Helitran® — UHV Flow Cryostat

The ARS manufactured LT3B Helitran is a True UHV cold head (10-11 Torr) where all of the rubber o-ring seals have been replaced with welded joints and metal seals. Like all of our LT3 helium flow cryostats, the LT3B is an advanced liquid helium flow cryostat utilizing many unique features, such as the matrix heat exchanged and the coaxial shield flow transfer line to achieve unparalleled efficiency and ultra low vibration levels. The combination of True UHV and angstrom level vibrations makes the LT3B ideal for low temperature STM application. For UHV surface science where very long cold fingers are required we have the LT3M with customizable length up to 1200 mm and rigid support tube to allow for cleaving and manipulation.

Applications

- UHV
- STM
- Surface Science

Features

- True UHV (10-11 Torr)
- Bakeable to 200C
- Open Sample Space
- Optional Cold Tip Extensions
- Liquid Helium Flow (or Liquid Nitrogen)
- Matrix Heat Exchanged for High Cooling Efficiency
- Coaxial Shield Flow Transfer Line
- 4.2K Liquid Helium Operation (1.7K with Pumping)
- 0.7 LL/hr Liquid Helium Consumption at 4.2K (tip flow)
- Angstrom Level Vibrations
- Precision Flow Control
- Exhause Heater
- Operation in ANY Orientation
- Fully Customizable

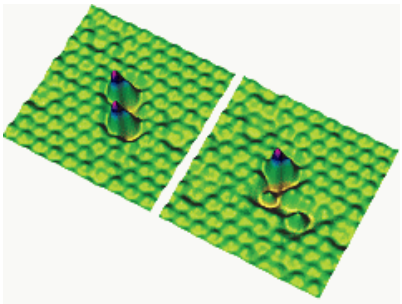
Typical Configuration

- Cold head (LT3B)
- Coaxial Shield Flow Transfer Line
- True UHV welded stainless steel instrumentation skirt with 2.75 in rotatable CF flange
- Dewar Adapter
- Flow Meter Panel for Helium Flow Control and Optimization
- Nickel Plated OFHC Copper Radiation Shield terminating 0.125 inch short of the cold tip
- Instrumentation for temperature measurement and control:
  - 10 pin UHV feed through
  - 36 ohm thermofoil heater (wire wrapped)
  - Silicon diode sensor curve matched to (±0.5K) for control
  - Calibrated silicon diode sensor (±12 mk) with 4 in. free length for accurate sample measurement.
- Wiring for electrical experiments:
  - 10 pin hermetic feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- High Flow Transfer Line
- 4.5 and 6 inch rotatable CF flanges available
- 450K High Temperature Interface
- 800K High Temperature Interface
- Custom temperature sensor configuration (please contact our sales staff
- Custom wiring configurations (please contact our sales staff)
- Sample holder upgrades (custom sample holders available)

The above picture shows LT3B Helitran® with a radiation shield.



Single Molecule Chemistry

Courtesy of Prof. Wilson Ho, UC Irvine

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Cooling Technology

LT3	Open Cycle Cryocooler, Helitran
Refrigeration Type	Liquid Helium Flow
Liquid Cryogen Usage	Helium, Nitrogen Compatible

Temperature*

LT3B	< 4.2K - 350K (<2K with pumping)
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	Base Temp - 450K
Stability	0.002 K

*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load

Sample Space

Diameter	Large Open Radiation Shield
Height	Large Open Radiation Shield
Sample Holder Attachment	1/4-28 screw
Sample Holder	www.arscryo.com/sample-holders

Temperature Instrumentation and Control (Standard)

Heater	36 ohm wire wrapped Thermofoil Heater anchored to the coldtip
Control Sensor	Curve Matched Silicon Diode installed on the coldtip
Sample Sensor	Calibrated Silicon Diode with free length wires

Contact ARS for other options

Instrumentation Access

Instrumentation Skirt	Welded Stainless Steel
Pump out Port	1 - NW 25
Instrumentation Ports	2 (1.33 Mini Conflat Flanges)
Instrumentation Wiring	Contact sales staff for options

Radiation Shield

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	Open End Radiation Shield terminated 0.125" short of cold tip (Customer Specified)

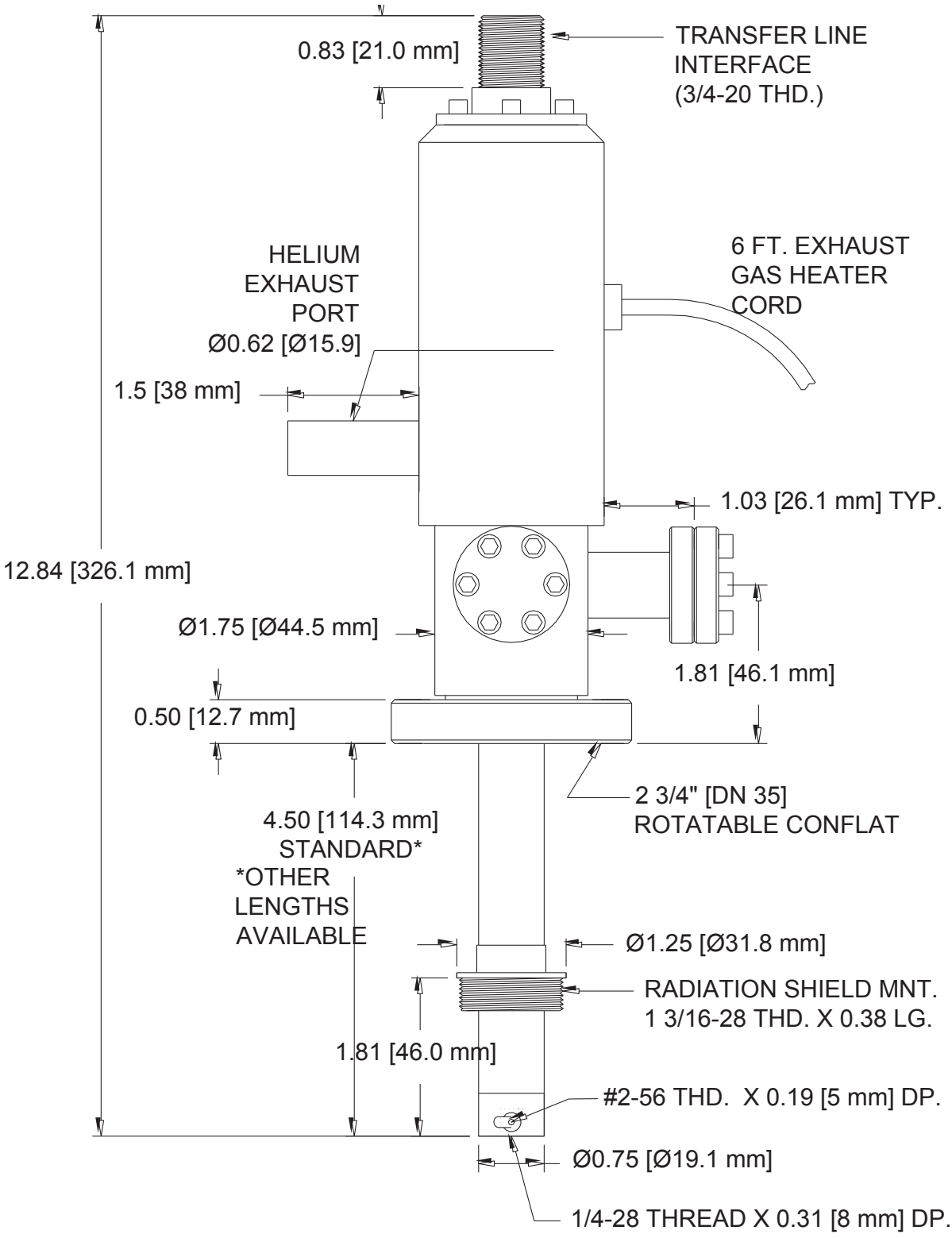
Cryostat Footprint

Overall Length	326 mm (12.84 in)
Motor Housing Diameter	N/A
Rotational Clearance	121 mm (4.8 in) with "G" Configuration

Cryostat Model LT3

Cryogen	Liquid Helium		Liquid Nitrogen
Base Temperature	4.2K	<2K with Pumping	77K
Nominal Helium Consumption at 4.2K	0.7 LL/hr	-	
Cooling Capacity	0.7 LL/hr	2 LL/hr	
4.2K	0.5W	1.5W	
20K	3.0W	8.0W	
50K	7W	20W	
Maximum Temperature	450K with cold gas through transfer line		
Cooldown Time	20 min		
Weight	0.9 kg (2 lbs)		

LT3B Outline Drawing



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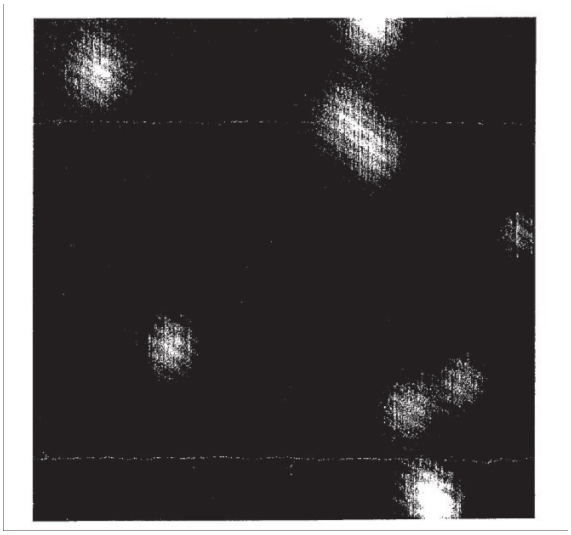
LT3B Vibration Image

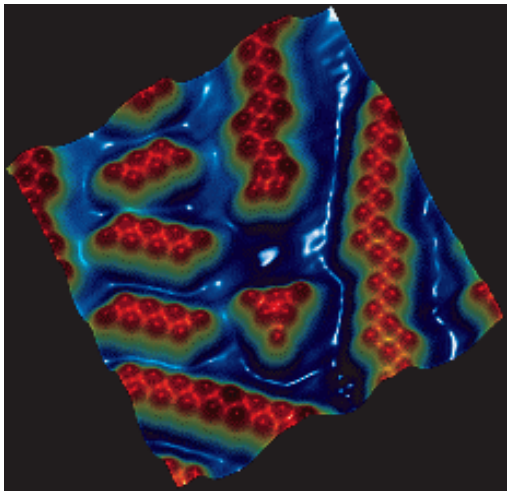


This image was taken by an STM scanner mounted directly on a LT3 Cold Tip.

This image as a scan area of 62 Å x 62 Å you can see the noise in the image is less than 3 Å.

Courtesy of Hyojune Lee, UCLA Elec. Engr.

STM Image



Courtesy of:
Prof. Michael F. Crommie,
University of California at Berkeley
Physics Department
Helitran® LT3B
120 x 120 Angstrom image of azobenzene molecules on Au(111) taken at T = 15K