Microscopy Cryostat - Ultra Low Vibrations

The **CS210F-GMX-20-OM** is the ARS Ultra Low Vibration Closed Cycle Cryostat for Optical Micrscopy applications such as MicroRaman and Micro Photoluminescence. The **CS210F-GMX-20-OM** uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE-210 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Sample vibrations of 10 nm have been exhibited. Due to the exchange gas being less conductive, the base temperature will increase by 4-5K and the cooling capacity is roughly cut in half at varying temperatures.

Applications

- Micro Raman
- Micro Photoluminescence (Micro-PL)
- Micro Spectroscopy
- Micro FTIR
- Low Vibration Optical Experiments
- Magneto-Optical Kerr Effect (MOKE)

Features

- Ultra Low Vibrations (10 nm)
- Supports working distances as small as 1.5mm
- Continuously Adjustable Sample Holder (1.5-7 mm)
- Low Profile Windows
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-210AF)
- Compressor (ARS-10HW)
- 2 Helium Hoses
- GMX-20-OM Ultra Low Vibration Interface
- Aluminum vacuum shroud with 1 window port for optical microscopy and electrical experiments
- Nickel Plated OFHC copper radiation shield
- 1 High purity quartz window
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feedthrough
  - 50 ohm thermofoil heater
  - 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 feedthrough
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- Transmission experiment upgrade
- Rotatable sample platter upgrade
- Magnet Post upgrade
- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (3W @ 10K)
- 450K High Temperature Interface
- 800K High Temperature Interface
- Turbo upgrade for faster cooldown times
- Custom temperature sensor configuration (please contact our sales staff)
- Custom wiring configurations (please contact our sales staff)
- Window material upgrades (custom materials available)
- Sample holder upgrades (custom sample holders available)

The above picture shows a DE-210SF cryocooler with a GMX-20-OM interface installed, including vacuum shroud, radiation shield, and sample holder.

The above picture shows the internal wiring and sample holder of the GMX-20-OM interface.

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Cooling Technology

DE-210	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Sample Vibrations

Independent Mounting	10 nm

Temperature* CS210SFg-GMX-20-OM

Sample stage, Base Temp	< 3.5K
Time to 20K	80min
Time To 4.2K	180mins
LHe Hold Time	40mins
Temperature Stability	3 mK

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

Sample Space

Diameter	19 mm (0.75 in.)
Height	1.5-7mm (Continuously
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/sample-holders

Optical Access

Window Ports	1 (2 with transmission option)
Diameter	25.4 mm (1 in)
Clear View	23 mm (0.9 in)
#/F	Variable
Window Material	www.arscryo.com/windows

Temperature Instrumentation and Control (Standard)

Heater	50 ohm 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	Bolt-On, Stainless Steel
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact ARS for options

Vacuum Shroud

Material	Aluminum
Length	39 mm (1.52 in) Sample Platter
Diameter	127mm (5 in) at the sample space
Width	127 mm (5 in) at the sample space

Radiation Shield

Material	Nickel Plated OFHC Copper
Attachment	Bolt On
Optical Access	1 (2 with transmission option)

Cryostat Footprint

Overall Length	787 mm (31 in)
Motor Housing Diameter	156 mm (6.14 in)

Cryocooler Model		DE-210AF		DE-210SFg	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<2.7K	<2.7K
Cooling Capacity*	4.2K	-	-	1.1W	1.1W
	10K	4W	4W	6W	6W
Radiation Shield Cooling Capacity		60W	60W	60W	60W
Cooldown Time	20K	35 min	35 min	40 min	40 min
	Base Temperature	70 min	70 min	80 min	80 min
Compressor Model		ARS-10HW		ARS-10HW	
Typical Maintenance Cycle		12,000 hours		12,000 hours	

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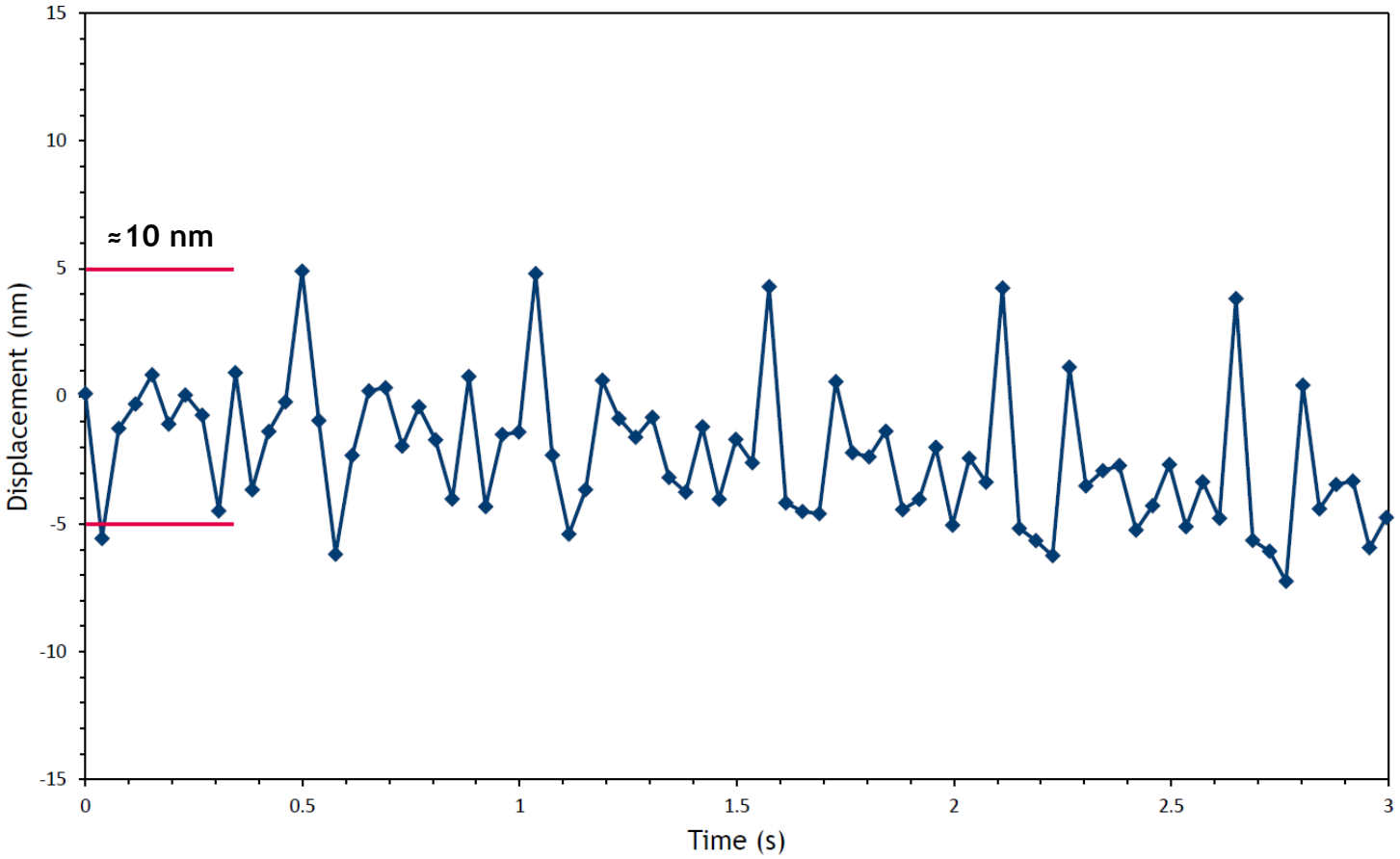
DE-210F-GMX-20-OM Vibration Spectra

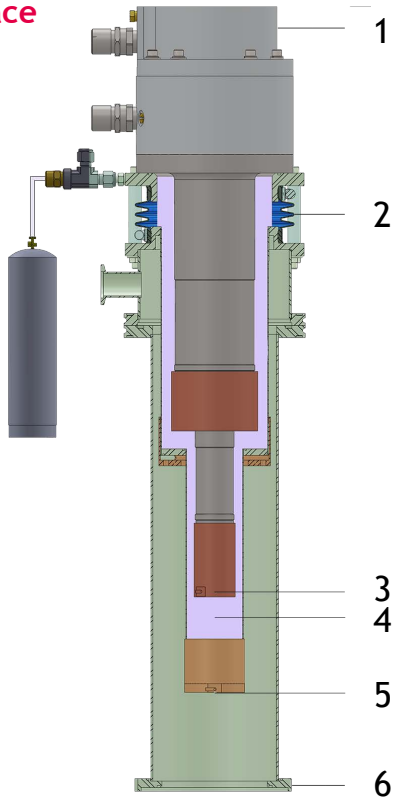
Data from System 17-A193



Understanding the GMX-20-OM Interface

The **X-20-OM** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 10 nm with the **DE210F-GMX-20-OM** (as shown above).

1. The Cryocooler is supported from a Floor Stand
2. The soft rubber bellows minimize vibrations transmitted to the sample while keeping in the Helium Exchange Gas.
3. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
4. Convective pockets of Helium Exchange Gas cools the sample space.
5. The sample is only in contact with the X-20 Interface
6. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



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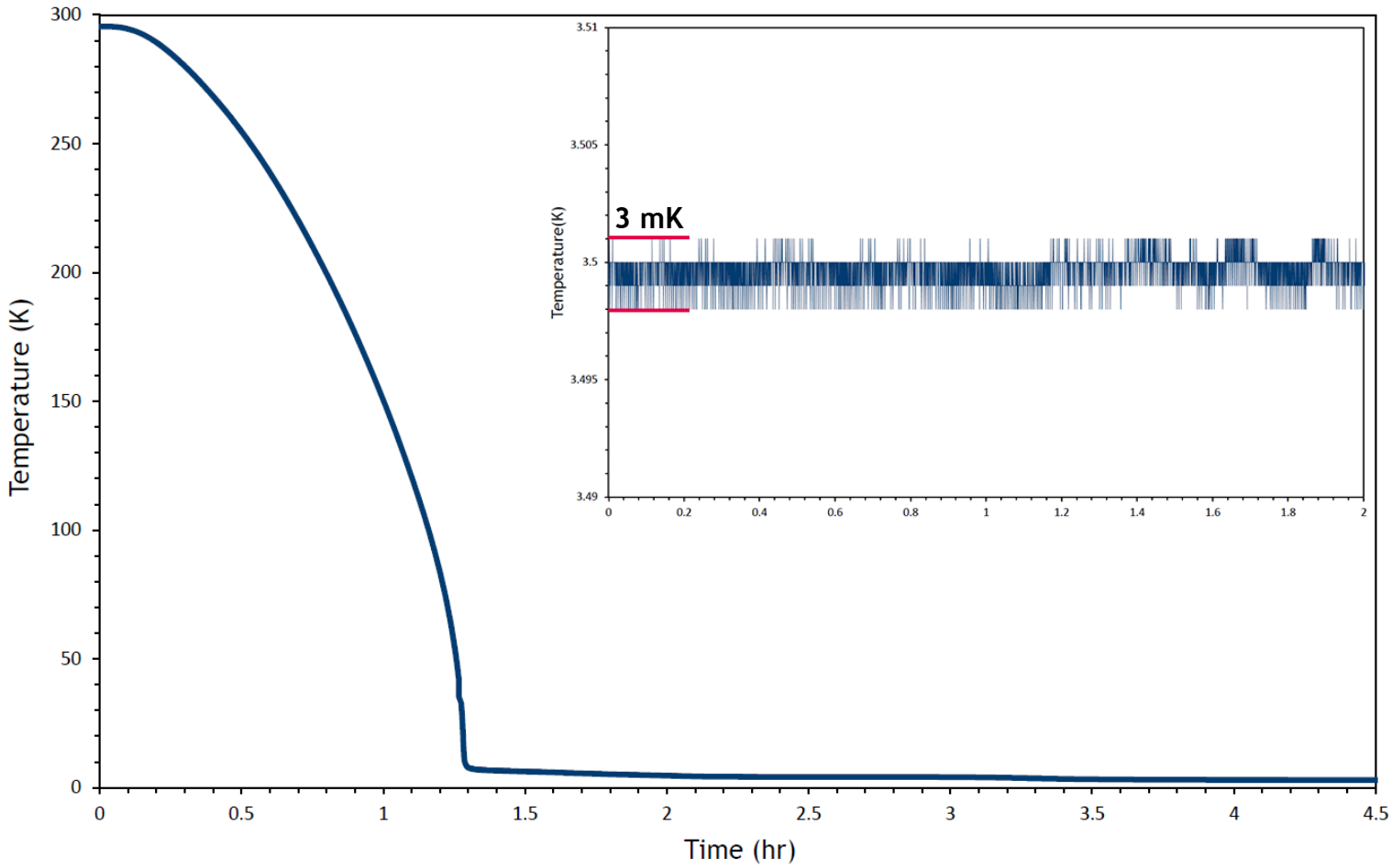
DE-210F-GMX-20-OM Cooldown Curve with Temperature Stability

Data from System 17-A193



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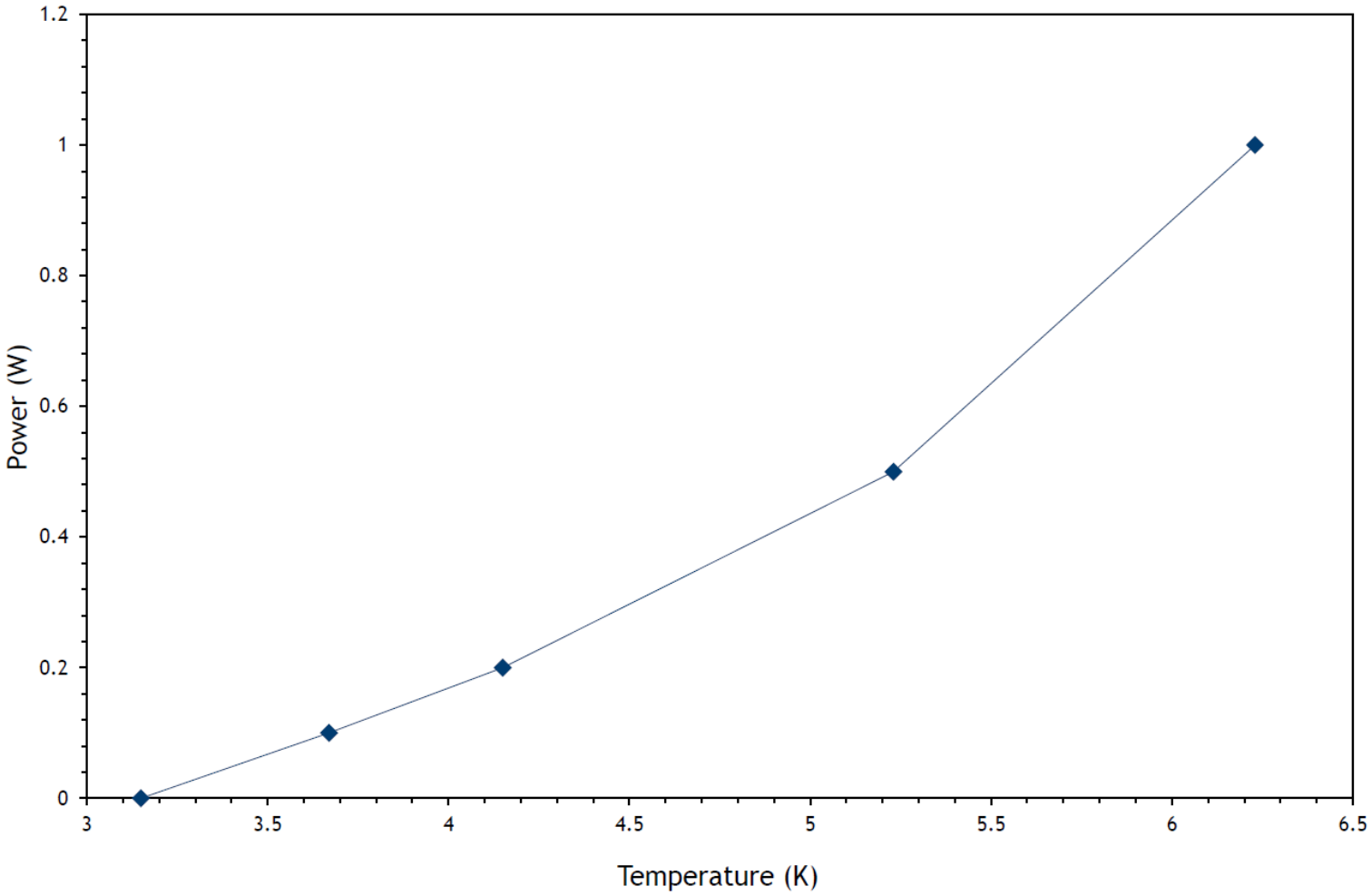
DE-210F-GMX-20-OM Cooling Power Curve

Data from System 17-A193



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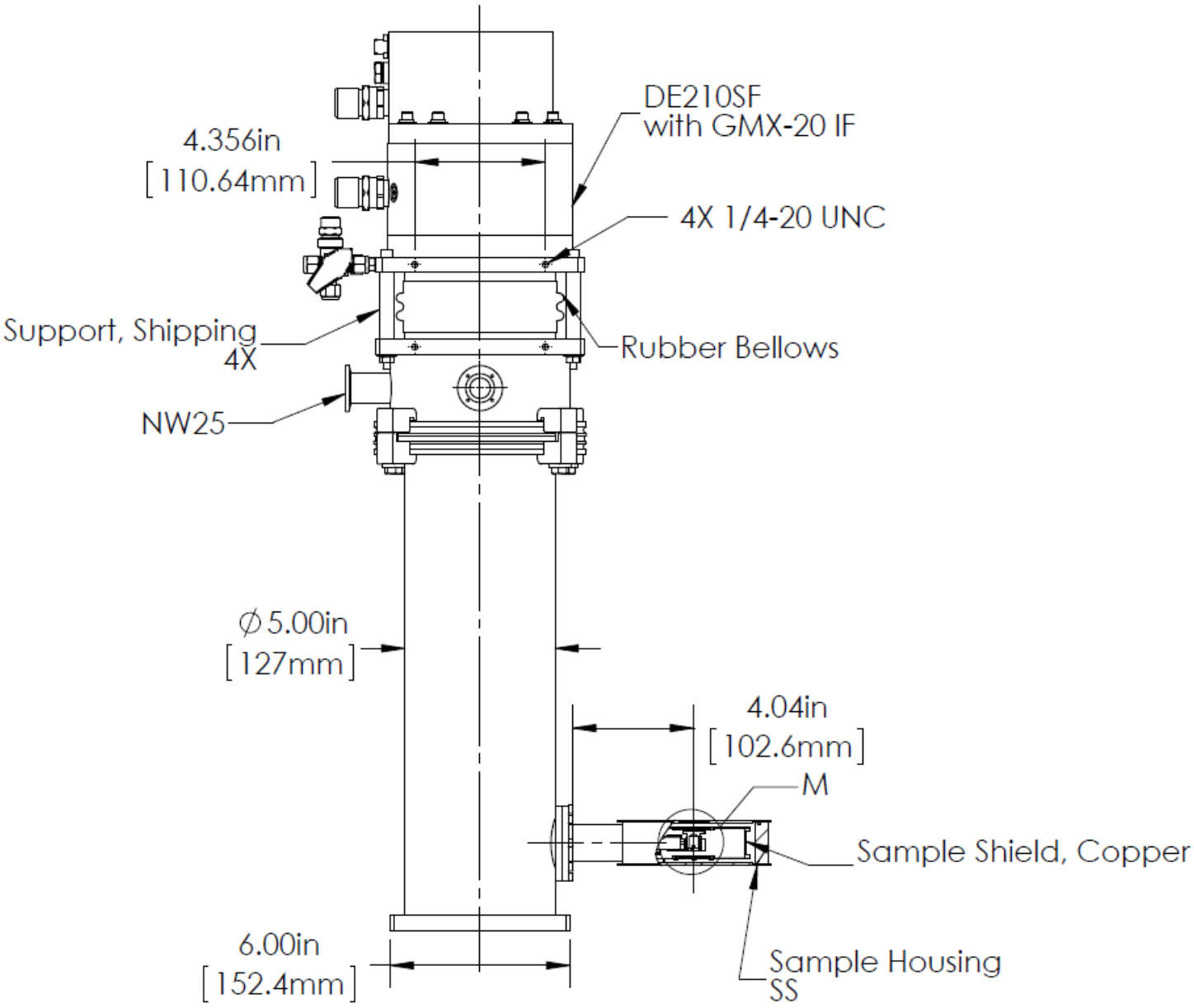
DE-210F-GMX-20-OM Outline Drawing



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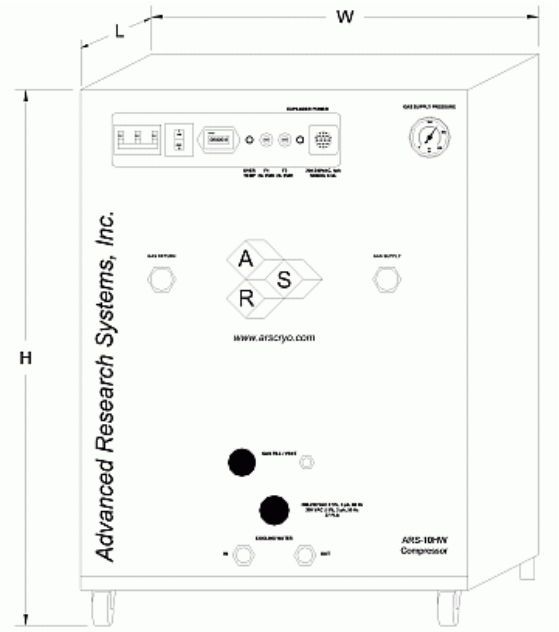
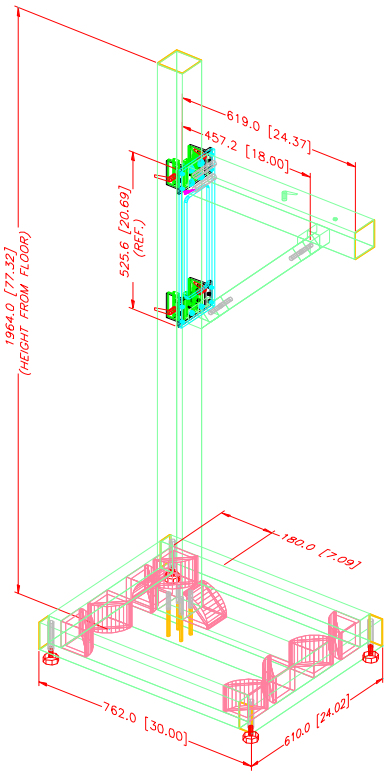
Direct Mounting

The GMX-20-OM can be direct mounted on the cryocooler. The vibrations at the sample will go up to 140 nm. It can be useful if the sample has to be translated in XYZ.

ARS-10HW Compressor



Floor Stand



Compressor Model		ARS-10HW	
	Frequency	60 Hz, 3 Phase	50 Hz, 3 Phase
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
High Voltage	Min	380 V	440 V
	Max	415 V	480 V
Power Usage	Three Phase	6.8 kW	6.8 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Ambient Temperature		5 - 40 C (40—104 F)	
Cooling Water	Consumption	5.7 L / min (1.5 Gal. / min)	
	Temperature	< 20 C (68 F)	
	Connection	1/2 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	533 mm (21 in)	
	H	617 mm (24.3 in)	
Weight		105 kg (230 lbs)	
Typical Maintenance Cycle		12,000 hours	