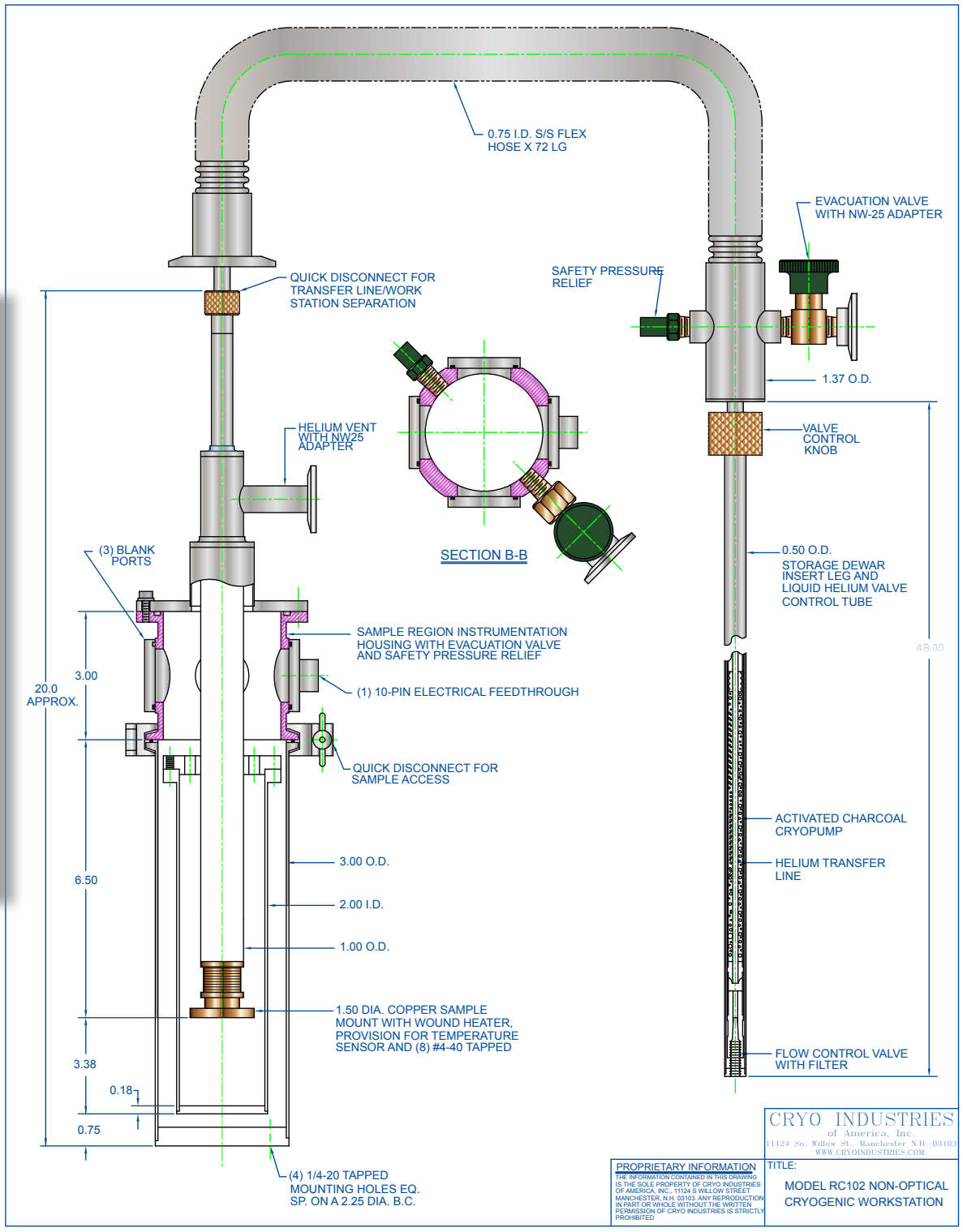
Standard Model RC-102 Non-Optical Workstation



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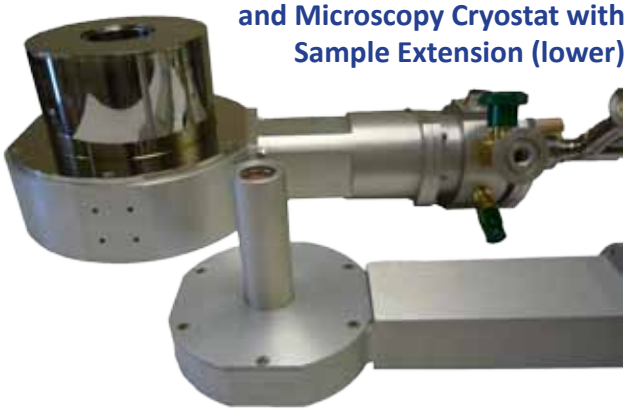
Cryo Industries is able to **custom design** a system that will meet all of your experimental needs. Following are examples of custom Models RC102 and RC110 that we have designed and manufactured over the years. You supply us with you experimental specifications and we will provide you with a system that is guaranteed to meet those needs!

Model RC102 in various configurations for use with Diamond Cell Anvil

Model RC-110 configured for Ultra High Vacuum Experiments

Model RC-102 Compact Optical with sample rotation (Left) and Model RC-102 with Linear Rotation for use with FTIR experiments (Right)

Model RC-102-CFM configured as Room Temperature Bore Microscopy Style for use with Superconducting Magnet (upper) and Microscopy Cryostat with Sample Extension (lower)



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