ARS Closed Cycle Cryocoolers

Series *DISPLEX*

DISTRIBUTORE ESCLUSIVO :

5Pascal

Cinquepascal S.r.l. *www.5pascal.it* *www.arscryo.com*
Via Boccaccio 108 - 20090 Trezzano s/N – MI info@5pascal.it
Tel.: +39-02-4455913 Fax: +39-02-48468659

ARS Cryocoolers

Advanced Research Systems, Inc manufactures its own series of Closed Cycle Cryocoolers. They are pneumatically driven GM Cryocoolers, that are offered as both single and two-stage units.

The single stage units are designed when fast cooldowns and high cooling capacities are needed. These systems have been modified to allow for high cooling capacities at 77K. The single stage units reach base temperatures of <25K. The cooling power at 77K ranges from **16W** to **200W.**

The two-stage units are designed for when low temperatures are needed. These system come available at 10K, <5.5K, and <4K cryocoolers. The cooling power at 4.2K are **0.1W**, **0.2W** or **0.8W**.

The above picture shows the ARS Cryocooler Family

Features

- Cryogen Free
- Displex, Pneumatically driven Gifford-McMahon closed cycle cryocooler designed for low sample vibrations.
- Simple, efficient design with only 3 moving components for high reliability.
- Easy field maintenance
- Low life cycle cost
- Water cooled compressor for quite and clean operation.

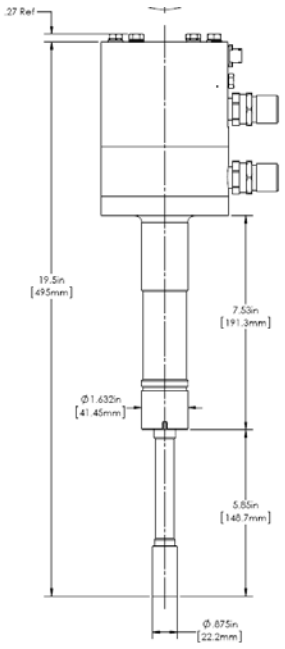
Standard Components

- Cold head (**DE102, DE104, DE110, DE202, DE204, DE210**)
- Compressor (**ARS-2HW, ARS-4HW, ARS-10HW)**
- 2 Helium Hoses

Options and Upgrades

- Turbo upgrade for faster cooldown
- 450K high temperature interface
- 800K high temperature interface

**Cooling Capacities are based on 60Hz performance with closed radiation shield. Actual sample temperature depends upon final configuration. 50Hz performance will be reduced.*

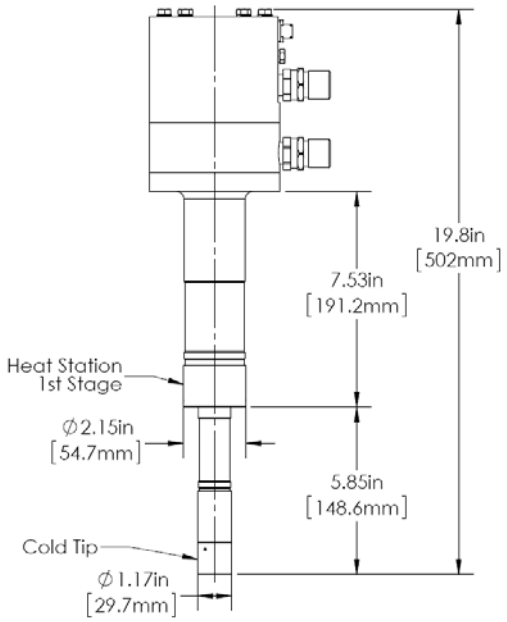


DE202 Cryocooler

Cryocooler Model		DE-202AF	DE-202A(T)F	DE-202PF	DE-202SF
	Frequency	60 Hz	60 Hz	60 Hz	60 Hz
Base Temperature		<9K	<9K	<5.5K	<4.2K
Cooling Capacity*	4.2K	-	-	-	0.1W
	10K	0.5W	0.7W	1W	1.2W
	20K	2.5W	3.7W	3.5W	4W
	77K	4W	6W	3.5W	4W
Radiation Shield Cooling Capacity		10W	15W	10W	10W
Cooldown Time	20K	50 min	35 min	60 min	60 min
	Base Temperature	70 min	50 min	90 min	90 min
Compressor Model		ARS-2HW	ARS-2HW	ARS-2HW	ARS-4HW
Typical Maintenance Cycle		12,000 hours	8,000 hours	12,000 hours	12,000 hours

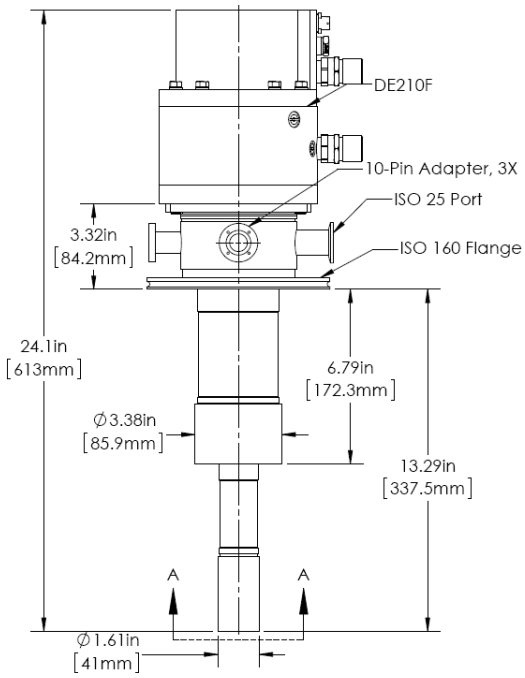
ARS Cryocoolers

DE204 Cryocooler



Cryocooler Model		DE-204AF	DE-204A(T)F	DE-204PF	DE-204SF
	Frequency	60 Hz	60 Hz	60 Hz	60 Hz
Base Temperature		<9K	<9K	<5.5K	<4.2K
Cooling Capacity*	4.2K	-	-	-	0.2W
	10K	2W	2.7W	3.5W	4W
	20K	9W	12W	8W	8W
	77K	17W	23W	14W	14W
Radiation Shield Cooling Capacity		18W	24W	18W	18W
Cooldown Time	20K	30 min	25 min	40 min	40 min
	Base Temperature	60 min	50 min	80 min	90 min
Compressor Model		ARS-4HW	ARS-4HW	ARS-4HW	ARS-4HW
Typical Maintenance Cycle		12,000 hours	8,000 hours	12,000 hours	12,000 hours

DE210 Cryocooler

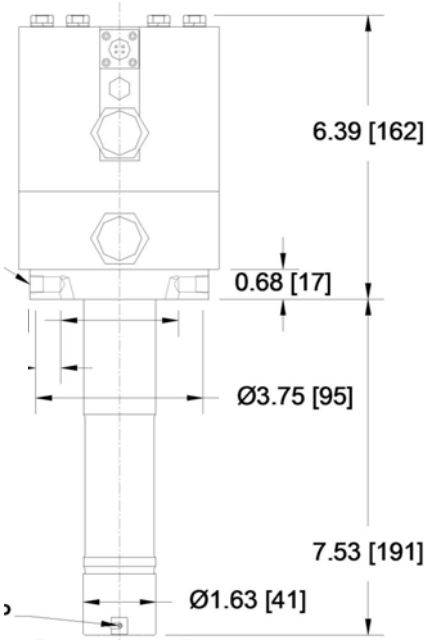


Cryocooler Model		DE-210AF	DE-210SF
	Frequency	60 Hz	60 Hz
Base Temperature		<9K	<3K
Cooling Capacity*	4.2K	-	0.8
	10K	4W	9W
	20K	17W	16W
	77K	25W	25W
Radiation Shield Cooling Capacity		60W	60W
Cooldown Time	20K	35 min	40 min
	Base Temperature	70 min	80 min
Compressor Model		ARS-10HW	ARS-10HW
Typical Maintenance Cycle		12,000 hours	8,000 hours

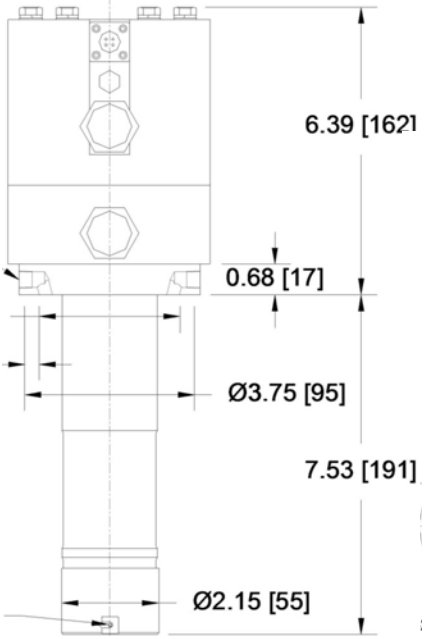
**Cooling Capacities are based on 60Hz performance with closed radiation shield. Actual sample temperature depends upon final configuration. 50Hz performance will be reduced.*

ARS Cryocoolers

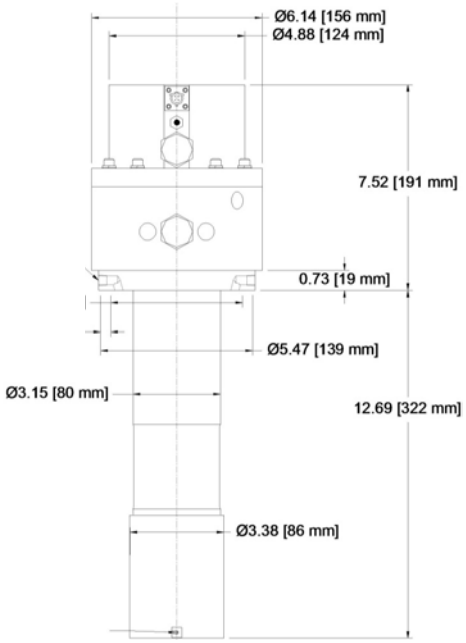
DE102 Cryocooler



DE104 Cryocooler



DE110 Cryocooler



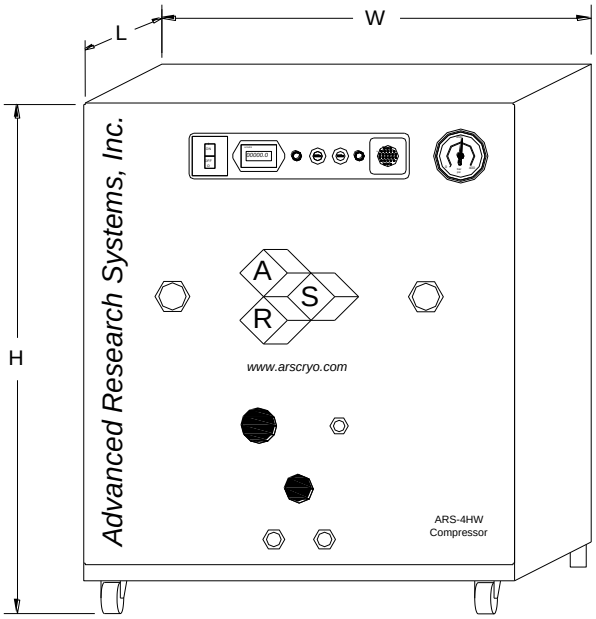
Cryocooler Model		DE-102F	DE-102(T)F	DE-104F	DE-104(T)F	DE-110
	Frequency	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
Base Temperature		<25K	<25K	<25K	<25K	<25
Cooling Capacity*	77K	16W	25W	35W	60W	200W
	150K	25W	38W	50W	90W	300W
Maximum Cylinder Temperature		355K	355K	355K	355K	355K
Cooldown Time-	77K	20 min	15 min	15 min	10 min	10 min
Weight [Expander] - kg (lb)		6 (13)	6.0 (13)	7.5 (17)	7.5 (17)	13 (28)
Compressor Model		ARS-4HW	ARS-4HW	ARS-4HW	ARS-4HW	ARS-10HW
Typical Maintenance Cycle		12,000 hours	8,000 hours	12,000 hours	8,000 hours	12,000 hours

**Cooling Capacities are based on 60Hz performance with closed radiation shield. Actual sample temperature depends upon final configuration. 50Hz performance will be reduced.*

ARS Cryocoolers

CoolPac

ARS Compressors



Compressor Model		ARS-2HW		ARS-4HW		ARS-10HW	
	Frequency	60 Hz, 1 Phase	50 Hz, 1 Phase	60 Hz, 1 Phase	50 Hz, 1 Phase	60 Hz, 3 Phase	50 Hz, 3 Phase
Standard Voltage	Min	208 V	190 V	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V	380 V	440 V
	15%		240 V		240 V	415 V	480 V
Power Usage		1.3 kW	1.2 kW	3.6 kW	3.0 kW	7.7 kW	7.7 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA			
Ambient Temperature		12 - 40 C (54—104 F)		12 - 40 C (54 - 104 F)		5 - 40 C (40—104 F)	
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)		5.7 L / min (1.5 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)		< 20 C (68 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting		1/2 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)		533 mm (21 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)		617 mm (24.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)		105 kg (230 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible		Not CoolPac Compatible	

1.7K Cryostat

The **DE302** is our lowest base temperature closed cycle cryostat. At its hear is the ARS manufactured DE-202 cryostat which pre-cools the helium gas. A Joulte Thompson (JT) circuit of ILL design acts as a third stage cooling stage, allowing the DE-302 to achieve base temperatures below1.7K, with **40mW** of cooling power at **2K**.

The DE-302 can be fitted with beryllium domes for cryostallography and x-ray diffraction experiments. And like the **DE-202*G**, the **DE-302*G** has the light weight and slim profile to fit on the Huber 512.12 cryostat mount.

Applications

- Crystallography
- X-ray Diffraction
- Neutron Scattering
- Resistivity
- Transport
- Non-Optical

Features

- Closed Cycle Cryocooler with Open Cycle Joule Thompson Circuit (ILL Design)
- Sample in static exchange gas, or in vacuum
- Designed to fit on a Huber cryostat carrier
- Cryogen Free, Low Power
- Displex, pneumatically driven Gifford-McMahon closed cycle cryocooler designed for low sample vibrations.
- Water cooled ARS-2HW compressor for quiet and clean operation.

Typical Configuration

- Cold head (DE-302AI)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Vacuum shroud, non-optical or beryllium dome
- Radiation shield, non-optical or beryllium dome
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 ohm thermofoil heater
  - Silicon diode sensor curve matched to (±0.5K) for control
  - Calibrated Cernox Sensor (±5 mk) with 4 in. free length for accurate sample measurement.
- Sample environment can be vacuum or static helium exchange gas using copper can mounted to tip with indium gasket.
- Stainless Steel gas capillaries for helium JT Circuit.
- Cold Trap to remove trace amounts of contaminants from the helium gas stream
- Dry pump for JT Circuit.
- Wiring for electrical experiments:
  - 10 pin hermetic feed through
  - 4 phosphor bronze wires
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- Liquid Nitrogen Flask
- Vacuum Pump System for Vacuum Shroud
- Custom wiring configurations (please contact our sales staff)

The above picture shows the bare DE302 cryocooler. This shows the copper sample can, but not the vacuum shroud or radiation shield. holder installed.

The above picture shows a system with Beryllium Dome Vacuum Shroud and Radiation Shield as well as the compressor and Trap for the LN2 Flask.

1.7K Cryostat

Cooling Technology-

DE-302	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-302A	< 1.7K - 350K
DE-302S	< 1.5K - 350K
Stability	0.002K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Vacuum Shroud - HMX-2D (Beryllium Domes)

Material	Stainless Steel
Length	384 mm (15.1)
Diameter	76 mm (3 in) at the sample space
Width	76 mm (3 in) at the sample space

Radiation Shield - RSH-2D (Beryllium Dome)

Material	Nickel Plated OFHC Copper/ Beryllium Dome
Attachment	Threaded
Optical Access	None

Sample Space - With Sample Can (Copper)

Diameter	17 mm (0.68 in.)
Height	41 mm (1.61 in.)
Sample Holder Attachment	1/4 - 28 screw

Temperature Instrumentation and Control - (Standard) -

Heater	36 ohm Thermofoil Heater anchored to the coldtip
Control Sensor	Curve Matched Silicon Diode installed on the coldtip
Sample Sensor	Calibrated Cernox 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 sales staff for options

Vacuum Shroud - HMX-3 (Non-Optical)

Material	Stainless Steel
Length	384 mm (15.1)
Diameter	76 mm (3 in) at the sample space
Width	76 mm (3 in) at the sample space

Radiation Shield - RSH-3 (Non-Optical)

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	None

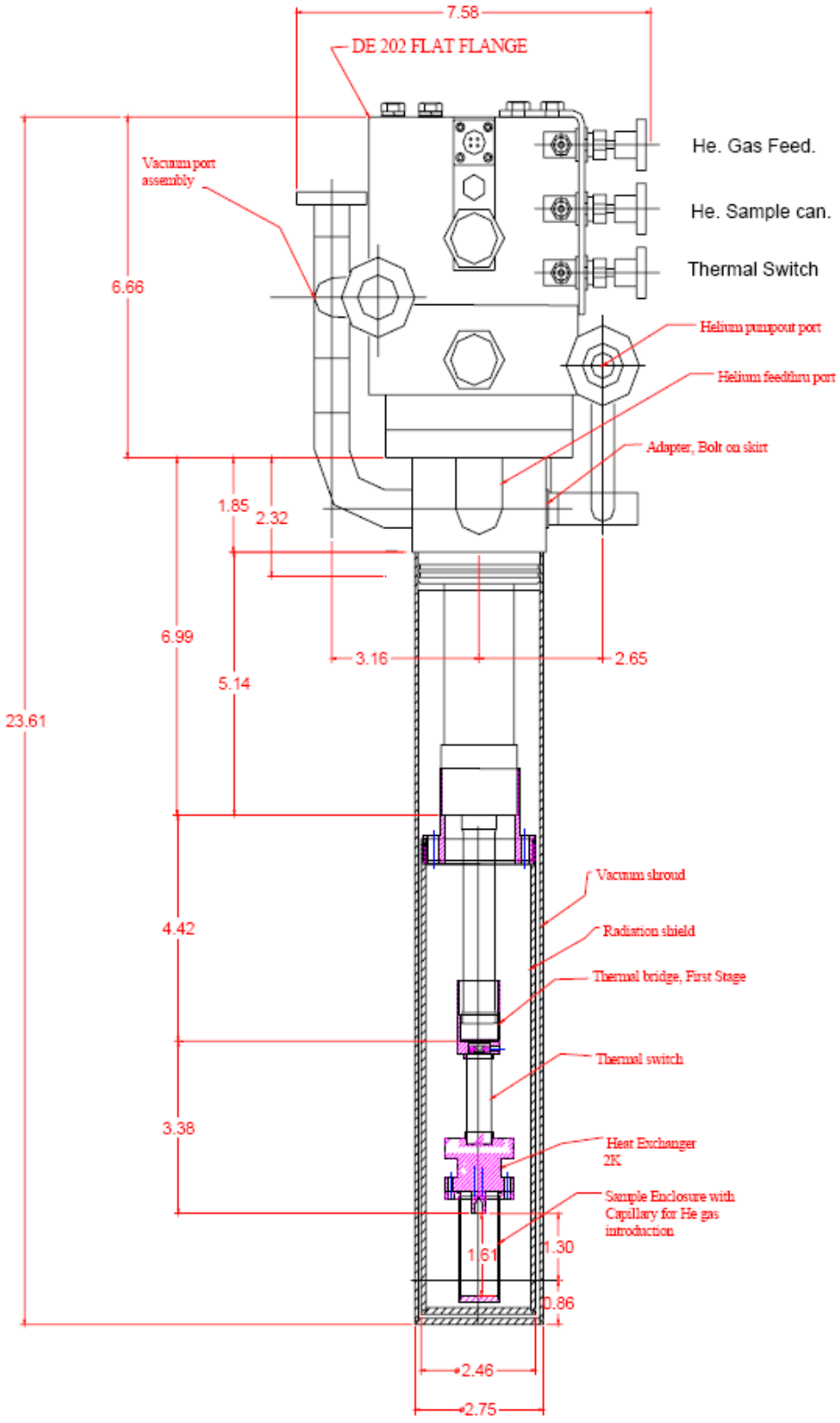
Cryostat Footprint -

Overall Length	600 mm (23.61 in)
Motor Housing Diameter	114 mm (4.5 in)

Cryocooler Model		**DE-302A**		**DE-302S**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<1.7K	<1.7K	<1.5K	<1.5K
Cooling Capacity	2K	40mW	40mW	40mW	40mW
Radiation Shield Cooling Capacity		10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	60 min	72 min
	Base Temperature	150 min	150 min	150 min	150 min
Compressor Model		ARS-2HW	ARS-2HW	ARS-4HW	ARS-4HW
Typical Maintenance Cycle		12,000 hours		12,000 hours	

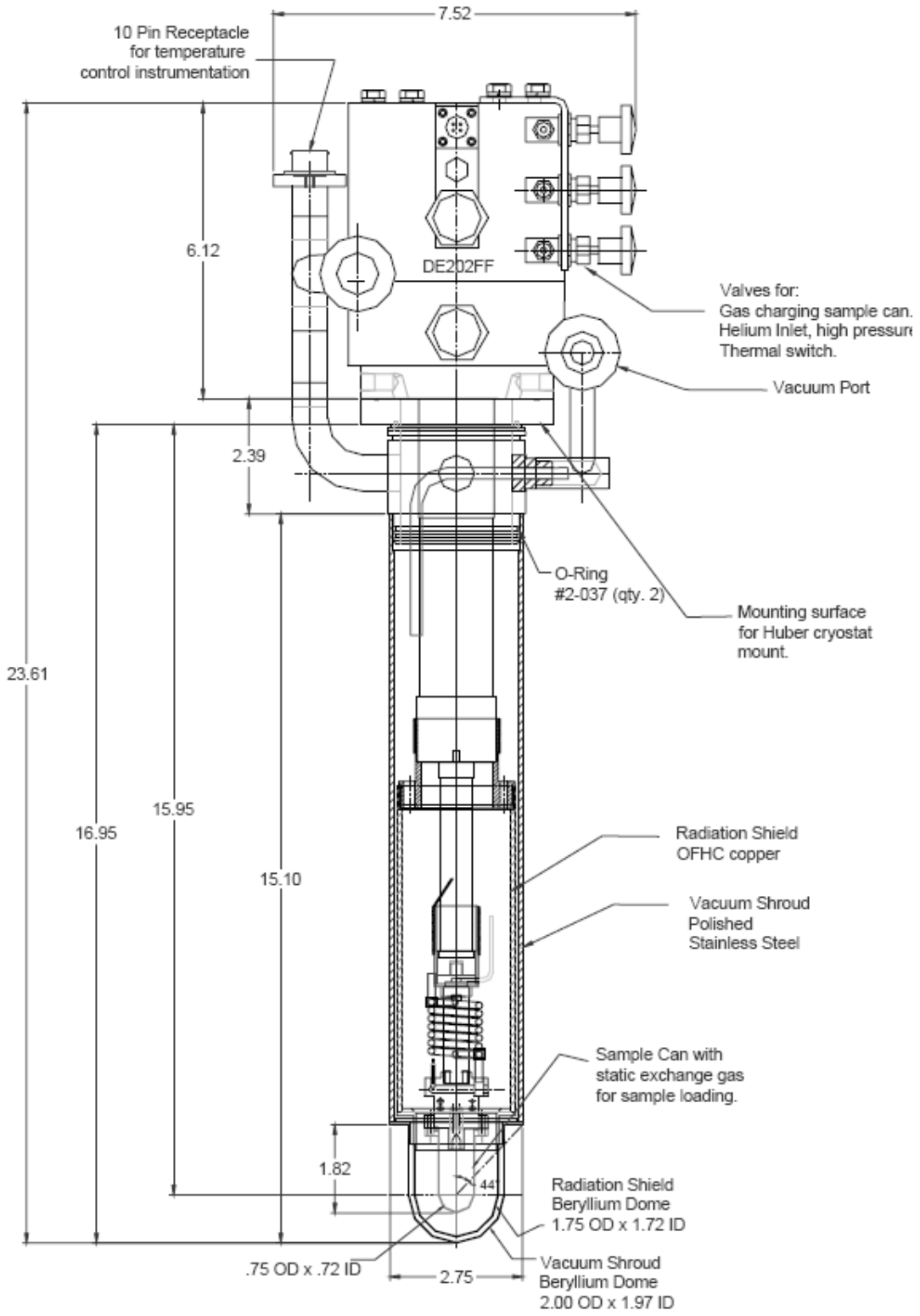
1.7K Cryostat

DE302*G-HMX-3 Outline Drawing



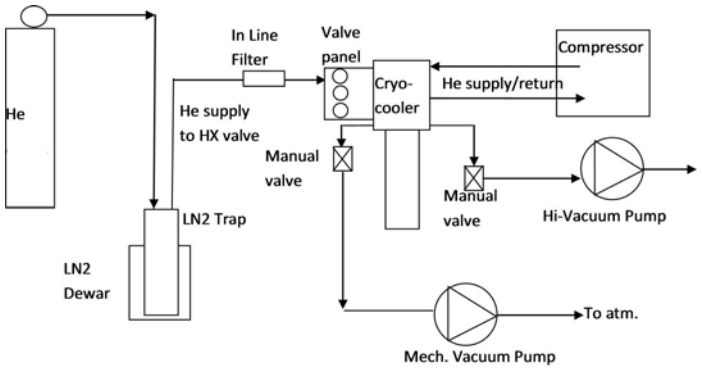
1.7K Cryostat

DE302*G-HMX-2D Outline Drawing

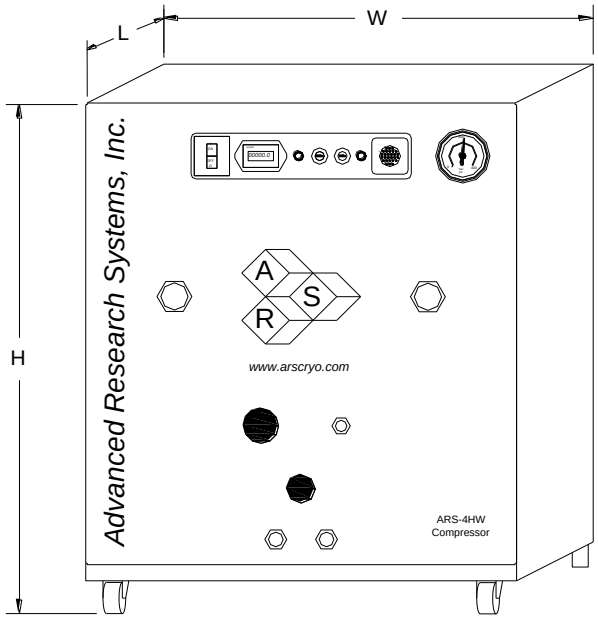


1.7K Cryostat

Typical Flow Diagram



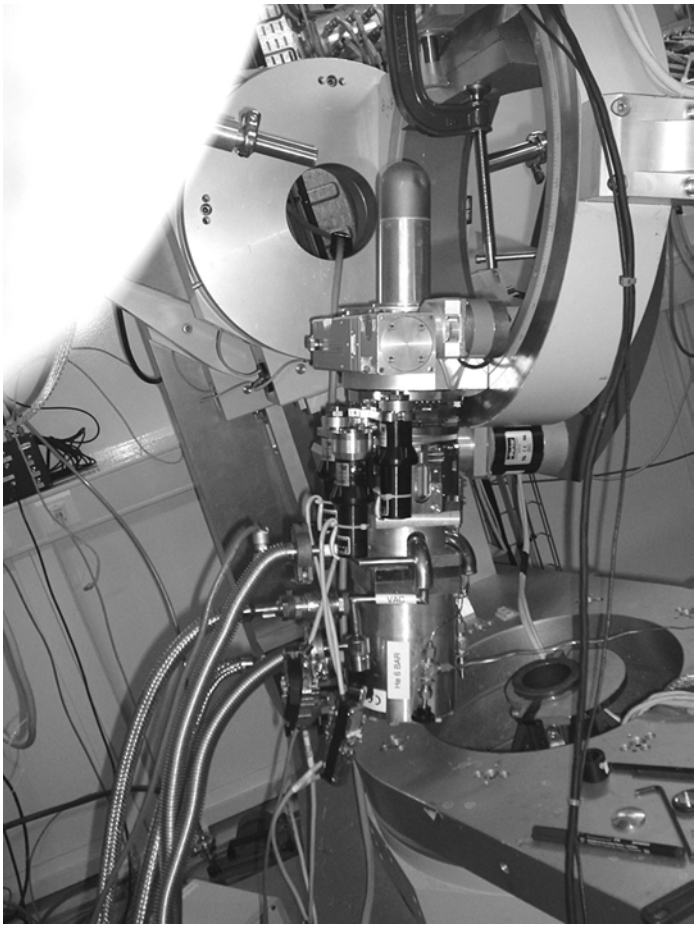
ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)			
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

1.7K Cryostat

2K Cryocooler Installed



DE-302 (ILL manufactured) installed on a Huber 5020 6 circle Horizontal Goniometer

Courtesy Xmas Beamline, ESRF, France

Cryostat Installation

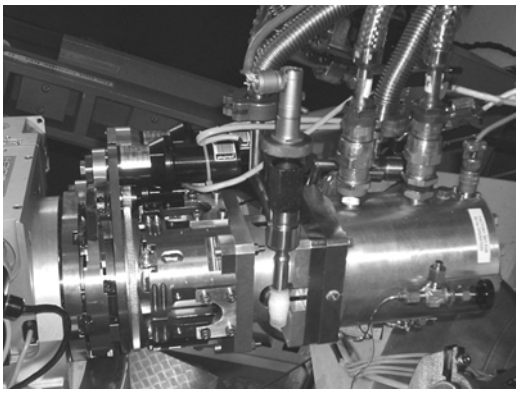
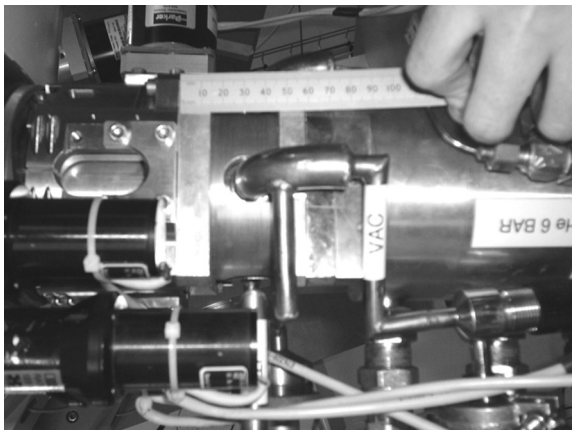


Photo shows the orientation o fall feedthroughs to clear the goniometer geometry. Some blind sports (shadow) is inevitable.

Courtesy: XMaS Beamline, ESRF, France

Extension for Huber Mount



Extension for Huber mount to align the sample holder with the center of the CHI Circle

Courtesy XMaS Beamline, ESRF, France

True UHV - Low Power

The **CS202*B** 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. A CF flange is directly welded to the cryocooler.

These True UHV systems are bakeable to 80C, and the 10K **CS202AB** is bakeable to 1200C if the displacer is removed. (Special Training Required).

Cold tip extensions are available to put the sample right where it is needed in the chamber. The extra cooling power of the CS204*B comes in handy when working with long cold tip extensions.

Applications

- UHV
- Surface Science
- UHV Manipulator for XYZ motion
- Photoemission Spectroscopy

Features

- True UHV (10-11 Torr)
- Bakeable to **80C** (10K version can remove displacer and bake to 200C)
- Open Sample Space
- Optional Cold Tip Extensions
- Cryogen Free
- Operation in Any Orientation
- Fully Customizable

Typical Configuration

- Cold head (DE-202AB)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Tue UHV welded stainless steel instrumentation skirt with 6” rotatable CF flange
- Nickel Plated OFHC radiation shield terminating 0.125” short of the cold tip
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin UHV feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4.5 and 8 inch rotatable CF flanges available
- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 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 True UHV Closed Cycle Cryocooler

The above picture shows an instrumentation skirt with the electrical feedthroughs rotated 90 degrees upwards to allow for tight rotational clearances.

True UHV - Low Power

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AI	< 10K - 350K
DE-202PI	< 5.5K - 350K
DE-202SI	< 4.2K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*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/Products/SampleHolders.html

Chamber Interface -

Flanges	CF, ISO
Size	4.5”, 6”, 8”, 10”

Temperature Instrumentation and Control - (Standard) -

Heater	36 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	True UHV Welded Stainless Steel
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Radiation Shield -

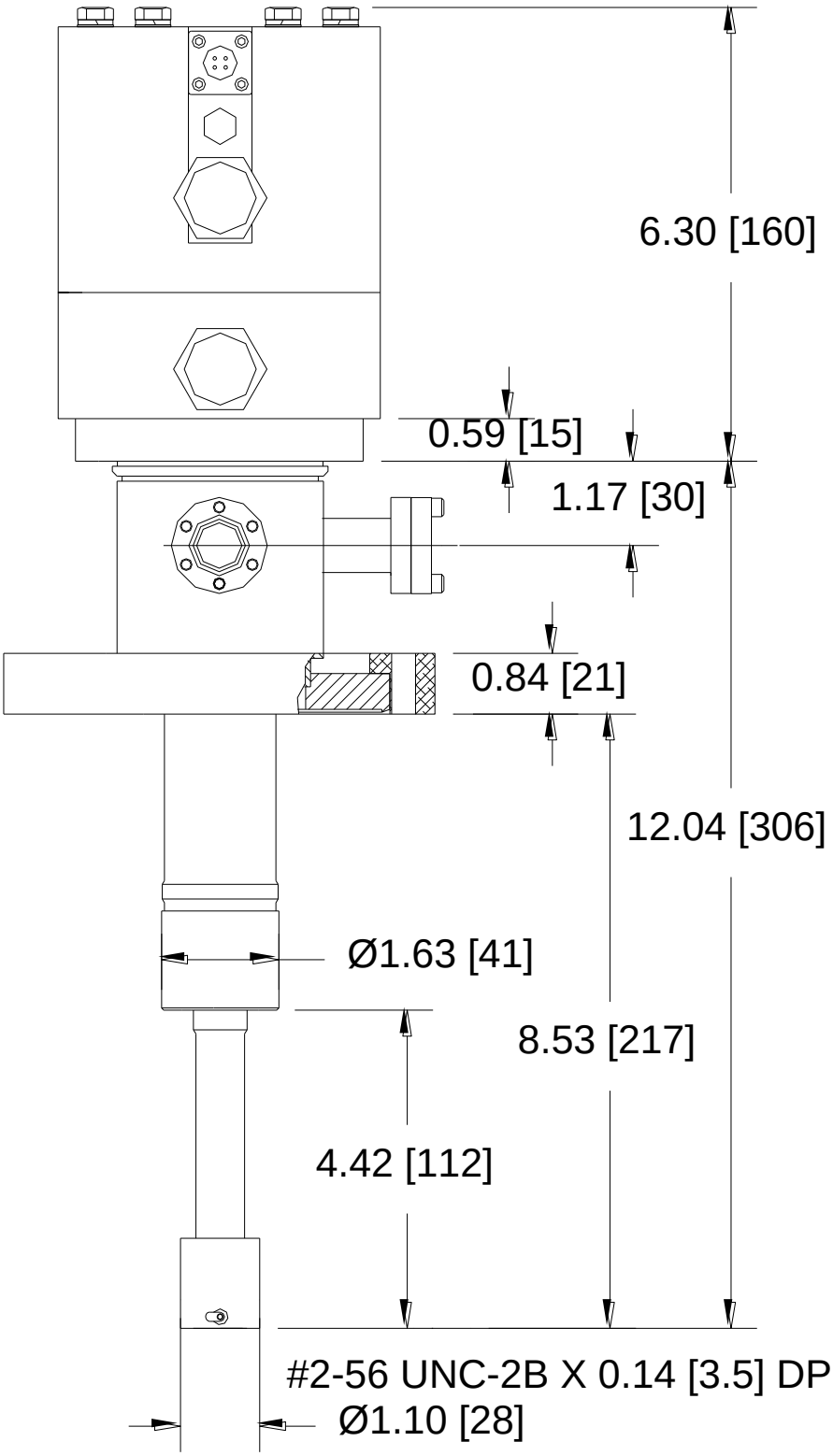
Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	Open End Radiation shield terminates 0.125” short of cold tip (customer specified)

Cryostat Footprint -

Overall Length	466 mm (18.34 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-202AB		DE-202A(T)B		DE-202PB		DE-202SB	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity*	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

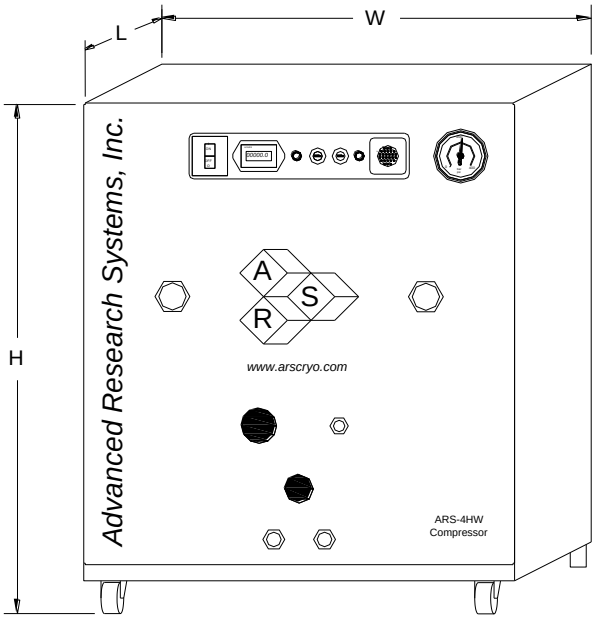
CS202*B Outline Drawing



True UHV - Low Power

CoolPac

ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)		12 - 40 C (54 - 104 F)	
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

Optical Cryostat - Economy

The **CS202*E-DMX-1AL** offers a wide range of flexibility at a low cost, making it an excellent choice for most sample and device testing. This system is well suited for optical, electrical, and magnetic sample testing.

Applications

- Optical
- Raman
- UV, VIS, IR
- FTIR
- Electro & Photoluminescence
- Resistivity/Hall Probe Experiments
- Diamond Anvil Cell
- Magneto-Optical
- PITS / DLTS
- Thermal, Electrical and Magnetic Susceptibility
- Magneto Optical Kerr Effect (MOKE)

Features

- Cryogen Free, Low Power
- Low cost aluminum construction
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/1)
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AE)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with 4 window ports for optical and electrical measures (DMX-1AL)
- Aluminum radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Optical Cryostat - Economy

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AE	< 10K - 350K
DE-202SE	< 4.2K - 350K
DE-202PE	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	36 mm (1.43 in.)
Height	39 mm (1.53 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	1
Window Material	www.arscryo.com/Products/WindowMaterials.html

Temperature Instrumentation and Control - (Standard) -

Heater	36 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, Aluminum
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	338 mm (13.3 in)
Diameter	76 mm (3 in) at the sample space
Width	76 mm (3 in) at the sample space

Radiation Shield -

Material	Aluminum
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

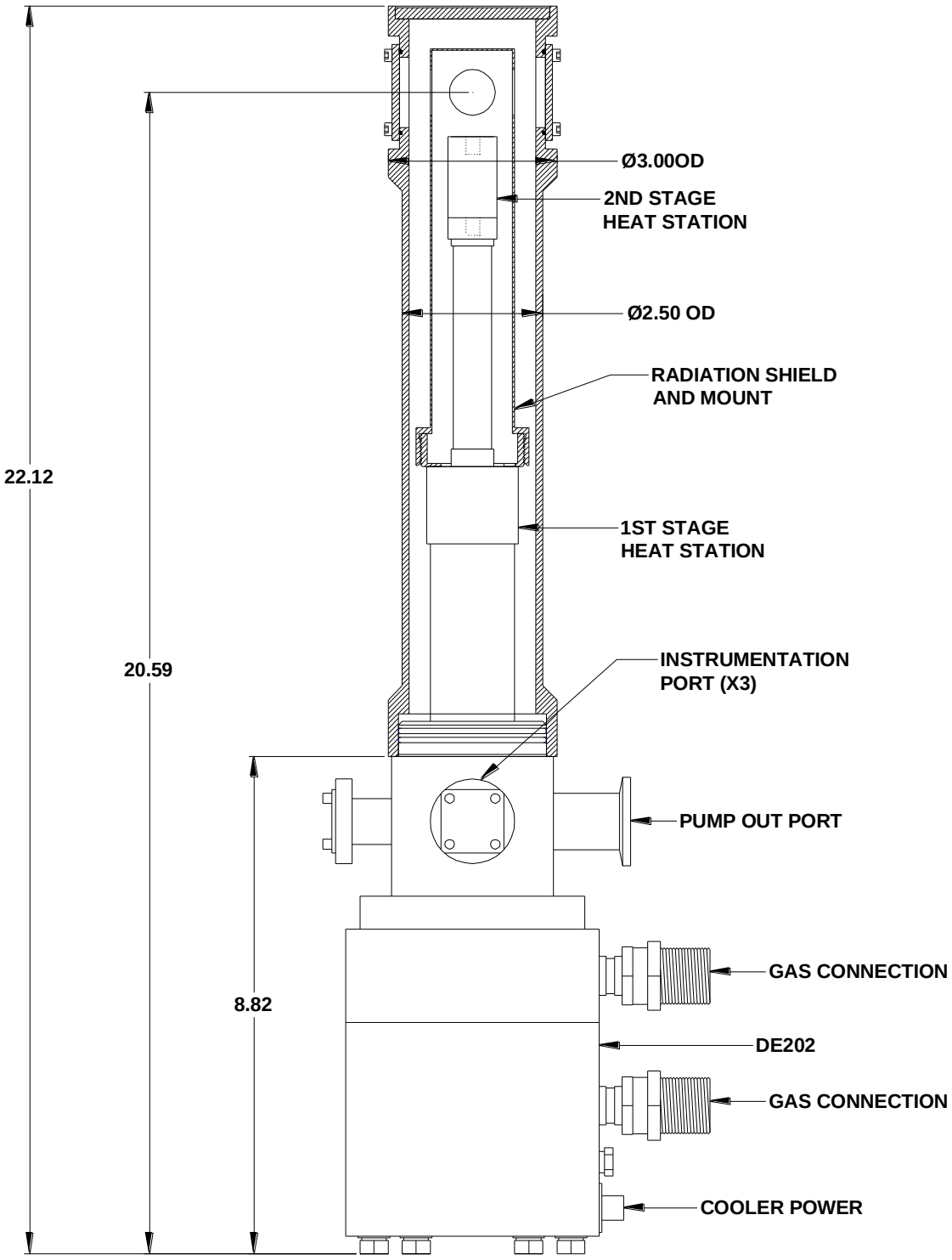
Cryostat Footprint -

Overall Length	562 mm (22.12 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-202AE		DE-202A(T)E		DE-202PE		DE-202SE	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

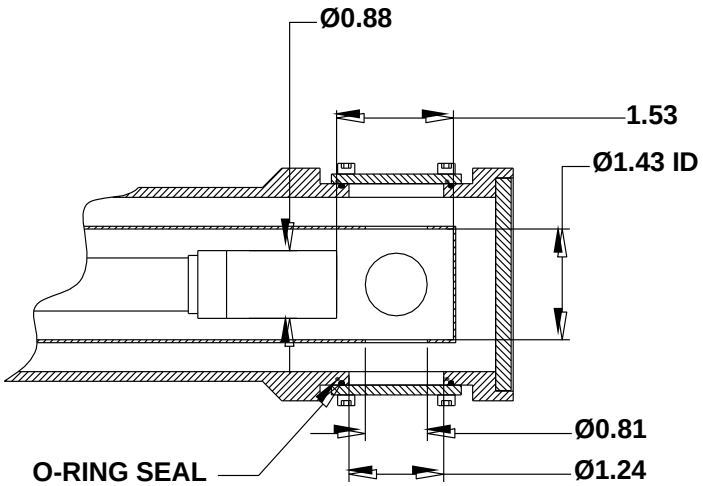
Optical Cryostat - Economy

DE202*E-DMX-1AL Outline Drawing

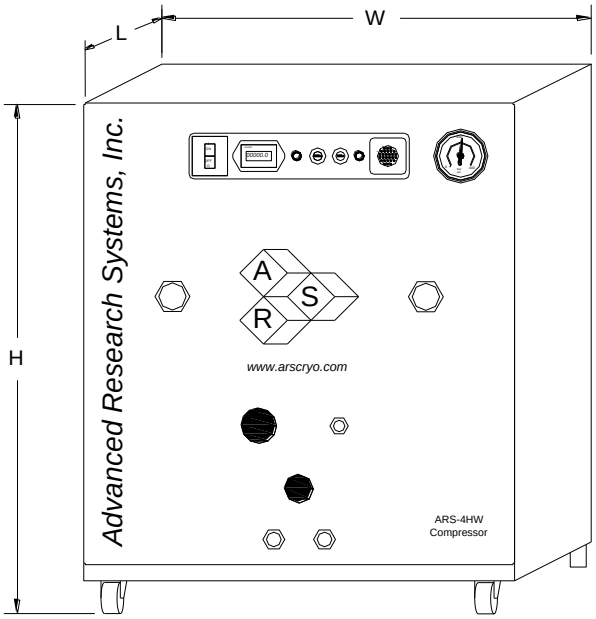


Optical Cryostat - Economy

Sample Space



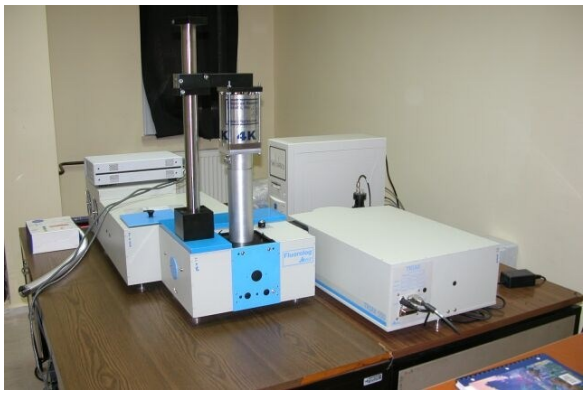
ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)			
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

Optical Cryostat - Economy

Optical Spectroscopy



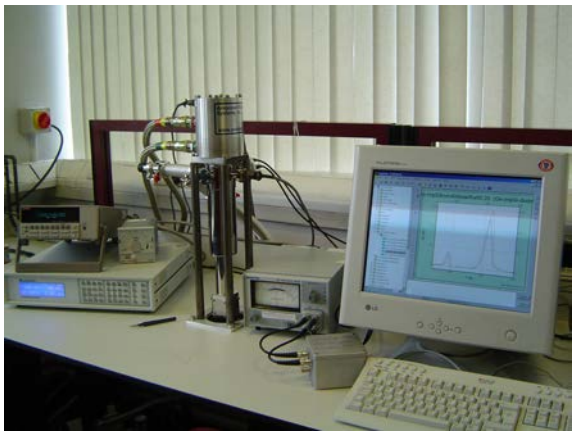
CS202SE-DMX1-AL Installed on Jobyn Yvon Spectrometer.

Courtesy: Prof. Dr. Suleyman, Gazi University

Micro PL. Adjustable sample to window distance for short focal length experiments.

Courtesy: Mr. DongHyun Kim

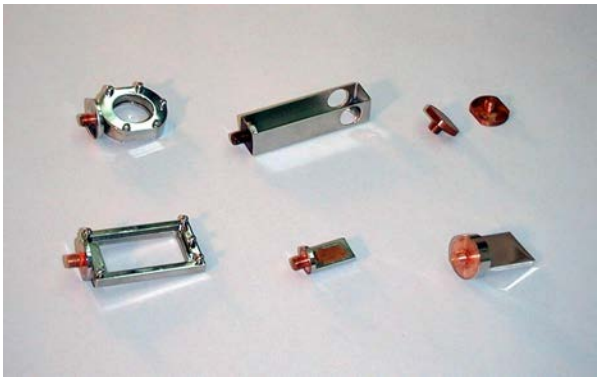
High Performance Stainless Steel Upgrade



Displex installed for spectroscopy.

Courtesy: Dr. M. Gad , Sheffield Hallam University

Optional Sample Holders



A wide range of sample holders are available for large bulk, thin film or liquid samples. Backscattering, reflection and transmission experiments.

See selection guide for more details.

Non-Optical Cryostat - Economy

The **CS202*E-DMX-1AL** offers a wide range of flexibility at a low cost, making it an excellent choice for most sample and device testing. This system is well suited for optical, electrical, and magnetic sample testing.

Applications

- Resistivity/Hall Probe Experiments
- Thermal, Electrical and Magnetic Susceptibility
- Heat Capacitance
- Seebeck Effect
- DLTS

Features

- Cryogen Free, Low Power
- Low cost aluminum construction
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AE)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with 4 window ports for electrical experiments (DMX-3)
- Aluminum radiation shield
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Non-Optical Cryostat - Economy

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AE	< 10K - 350K
DE-202SE	< 4.2K - 350K
DE-202PE	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	36 mm (1.43 in.)27mm(1.06in)
Height	39 mm (1.53 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	N/A
Diameter	N/A
Clear View	N/A
#/F	N/A
Window Material	N/A

Temperature Instrumentation and Control - (Standard) -

Heater	36 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, Aluminum
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	338 mm (13.3 in)
Diameter	45 mm (1.75 in) at the sample space
	35mm (1.37 in) FMX-3-1B

Radiation Shield -

Material	Aluminum
Attachment	Threaded
Optical Access	N/A

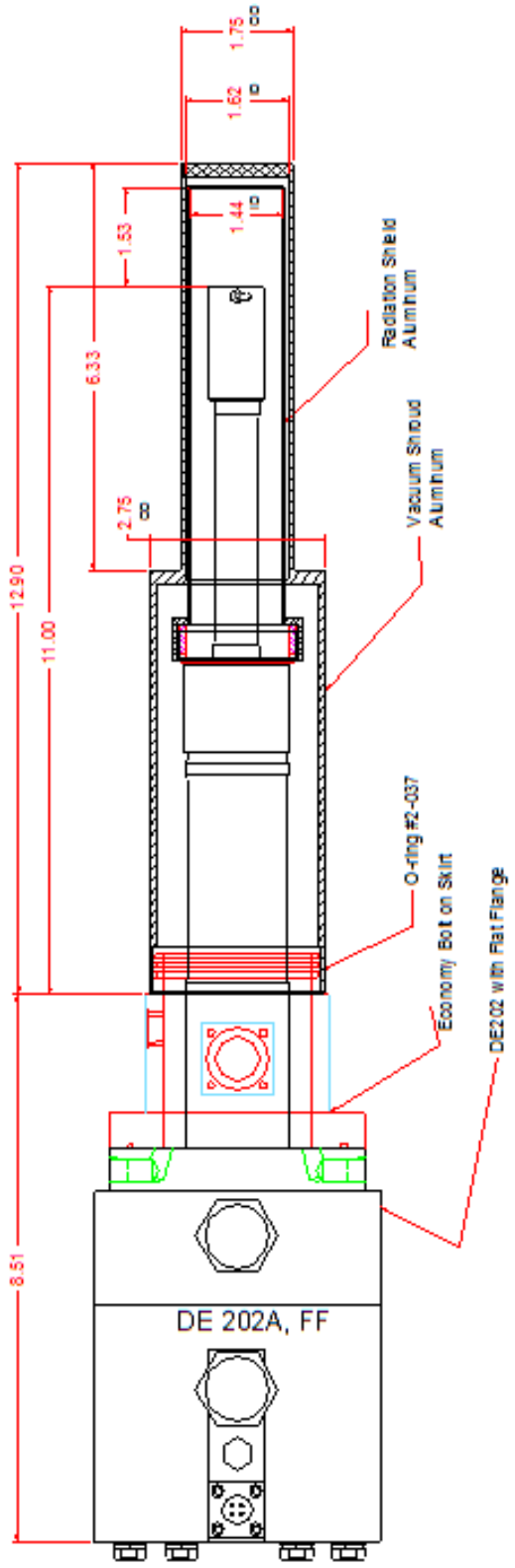
Cryostat Footprint -

Overall Length	544 mm (21.41 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-202AE		DE-202A(T)E		DE-202PE		DE-202SE	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

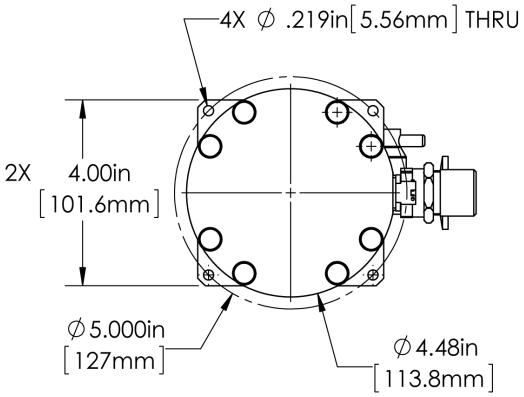
Non-Optical Cryostat - Economy

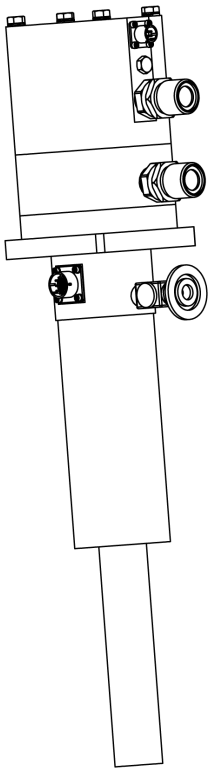
DE202*E-DMX-3-1 Outline Drawing

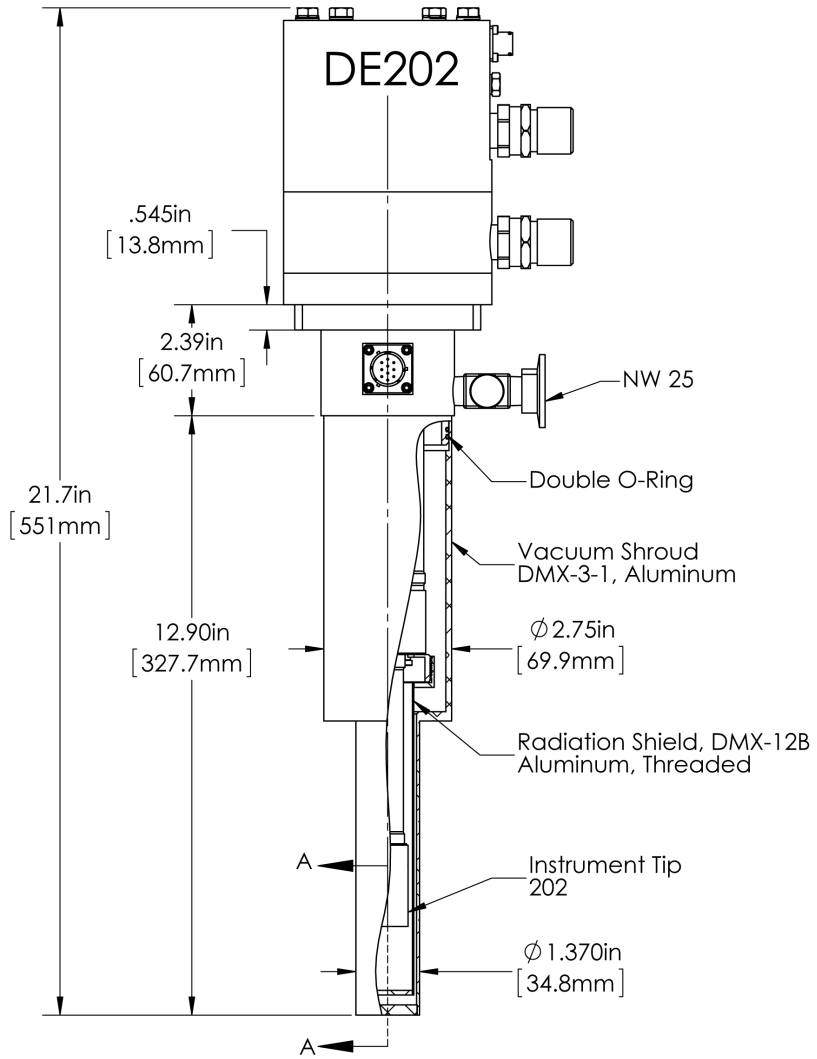


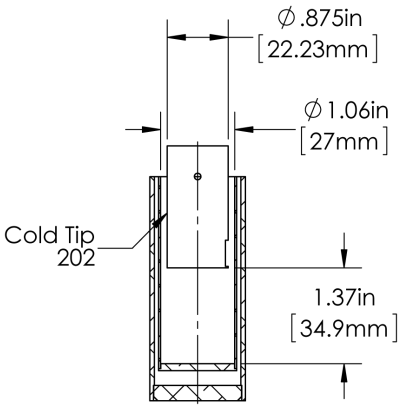
Non-Optical Cryostat - Economy

DE202*E-DMX-3-1B Outline Drawing





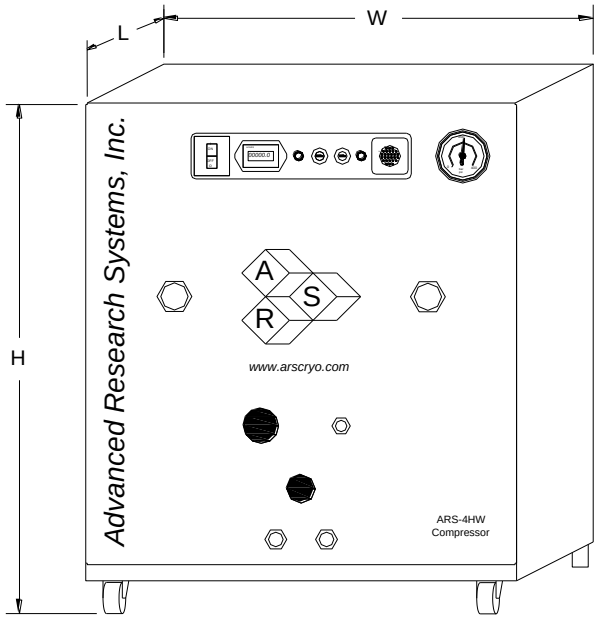




Non-Optical Cryostat - Economy

Sample Space

ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)			
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

Non-Optical Cryostat - Economy

The **CS202*E-DMX-3AL** offers a wide range of flexibility at a low cost, making it an excellent choice for most sample and device testing. This system is well suited for Electrical, and Magnetic sample testing. The vacuum shroud allows for a large sample accommodating a lot of wires and larger samples.

Applications

- Resistivity/Hall Probe Experiments
- Thermal, Electrical and Magnetic Susceptibility
- Heat Capacitance
- Seebeck Effect
- DLTS

Features

- Cryogen Free, Low Power
- Low cost aluminum construction
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AE)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with epoxied end cap (DMX-3)
- Aluminum radiation shield
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 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 cryocooler with no vacuum shroud or radiation shield. A bulkhead with 2 SMA connectors are shown. This has the upgrade instrumentation skirt.

The above picture shows the vacuum shroud and radiation shield for the cryostat.

Non-Optical Cryostat - Economy

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AE	< 10K - 350K
DE-202SE	< 4.2K - 350K
DE-202PE	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	48 mm (1.87 in.)
Height	84 mm (3.3 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	N/A
Diameter	N/A
Clear View	N/A
#/F	N/A
Window Material	N/A

Temperature Instrumentation and Control - (Standard) -

Heater	36 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, Aluminum
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	338 mm (13.3 in)
Diameter	70 mm (2.75 in) at the sample space
Width	70 mm (2.75 in) at the sample space

Radiation Shield -

Material	Aluminum
Attachment	Bolt On
Optical Access	N/A

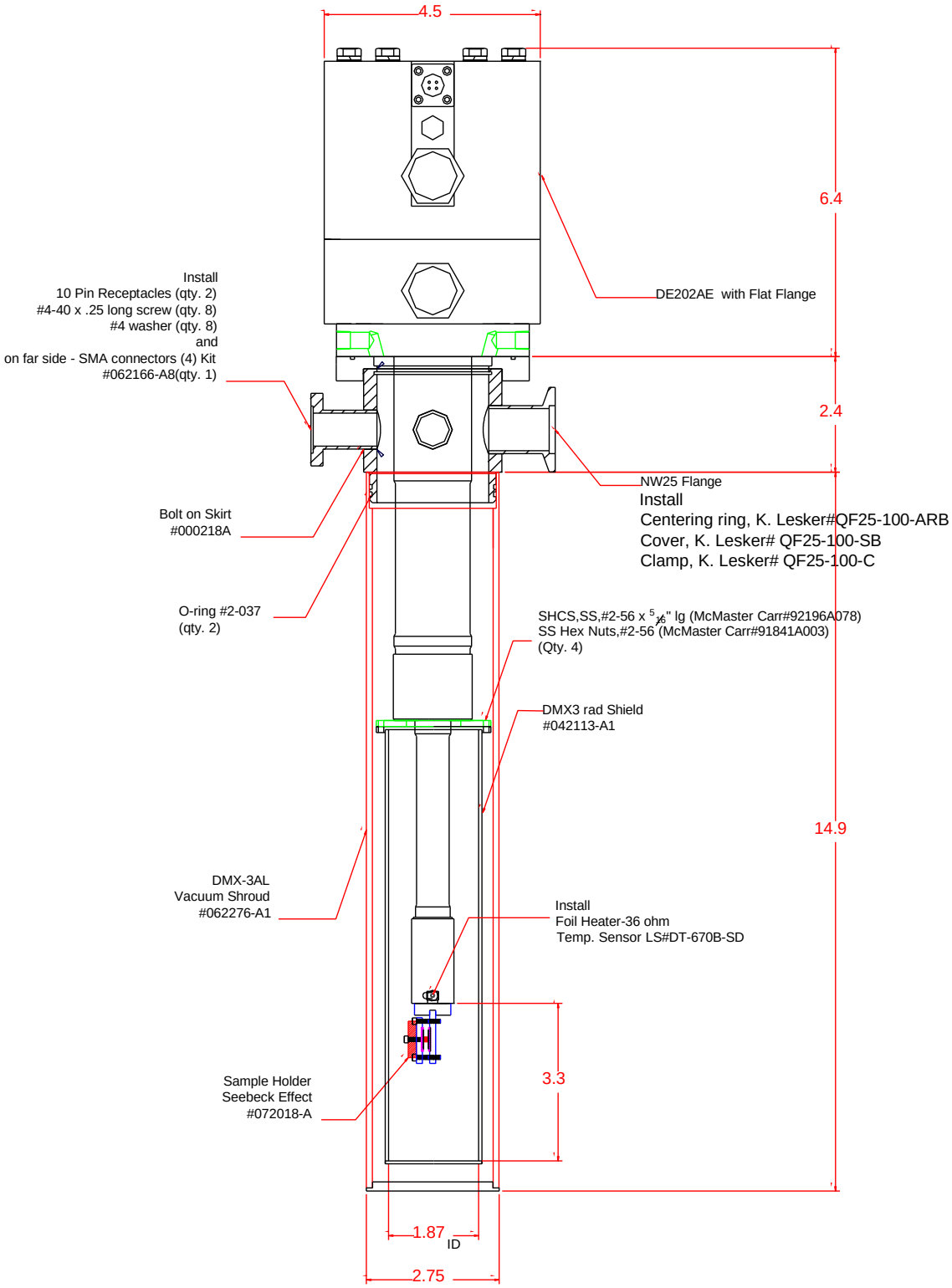
Cryostat Footprint -

Overall Length	602 mm (23.7 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-202AE		DE-202A(T)E		DE-202PE		DE-202SE	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

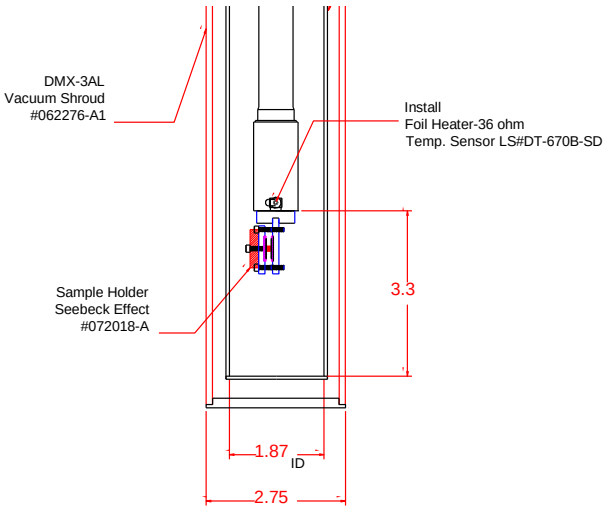
Non-Optical Cryostat - Economy

DE202*E-DMX-3AL Outline Drawing

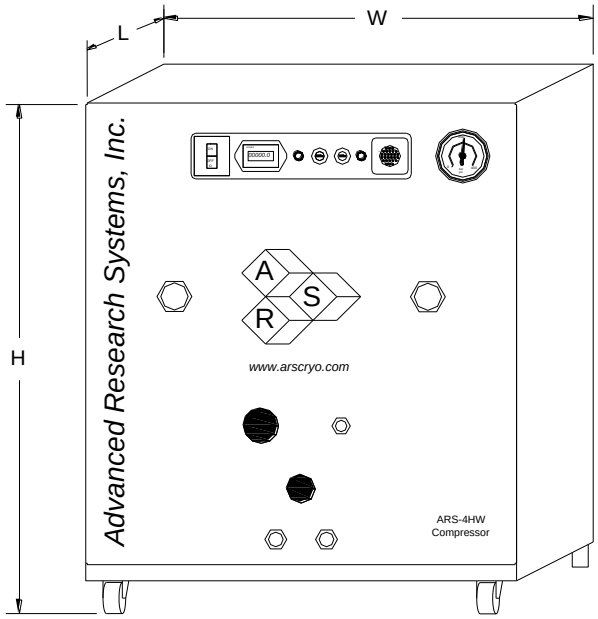


Non-Optical Cryostat - Economy

Sample Space



ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)			
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

UHV Cryostat - Low Power ULV

The **CS202*F-DMX-20B** opens up a wide range of possibilities never before possible with a closed cycle cryocooler. The ARS manufactured DMX-20B interface, like our “B” series cold heads is a True UHV System (10^{-11} Torr) where all of the rubber o-ring seals have been replaced with welded joings and metal seals. A CF flange is The DE202*F-DMX-20B uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE202 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Sample vibration levels of 3-5nm have been demonstrated by users. Due to the exchange gas being less conductive, the base temperature will increase by 1-2K and the cooling capacity is roughly cut in half at varying temperatures.

Applications

- Low Vibration UHV applications
- Microscopy Applications
- Surface Science
- Nanomaterials

Features

- **Ultra Low Vibrations (3-5 nm)**
- True UHV (10^{-11} Torr)
- Bakeable to 200C with cold head removed
- Open Sample Space
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AF)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- 6” Rotatable CF flange
- Nickel Plated OFHC copper radiation shield terminating 0.125” short of the cold tip
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4.5” CF flange available but uses non standard ID and may not fit existing chambers
- 8” CF flange avilable
- 4K Coldhead (0.2W @ 4.2K) CS204SF-DMX-20B **(DE-202S not recommended)**
- 5.5K Coldhead (3W @ 10K) CS204PF-DMX=20B **(DE-202P not receommened)**
- 450K High Temperature Interface
  (Not required with the DMX-20 interface, but the 450K interface is helpful for high temperature performance)
- 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)
- Sample holder upgrades (custom sample holders available)

The above picture shows a cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows the compressor for the system. What is not shown is a required vacuum pump, Helium Hoses (included with system), temperature controller and Helium Gas bottle with regulator for the exchange gas.

UHV Cryostat - Low Power ULV

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*- DMX-20 adds 1-2K to base temperature

DE-204AF	< 10K - 350K
DE-202PF	Not Recommended
DE-202SF	Not Recommended
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*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/Products/SampleHolders.html

Chamber Interface -

Flanges	CF, ISO
Size	4.5”, 6”, 8” 10” (4.5” CF flange non standard may not fit all chambers)

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	Welded Stainless Steel
Pump out Port	0
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	Open End Radiation Shield terminateds 0.125” short of cold tip (customer specified)

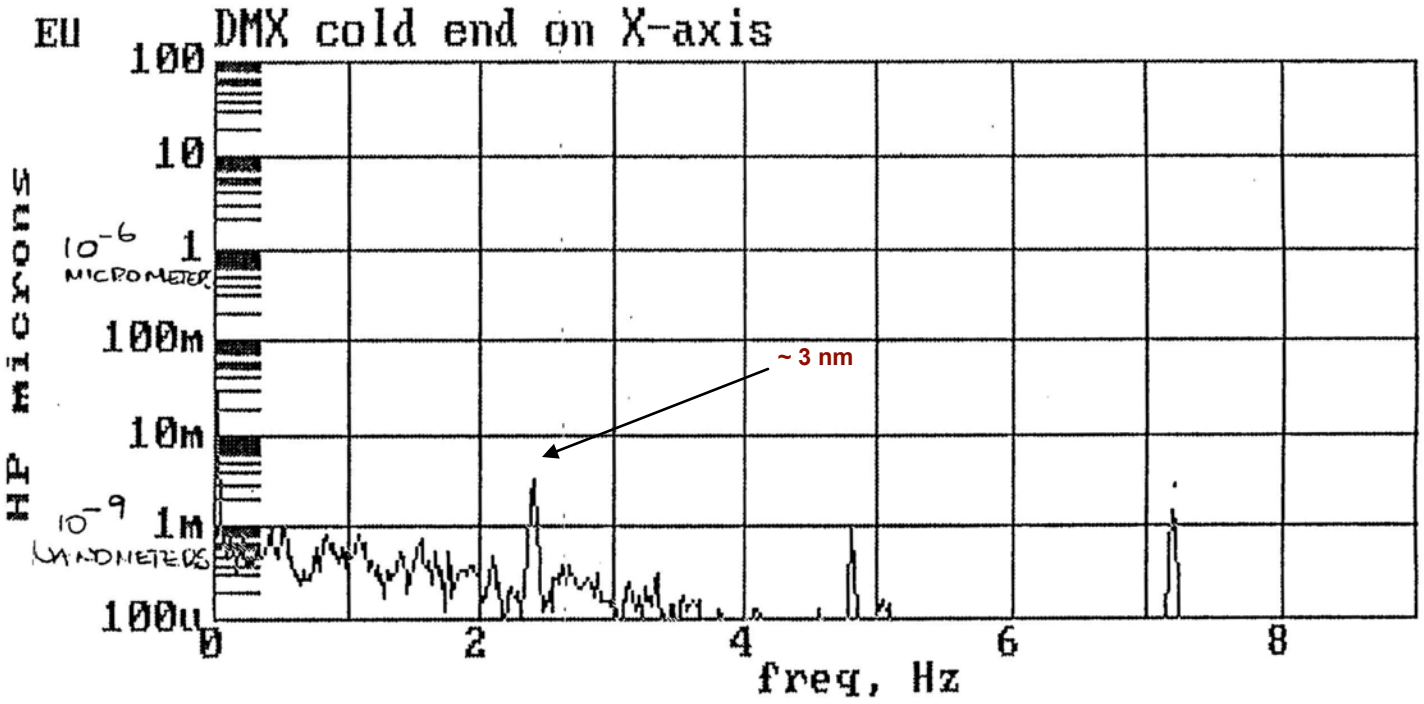
Cryostat Footprint -

Overall Length	590 mm (23.24 in) 295 mm (11.63 in) standard flange to tip length
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-202AF**		**DE-202A(T)F**		**DE-202PF**		**DE-202SF**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

UHV Cryostat - Low Power ULV

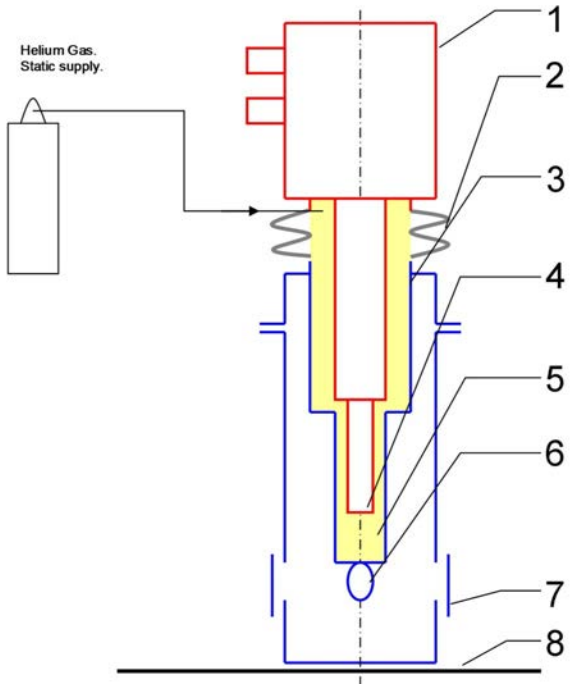
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

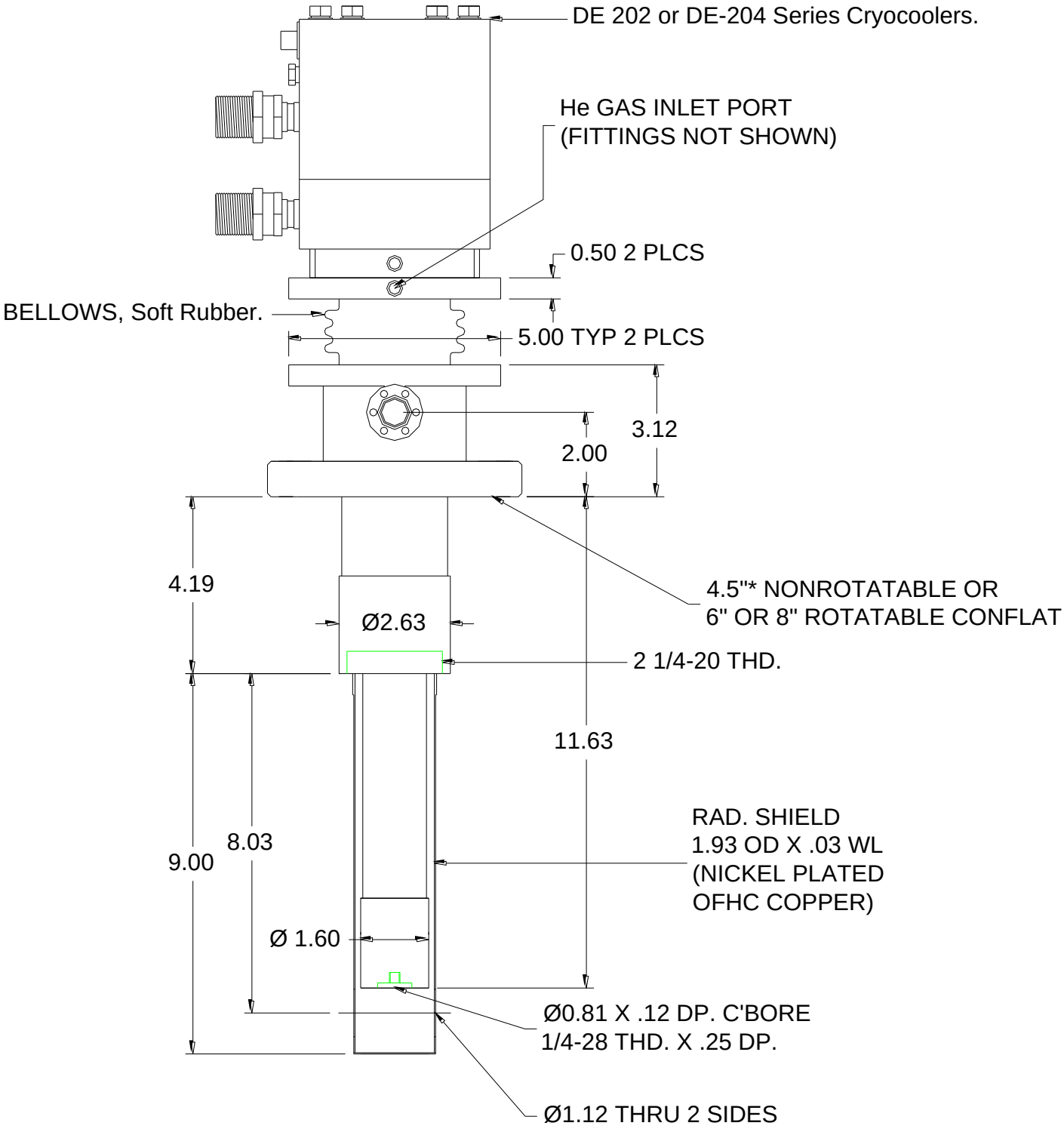
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

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 X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
5. Convective pockets of Helium Exchange Gas cools the sample space.
6. The sample is only in contact with the X-20 Interface
7. Windows for Optical Experiments
8. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



UHV Cryostat - Low Power ULV

DE202*F-DMX-20B Outline Drawing

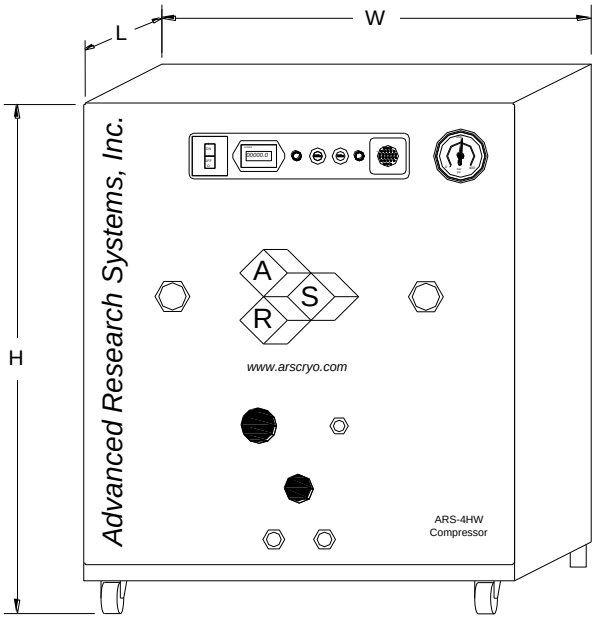


UHV Cryostat - Low Power ULV

Direct Mounting

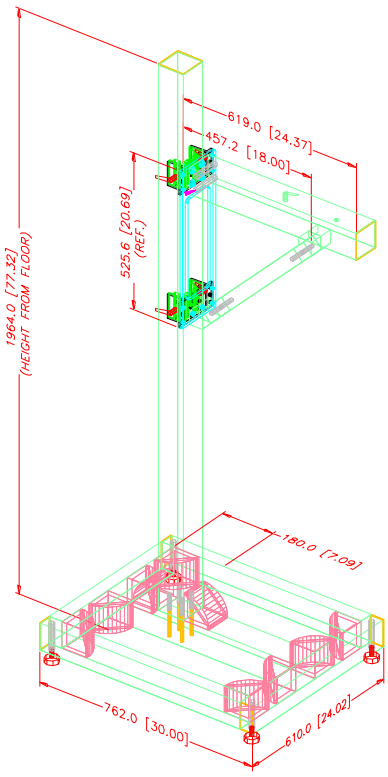
The DMX-20 can be direct mounted on the Cryocooler. The vibrations at the sample will go up to 140 nm. It can be useful if the sample has to be translated in XYZ.

ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

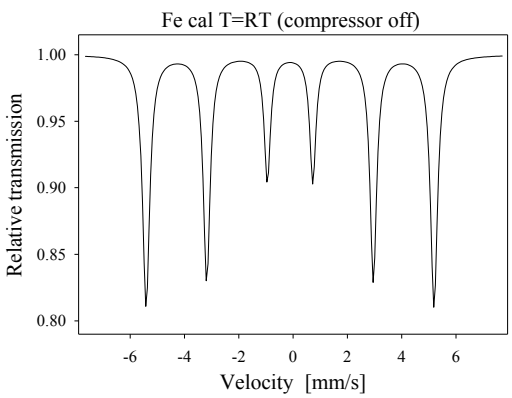
Floor Stand



UHV Cryostat - Low Power ULV

Mossbauer Spectra with DMX-20

Cryocooler Off



Calculated parameters:

WID=0.269 mm/s
W13=1.17

W23=1.08

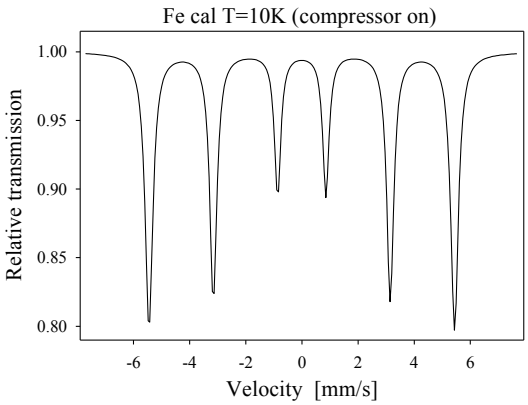
ISO=0.000 mm/s

BHF=32.94T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

Cryocooler On



Calculated parameters:

WID=0.270 mm/s
W13=1.21

W23=1.11

ISO=+0.115 mm/s

BHF=33.81T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

When the system is properly mounted to the wall and the table and properly adjusted then the effect of vibrations induced by the working compressor is very small (almost negligible).

The broadening (rather no broadening!) is fully reproducible and is well below 2%. Such broadening has practically no effect and in almost all cases can be ignored. However, compare the lin ewidths calculated in the same way!

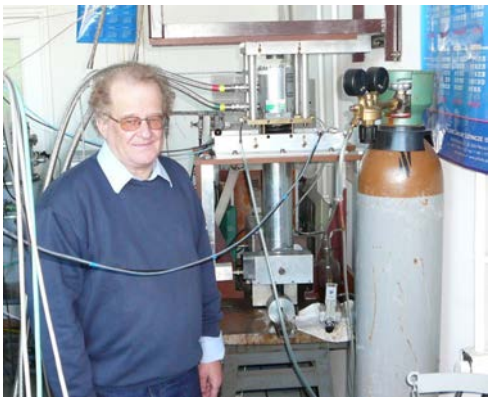
The Displex system is virtually vibration free!

Prof. Dr. habil. Michal Kopcewicz

Institute of Electronic Materials Technology

WARSAW, Poland

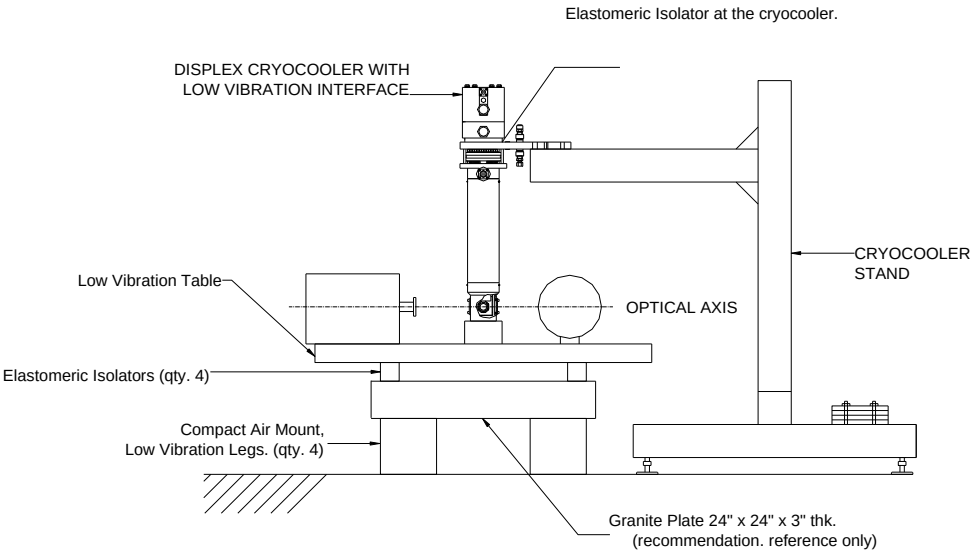
Mossbauer Cryostat, DMX-20



Prof. Dr. habil. Michal Kopcewicz

UHV Cryostat - Low Power ULV

Possible Mossbauer Configuration



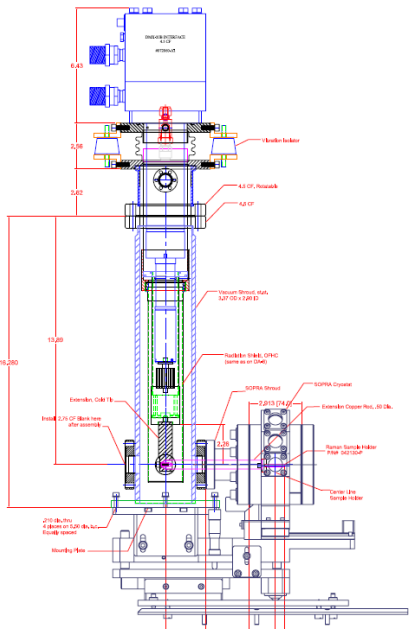
For maximum isolation proper mounting of the system is important. ARS offers a special ULV stand to isolate the ultra low vibration cryostat from the vibrating components of the cooler and the floor vibrations.

The cryocooler stand can be adjusted for the proper height, this holds the cooler.

The cryostat is mounted on the low vibration table. which consists of a high mass granite block (User supplied), resting on 4 air legs (optional ARS offering). Additional elastomeric isolators additional filter the unwanted frequencies from the floor to the cryostat.

System can be tested by shutting off the cryocooler only and watching the vibration effect on the experiment.

Ellipsometry



Low Vibration system for SOPRA Ellipsometer

UHV Cryostat - Low Power ULV

SEM Setup

The picture shows the Displex and its interface. All items showing stainless steel in the photo are modifications to our JSM-5910 SEM. Please also note the published papers on my website, which demonstrate CL results that were acquired with this cooling system.

The sample temperature, is between 40 K and 50 K.

Courtesy; Prof. Dan Rich, Ben Gurion University, Beer Sheva, Israel.

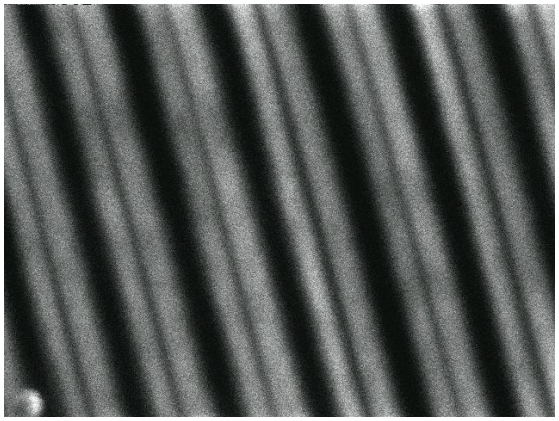
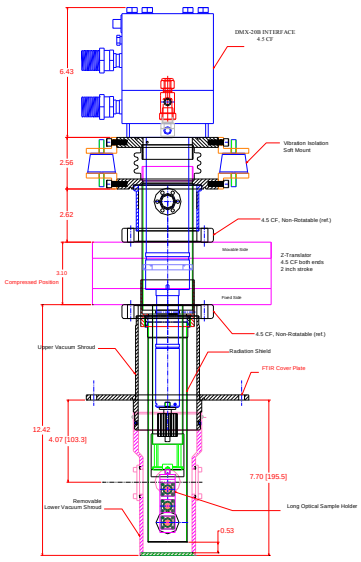


Image of a InGaN/GaN quantum well grown on a patterned GaN substrate. The patterning consists of stripes with a periodicity of 10 microns.

Monochromatic CL image (Mag. 2000) taken with a 390 nm detection wavelength.

The degradation of image quality from room temperature and 50K suggests that the vibration is less than 10nm.

FTIR Setup

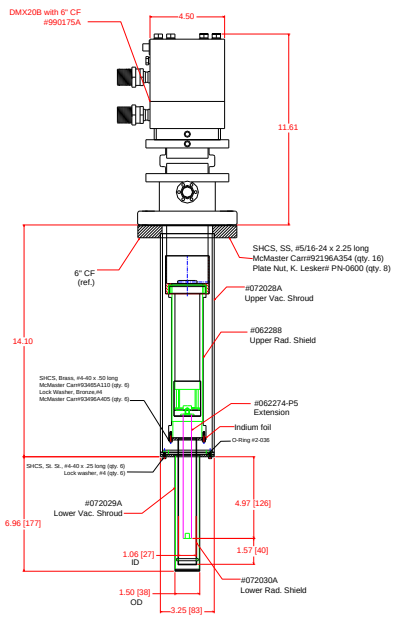


Low Vibration system for FTIR spectrometer. Sample holder with 3 samples can be translated in Z direction.

Low Vibration system for BOMEM, DA8 FTIR spectrometer.

UHV Cryostat - Low Power ULV

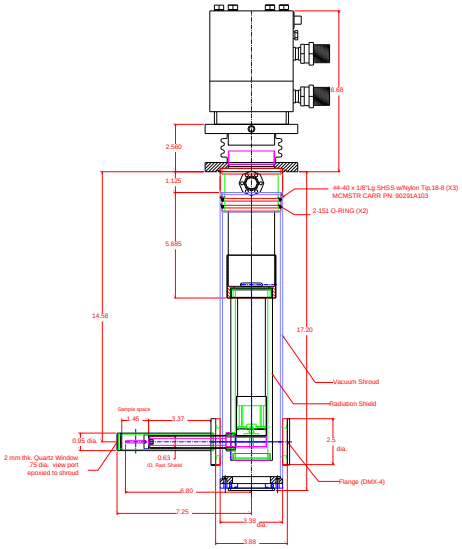
Magneto Electrical Experiments



The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

Magneto Optical Experiments (MOKE)



Low Vibration Side looking window can be placed in a MOKE, (Magneto Optical Kerr Effect). Sample can be located in any plane. The pole spacing can be as low as 1 inch.

Small diameter vacuum housing can be inserted into a narrow gap (high field). The optical window allows collection of light from the sample. The window can be very close to the sample for short focal length objective.

Optical Cryostat - Low Power, ULV

The **CS202*F-DMX-20** opens up a wide range of possibilities never before possible with a closed cycle cryocooler. The DE202*F-DMX-20 uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE202 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Sample vibration levels of 3-5nm have been demonstrated by users. Due to the exchange gas being less conductive, the base temperature will increase by 1-2K and the cooling Capacity is roughly cut in half at varying temperatures.

Applications

- Mössbauer
- Low Vibration Optical Experiments
- Quantum Dots
- Photoluminescence (PL)
- Micro-Raman (Micro-PL)
- Micro-Spectroscopy
- Magneto Optical Kerr Effect (MOKE)
- Nanoscience
- Ellipsometry

Features

- **Ultra Low Vibrations (3-5 nm)**
- Pop-Off optical block for easy in-situ sample change
- Beryllium and Kapton windows available for Mössbauer experiments
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/1.4)
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AF)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with 4 window ports for optical and electrical measurements with 4 window ports on a pop-off optical block
- Nickel Plated OFHC copper radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.2W @ 4.2K) CS204SF-DMX-20 **(DE-202S not recommended)**
- 5.5K Coldhead (3W @ 10K) CS204PF-DMX-20 **(DE-202P not recommended)**
- 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows the compressor for the system. What is not shown is a required vacuum pump, Helium Hoses (included with system), temperature controller and Helium Gas bottle with regulator for the exchange gas.

Optical Cryostat - Low Power, ULV

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*- DMX-20 adds 1-2K to base temperature

DE-202AF	< 10K - 350K
DE-202SF	Not Recommended
DE-202PF	Not Recommended
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	47 mm (1.87 in.)
Height	39 mm (1.53 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	1.4
Window Material	www.arscryo.com/Products/WindowMaterials.html

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 sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	388 mm (15.29 in)
Diameter	86 mm (3.38 in) at the sample space
Width	86 mm (3.38 in) at the sample space

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

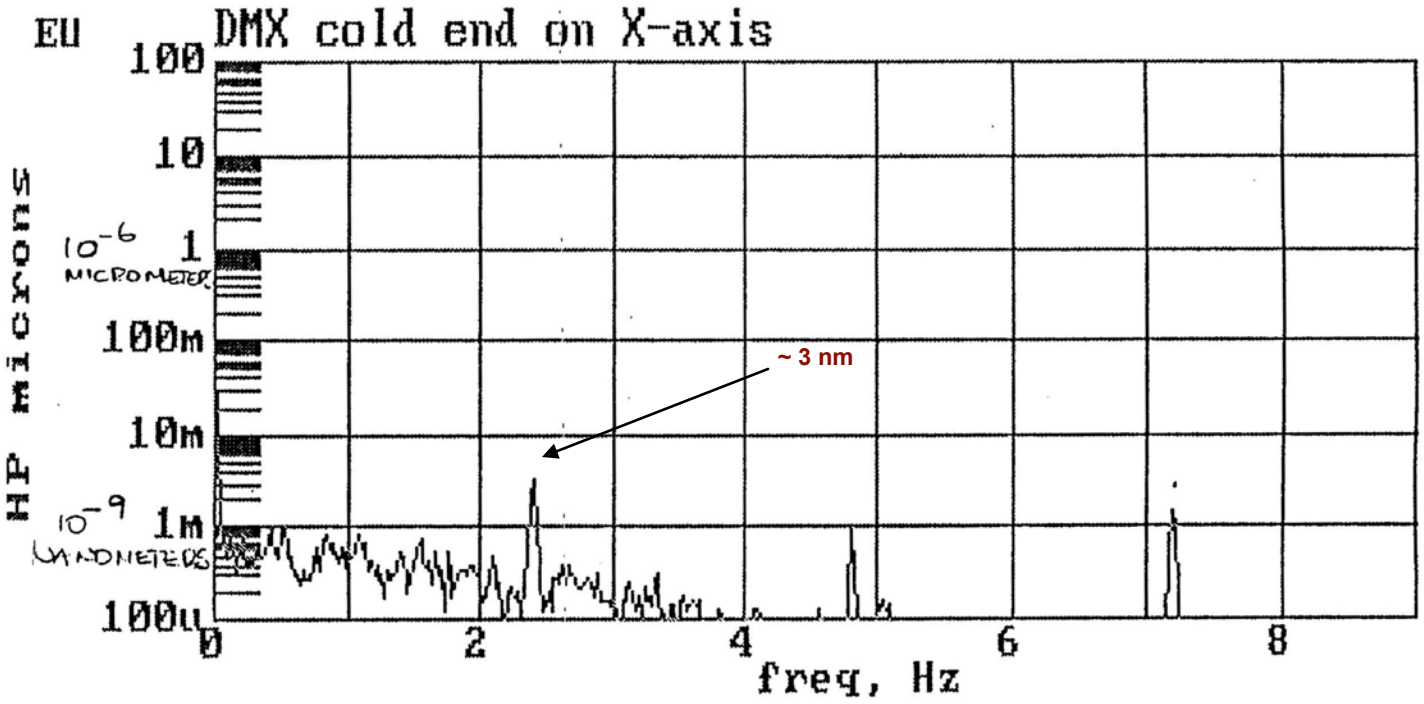
Cryostat Footprint -

Overall Length	562 mm (25.4 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-202AF**		**DE-202A(T)F**		**DE-202PF**		**DE-202SF**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

Optical Cryostat - Low Power, ULV

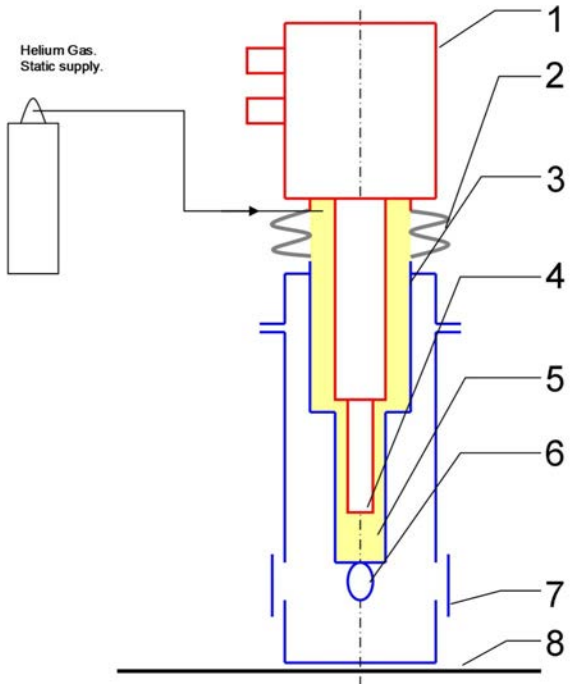
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

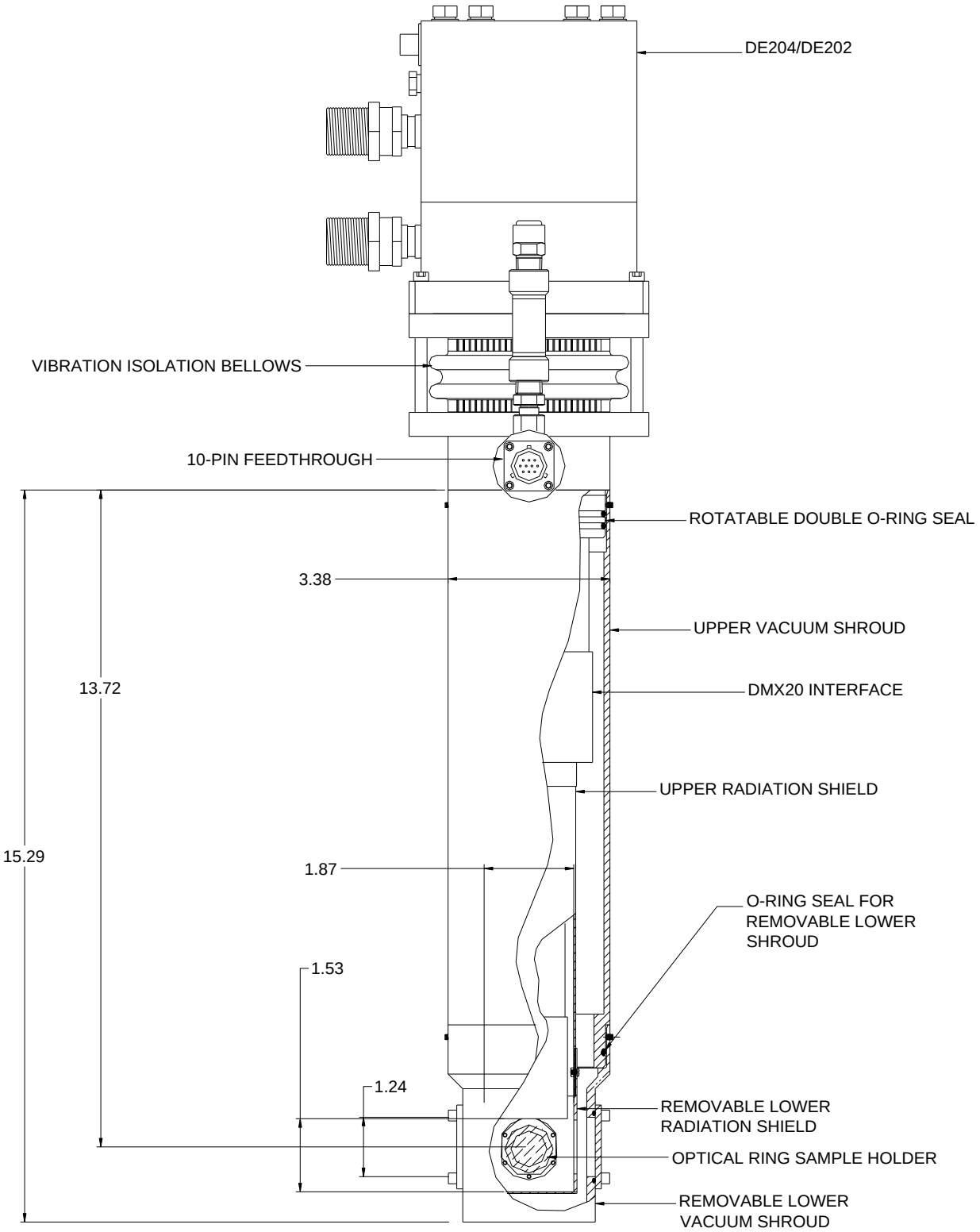
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

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 X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
5. Convective pockets of Helium Exchange Gas cools the sample space.
6. The sample is only in contact with the X-20 Interface
7. Windows for Optical Experiments
8. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



Optical Cryostat - Low Power, ULV

DE202*F-DMX-20 Outline Drawing

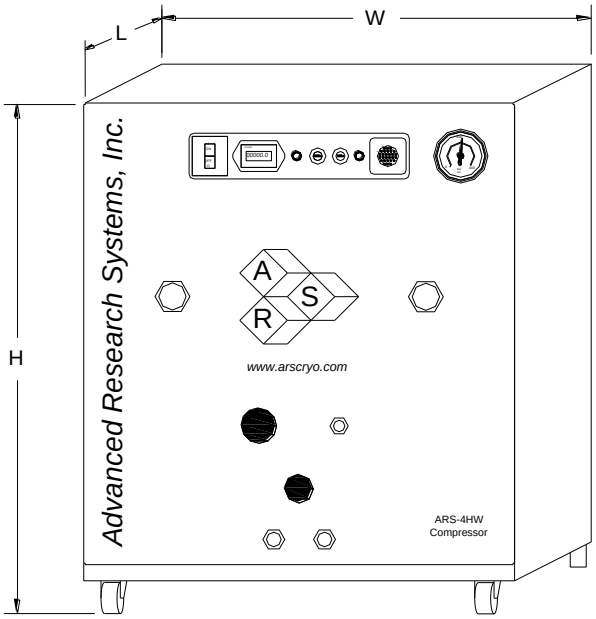


Optical Cryostat - Low Power, ULV

Direct Mounting

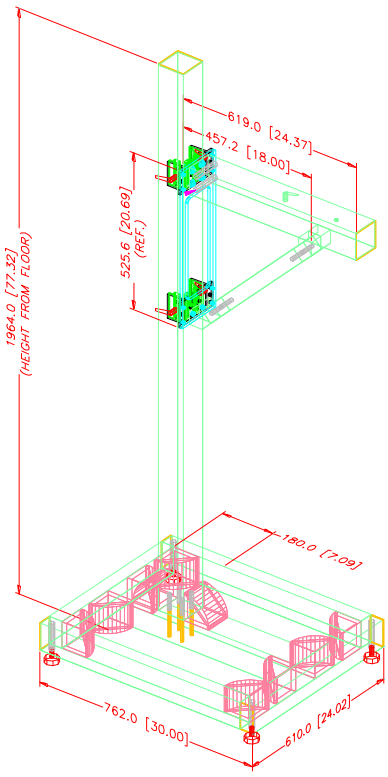
The DMX-20 can be direct mounted on the Cryocooler. The vibrations at the sample will go up to 140 nm. It can be useful if the sample has to be translated in XYZ.

ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

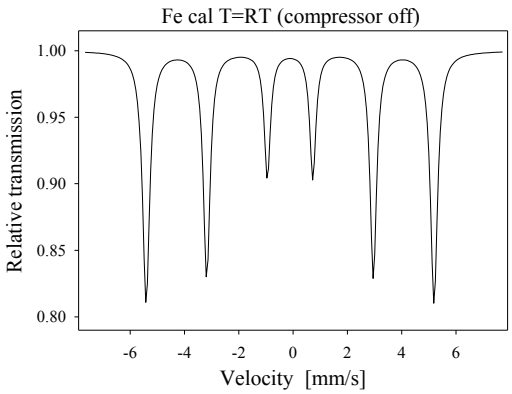
Floor Stand



Optical Cryostat - Low Power, ULV

Mossbauer Spectra with DMX-20

Cryocooler Off



Calculated parameters:

WID=0.269 mm/s
W13=1.17

W23=1.08

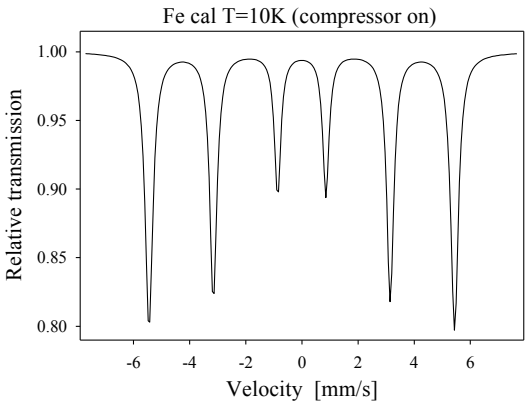
ISO=0.000 mm/s

BHF=32.94T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

Cryocooler On



Calculated parameters:

WID=0.270 mm/s
W13=1.21

W23=1.11

ISO=+0.115 mm/s

BHF=33.81T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

When the system is properly mounted to the wall and the table and properly adjusted then the effect of vibrations induced by the working compressor is very small (almost negligible).

The broadening (rather no broadening!) is fully reproducible and is well below 2%. Such broadening has practically no effect and in almost all cases can be ignored. However, compare the lin ewidths calculated in the same way!

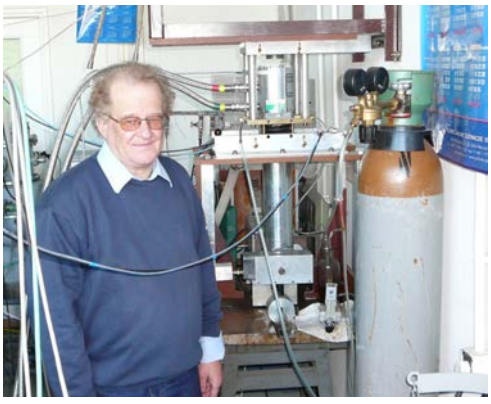
The Displex system is virtually vibration free!

Prof. Dr. habil. Michal Kopcewicz

Institute of Electronic Materials Technology

WARSAW, Poland

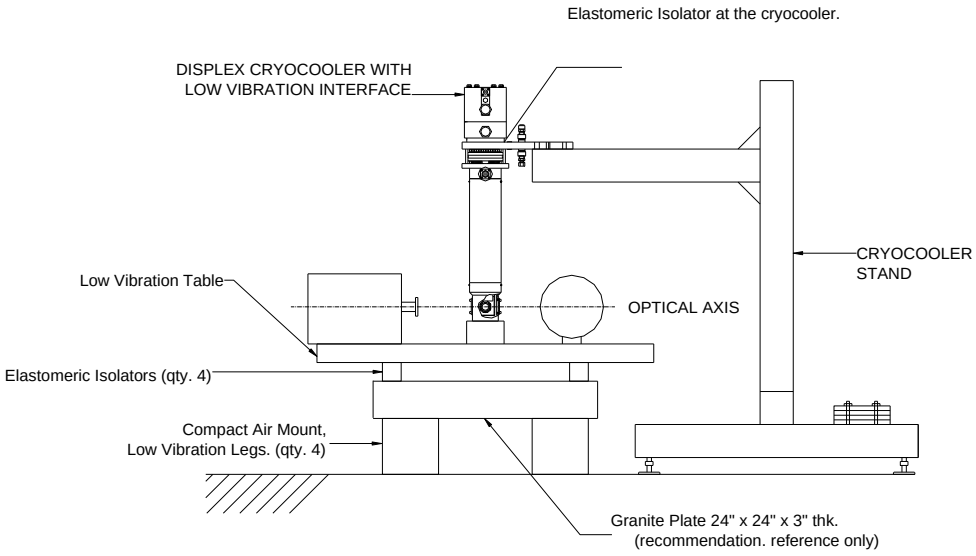
Mossbauer Cryostat, DMX-20



Prof. Dr. habil. Michal Kopcewicz

Optical Cryostat - Low Power, ULV

Possible Mossbauer Configuration



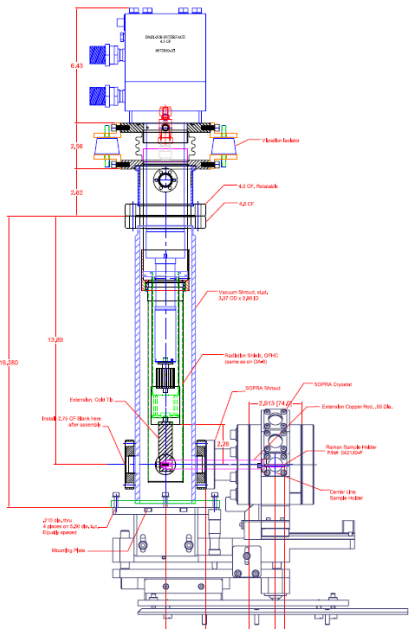
For maximum isolation proper mounting of the system is important. ARS offers a special ULV stand to isolate the ultra low vibration cryostat from the vibrating components of the cooler and the floor vibrations.

The cryocooler stand can be adjusted for the proper height, this holds the cooler.

The cryostat is mounted on the low vibration table. which consists of a high mass granite block (User supplied), resting on 4 air legs (optional ARS offering). Additional elastomeric isolators additional filter the unwanted frequencies from the floor to the cryostat.

System can be tested by shutting off the cryocooler only and watching the vibration effect on the experiment.

Ellipsometry



Low Vibration system for SOPRA Ellipsometer

Optical Cryostat - Low Power, ULV

SEM Setup

The picture shows the Displex and its interface. All items showing stainless steel in the photo are modifications to our JSM-5910 SEM. Please also note the published papers on my website, which demonstrate CL results that were acquired with this cooling system.

The sample temperature, is between 40 K and 50 K.

Courtesy; Prof. Dan Rich, Ben Gurion University, Beer Sheva, Israel.

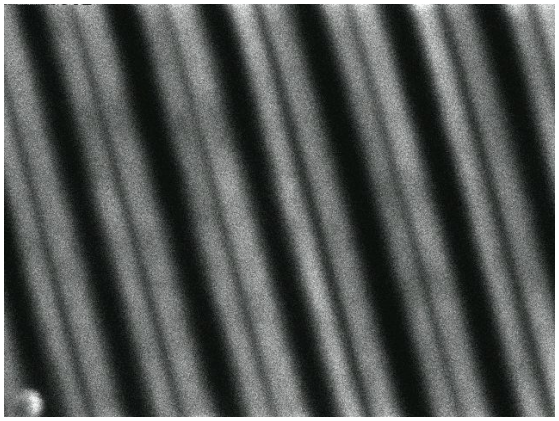
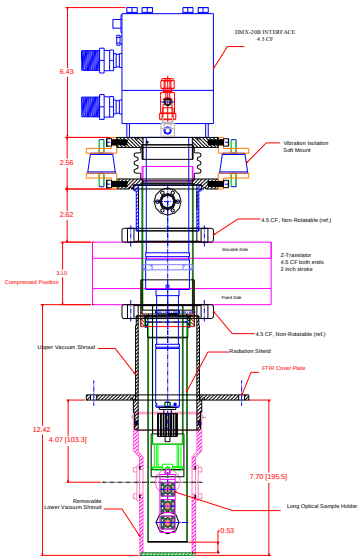


Image of a InGaN/GaN quantum well grown on a patterned GaN substrate. The patterning consists of stripes with a periodicity of 10 microns.

Monochromatic CL image (Mag. 2000) taken with a 390 nm detection wavelength.

The degradation of image quality from room temperature and 50K suggests that the vibration is less than 10nm.

FTIR Setup

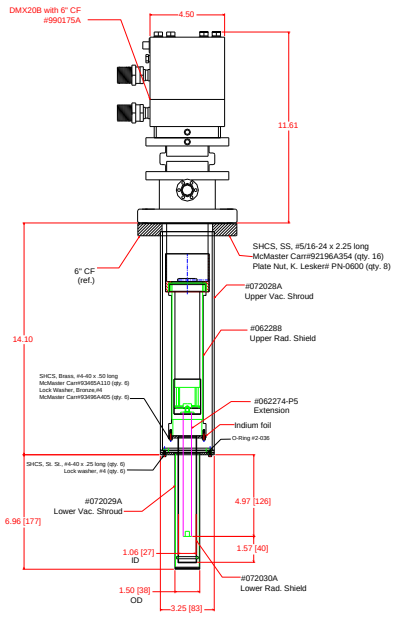


Low Vibration system for FTIR spectrometer. Sample holder with 3 samples can be translated in Z direction.

Low Vibration system for BOMEM, DA8 FTIR spectrometer.

Optical Cryostat - Low Power, ULV

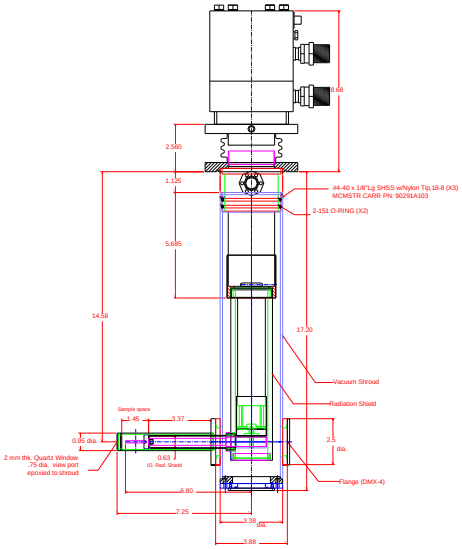
Magneto Electrical Experiments



The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

Magneto Optical Experiments (MOKE)



Low Vibration Side looking window can be placed in a MOKE, (Magneto Optical Kerr Effect). Sample can be located in any plane. The pole spacing can be as low as 1 inch.

Small diameter vacuum housing can be inserted into a narrow gap (high field). The optical window allows collection of light from the sample. The window can be very close to the sample for short focal length objective.

Optical Cryostat - High Vacuum

The **CS202*I-DMX-1SS** is a high performance closed cycle cryostat for Optical, Electrical, and Magnetic sample testing. It has an all stainless steel vacuum shroud along with a welded stainless steel instrumentation skirt. The system is capable of vacuum levels of 10^{-7} Torr with an appropriate vacuum pump.

Applications

- Optical
- Raman
- UV, VIS, IR
- FTIR
- Electro & Photoluminescence
- Resistivity/Hall Probe Experiments
- Diamond Anvil Cell
- Magneto-Optical
- PITS / DLTS
- Thermal, Electrical and Magnetic Susceptibility
- Magneto Optical Kerr Effect (MOKE)

Features

- Cryogen Free, Low Power
- High Performance Stainless Steel Construction
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/0.8)
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AI)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Stainless Steel vacuum shroud with 5 window ports for optical and electrical measures (DMX-1SS)
- Nickel Plated OFHC radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Optical Cryostat - High Vacuum

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AI	< 10K - 350K
DE-202PI	< 5.5K - 350K
DE-202SI	< 4.2K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	36 mm (1.44 in.)
Height	39 mm (1.53 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	5 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	0.8
Window Material	www.arscryo.com/Products/WindowMaterials.html

Temperature Instrumentation and Control - (Standard) -

Heater	36 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	Welded Stainless Steel
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	338 mm (13.3 in)
Diameter	70 mm (2.75 in)
Width	70 mm (2.75 in)

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

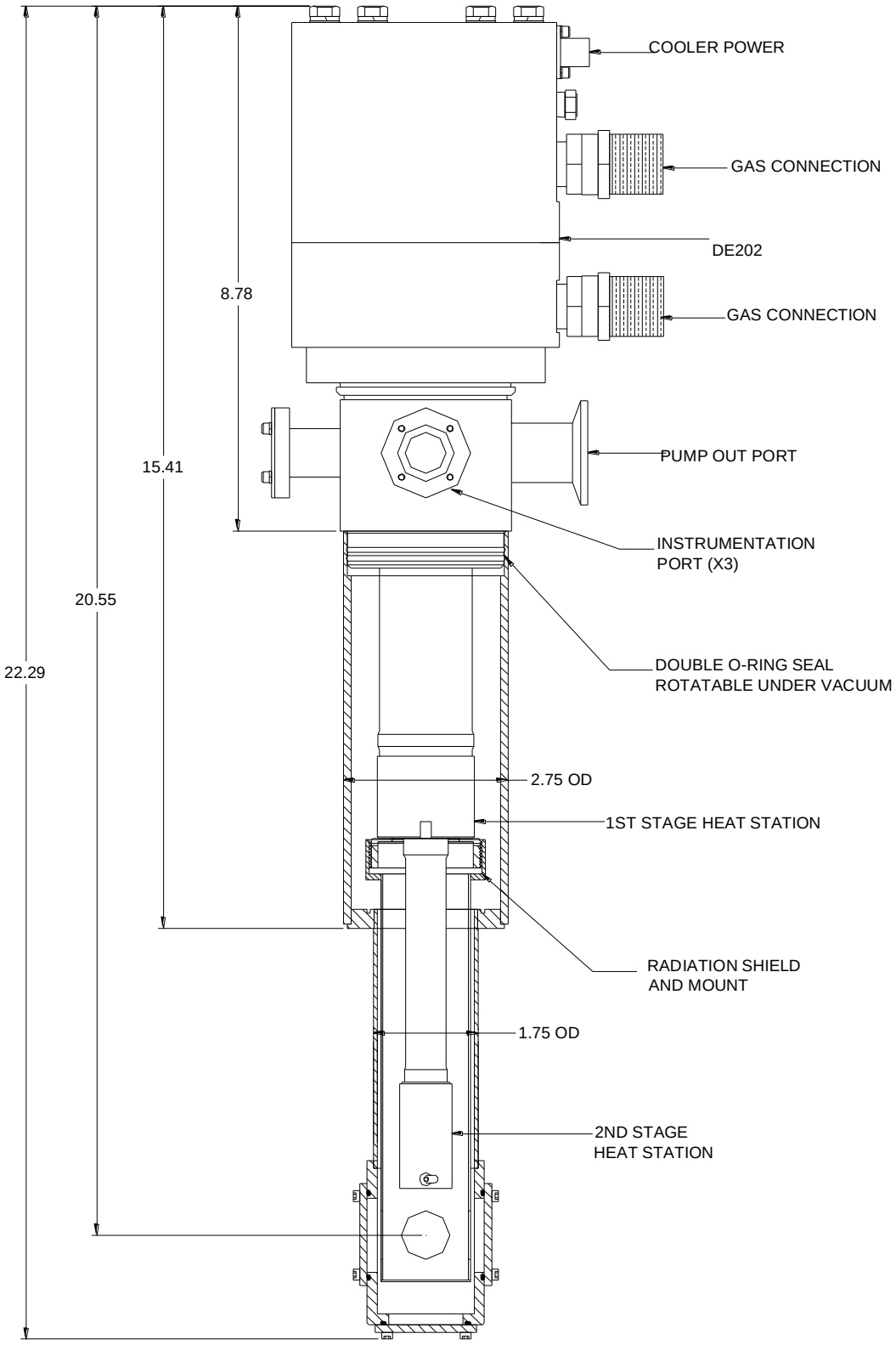
Cryostat Footprint -

Overall Length	566 mm (22.29 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-202AI		DE-202A(T)I		DE-202PI		DE-202SI	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity*	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

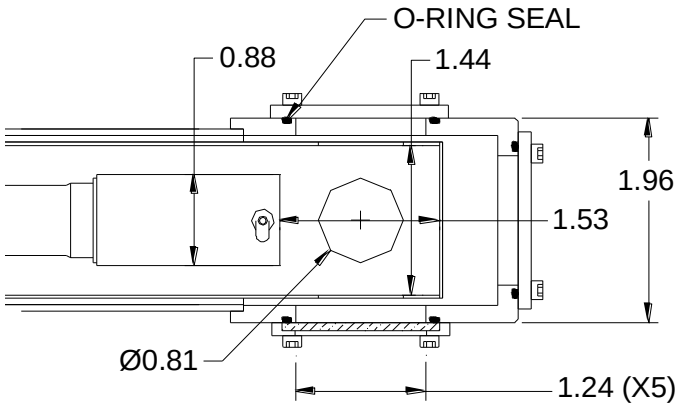
Optical Cryostat - High Vacuum

DE202*I-DMX-1SS Outline Drawing

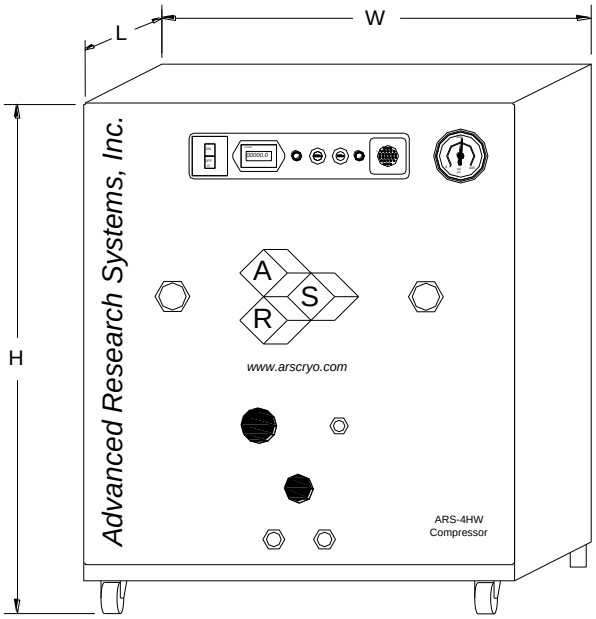


Optical Cryostat - High Vacuum

Sample Space



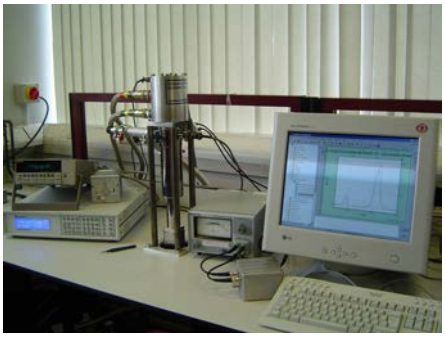
ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)		12 - 40 C (54 - 104 F)	
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

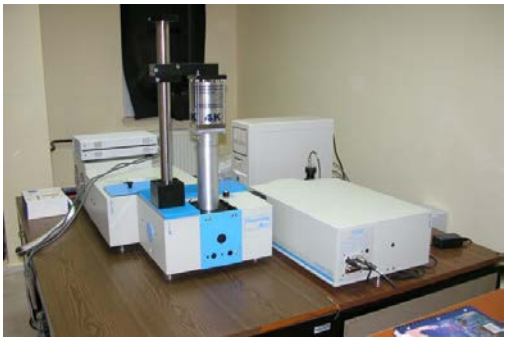
Optical Cryostat - High Vacuum

Optical Spectroscopy



Displex installed for spectroscopy.

Courtesy: Dr. M. Gad , Sheffield Hallam University



Displex installed on a spectrometer.

Courtesy: Mehmet Turken

FTIR

CS-202AI-DMX-1-2SS Designed for Bruker FTIR

Matrix Isolation

System set up for Matrix Isolation. Mixing chamber lower right. Expander and sample can be manually rotated with respect to the shroud and window. Clamped shroud stays stationary during sample rotation.

Courtesy: Dr. Mary Price, Dublin University.

Optical Cryostat - Large Sample Space

The **CS202*I-DMX-4SS** provides the same high performance as our CS202*I-DMX-1SS with its all welded stainless steel construction and welded stainless steel instrumentation skirt but provides a larger than standard sample space. The vacuum shroud comes standard with 4 window ports, however a 5th port can be added on the end. The system is capable of vacuum levels of 10^{-7} Torr with an appropriate vacuum pump.

Applications

- Large Samples
- Optical
- Raman
- UV, VIS, IR
- FTIR
- Electro & Photoluminescence
- Resistivity/Hall Probe Experiments
- Diamond Anvil Cell
- Magneto-Optical
- PITS / DLTS
- Thermal, Electrical and Magnetic Susceptibility
- Magneto Optical Kerr Effect (MOKE)

Features

- Cryogen Free, Low Power
- High Performance Stainless Steel Construction
- Large clear view optical windows (1.5 in)
- Large sample viewing angle for optical collection (F/1.1)
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AI)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Stainless Steel vacuum shroud with 4 window ports for optical and electrical measures (DMX-4SS)
- Nickel Plated OFHC radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 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)

The above picture shows a cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Optical Cryostat - Large Sample Space

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AI	< 10K - 350K
DE-202PI	< 5.5K - 350K
DE-202SI	< 4.2K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	47.5 mm (1.87in.)
Height	90 mm (3.54 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4 - 90° Apart
Diameter	51 mm (2 in)
Clear View	38 mm (1.5 in)
#/F	1.1
Window Material	www.arscryo.com/Products/WindowMaterials.html

Temperature Instrumentation and Control - (Standard) -

Heater	36 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	Welded Stainless Steel
Pump out Port	1 - NW 25
Instrumentation Ports	3
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	378 mm (14.9 in)
Diameter	95mm (3.75 in) (at the sample space)
Width	95 mm (3.75 in) (at the sample space)

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Flanged
Optical Access	0, 2, or 4 (customer specified)

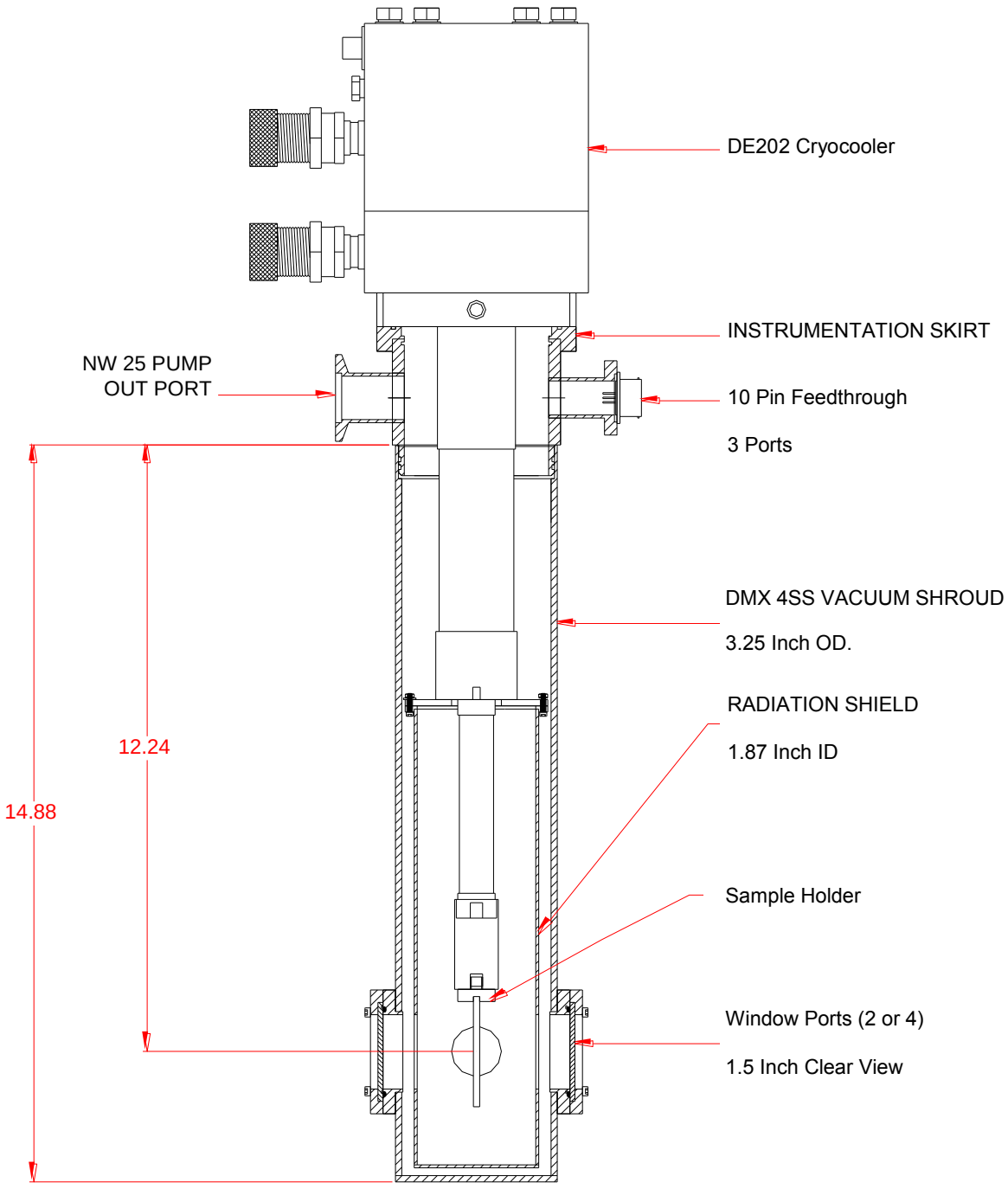
Cryostat Footprint -

Overall Length	603 mm (23.72 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-202AI**		**DE-202A(T)I**		**DE-202PI**		**DE-202SI**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity*	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

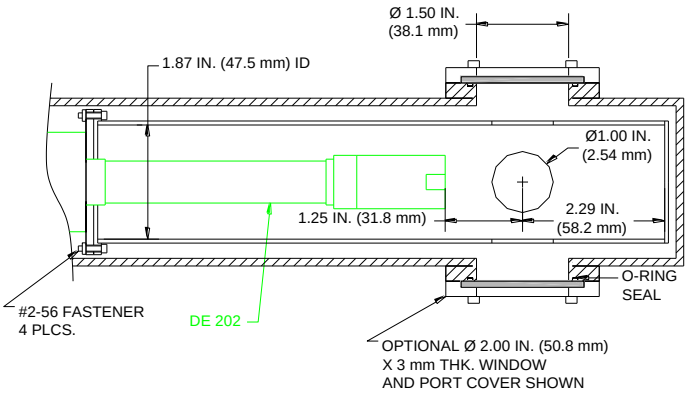
Optical Cryostat - Large Sample Space

CS202*I-DMX-4SS Outline Drawing

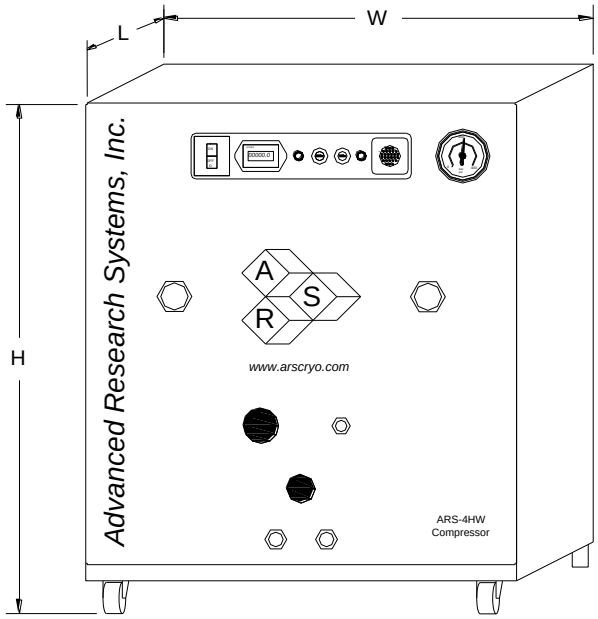


Optical Cryostat - Large Sample Space

Sample Space



ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)		12 - 40 C (54 - 104 F)	
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

Optical Cryostat - Narrow Gap

The **CS202*I-DMX-12** is an optical cryostat specially constructed for use with narrow gap magnets. As always, the challenge in magnet systems is to shrink the vacuum shroud dimensions to fit inside the small magnet pole spacing to maximize the field. The profile of the vacuum shroud has been reduced to fit the cryocooler like a glove and the optical block has been reduced to allow for the smallest pole spacing.

Applications

- Magnetic Susceptibility
- Electro-Optical
- Magneto-Optical
- Hall Measurements
- UV, Vis, IR
- Electro and Photoluminescence
- DLTS
- Resistivity

Features

- Cryogen Free, Low Power
- High Performance Stainless Steel Construction
- Large clear view optical windows (1 in)
- Large sample viewing angle for optical collection (F/1.25)
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-202AI)
- Compressor (ARS-2HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with 2 window ports for optical and electrical measurements (DMX-12)
- Non-Nickel Plated Polished OFHC radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 10K)
- 450K 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Optical Cryostat - Narrow Gap

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AI	< 10K - 350K
DE-202PI	< 5.5K - 350K
DE-202SI	< 4.2K - 350K
With 800K Interface	N/A
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	**DMX-12** 28.4 mm (1.12 in.) **DMX-12B** 27.18 mm (1.07 in.)
Height	30 mm (1.18 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	2 - 180° Apart
Diameter	38 mm (1.5 in)
Clear View	25 mm (1 in)
#/F	1.25
Window Material	www.arscryo.com/Products/WindowMaterials.html

Temperature Instrumentation and Control - (Standard) -

Heater	36 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	Welded Stainless Steel
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	338 mm (13.3 in)
Diameter	70 mm (2.75 in) (at the sample space)
Width	**DMX-12** 41.1 mm (1.62 in) **DMX-12B** 34.8 mm (1.37 in)

Radiation Shield -

Material	Non Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	0, 2 (customer specified)

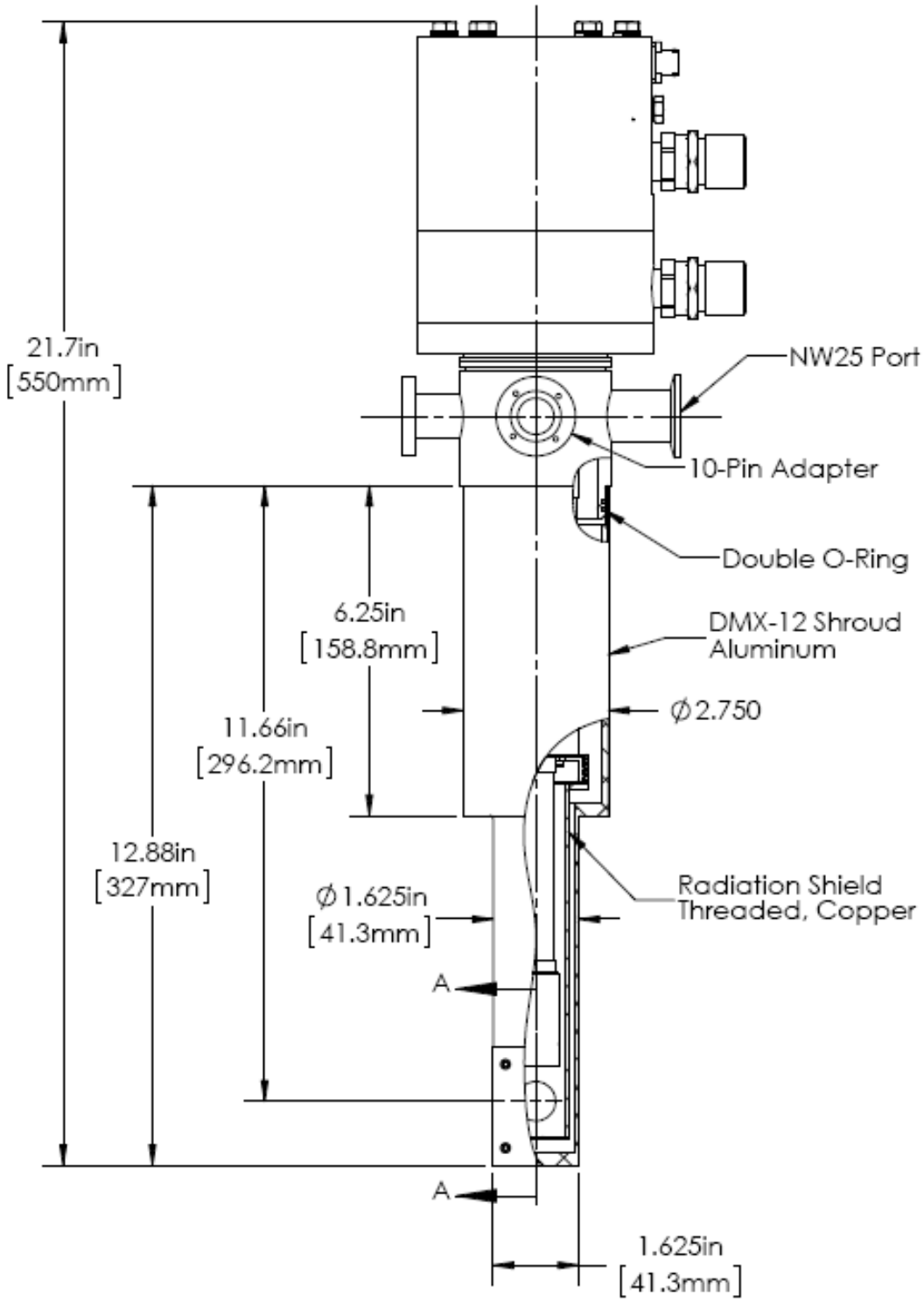
Cryostat Footprint -

Overall Length	566 mm (22.29 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-202AI**		**DE-202A(T)I**		**DE-202PI**		**DE-202SI**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity*	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

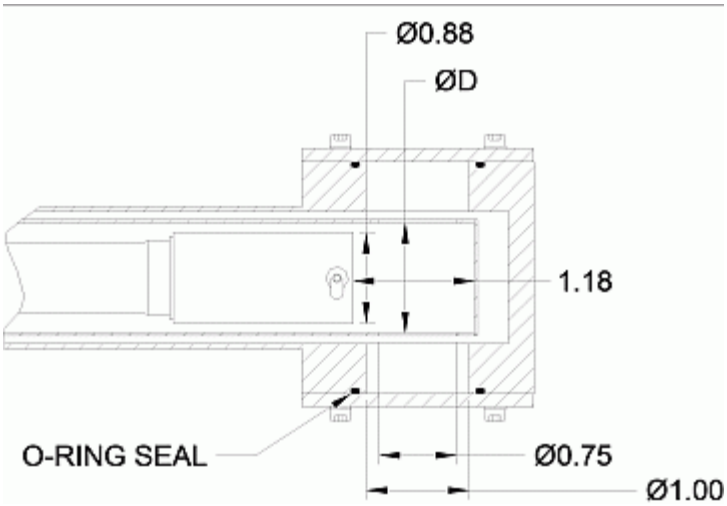
Optical Cryostat - Narrow Gap

DE202*I-DMX-12 Outline Drawing

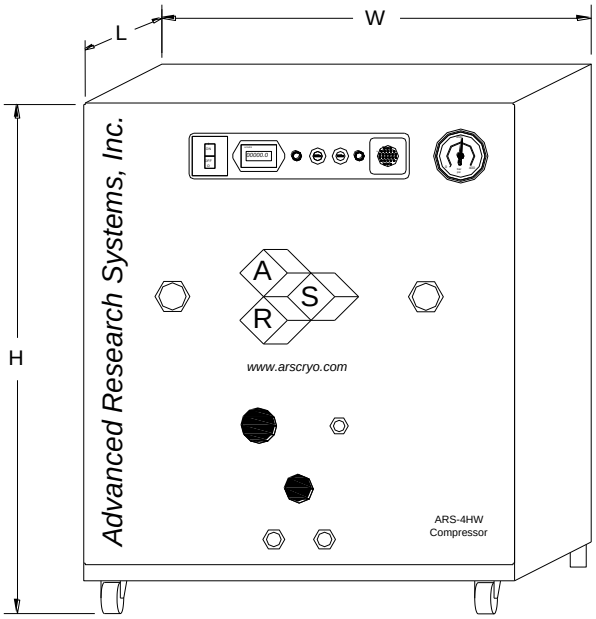


Optical Cryostat - Narrow Gap

Sample Space



ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-2HW		ARS-4HW	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V	208 V	190 V
	Max	230 V	210 V	230 V	210 V
Transformer Options	10%		220 V, 230V		220 V, 230 V
	15%		240 V		240 V
Power Usage	Single Phase	1.3 kW	1.2 kW	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA		60 dBA	
Ambient Temperature		12 - 40 C (54—104 F)		12 - 40 C (54 - 104 F)	
Cooling Water	Consumption	1.5 L / min (0.4 Gal. / min)		2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)		10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting		3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)		483 mm (19 in)	
	W	434 mm (17.1 in)		434 mm (17.1 in)	
	H	516 mm (20.3 in)		516 mm (20.3 in)	
Weight		62 kg (137 lbs)		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours		12,000 hours	
Water Recirculation Option		CoolPac Compatible		CoolPac Compatible	

True UHV - Moderate Power

The **CS204*B** 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. A CF flange is directly welded to the cryocooler.

These True UHV systems are bakeable to 80C, and the 10K **CS204AB** is bakeable to 1200C if the displacer is removed. (Special Training Required).

Cold tip extensions are available to put the sample right where it is needed in the chamber.

Applications

- UHV
- Surface Science
- UHV Manipulator for XYZ motion
- Photoemission Spectroscopy

Features

- True UHV (10-11 Torr)
- Bakeable to **80C** (10K version can remove displacer and bake to 200C)
- Open Sample Space
- Optional Cold Tip Extensions
- Cryogen Free
- Operation in Any Orientation
- Fully Customizable

Typical Configuration

- Cold head (DE-204AB)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Tue UHV welded stainless steel instrumentation skirt with 6” rotatable CF flange
- Nickel Plated OFHC radiation shield terminating 0.125” short of the cold tip
- Instrumentation for temperature measurement and control:
  - 10 pin UHV feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4.5 and 8 inch rotatable CF flanges available
- 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 True UHV Closed Cycle Cryocooler

The above picture shows an instrumentation skirt with the electrical feedthroughs rotated 90 degrees upwards to allow for tight rotational clearances.

True UHV - Moderate Power

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-202AI	< 10K - 350K
DE-202PI	< 5.5K - 350K
DE-202SI	< 4K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*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/Products/SampleHolders.html

Chamber Interface -

Flanges	CF, ISO
Size	4.5”, 6”, 8”, 10”

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	True UHV Welded Stainless Steel
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Radiation Shield -

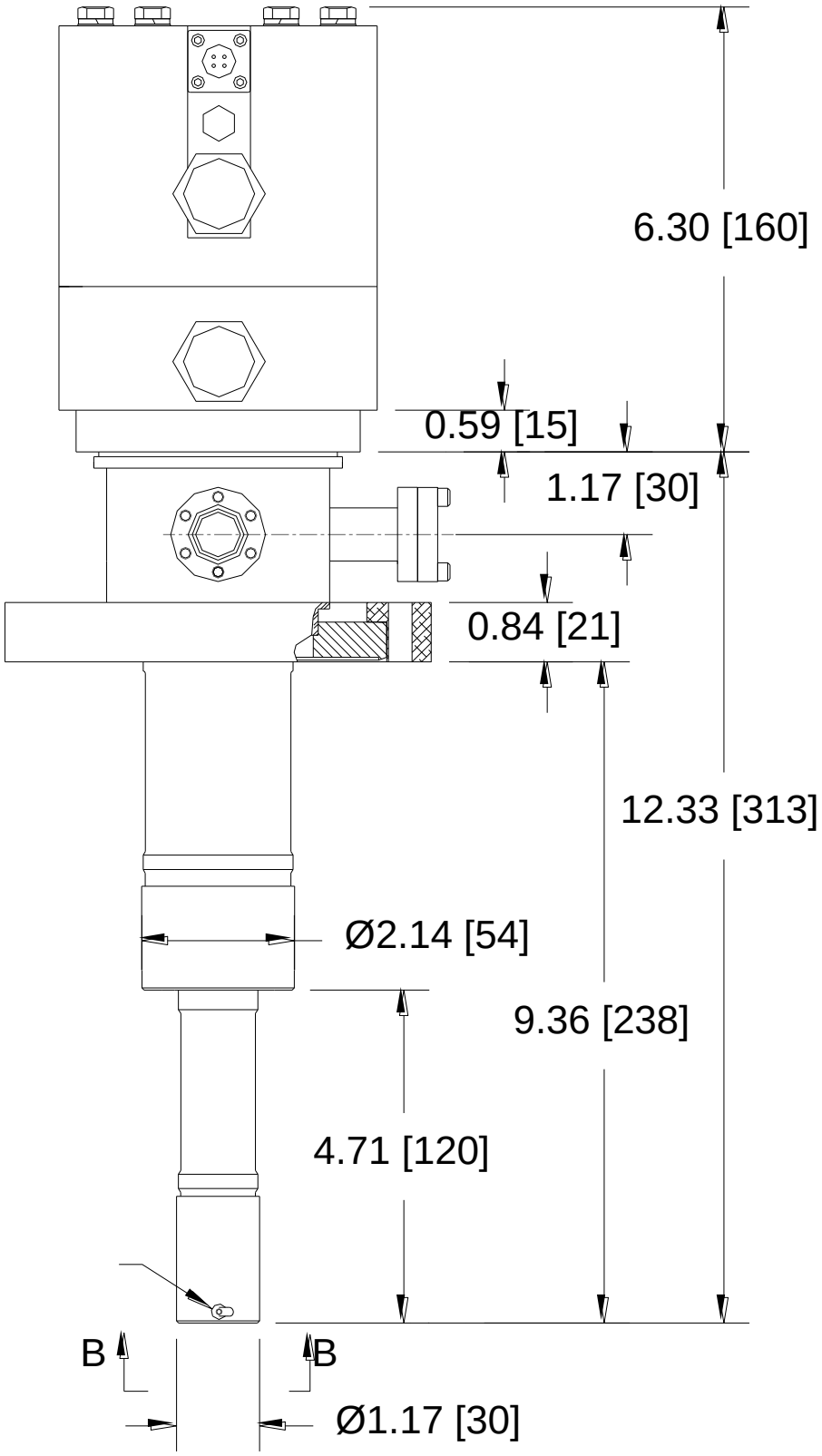
Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	Open End Radiation shield terminates 0.125” short of cold tip (customer specified)

Cryostat Footprint -

Overall Length	313 mm (12.33 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-202AB**		**DE-202A(T)B**		**DE-202PB**		**DE-202SB**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity*	4.2K	-	-	-	-	-	-	0.1W	0.08W
	10K	0.5W	0.4W	0.7W	0.56W	1W	0.8W	1.2W	1W
	20K	2.5W	2W	3.7W	3W	3.5W	2.8W	4W	3.2W
	77K	4W	3.2W	6W	4.8W	3.5W	2.8W	4W	3.2W
Radiation Shield Cooling Capacity		10W	8W	15W	12W	10W	8W	10W	8W
Cooldown Time	20K	50 min	60 min	35 min	42 min	60 min	72 min	60 min	72 min
	Base Temperature	70 min	84 min	50 min	60 min	90 min	108 min	90 min	108 min
Compressor Model		ARS-2HW		ARS-2HW		ARS-2HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

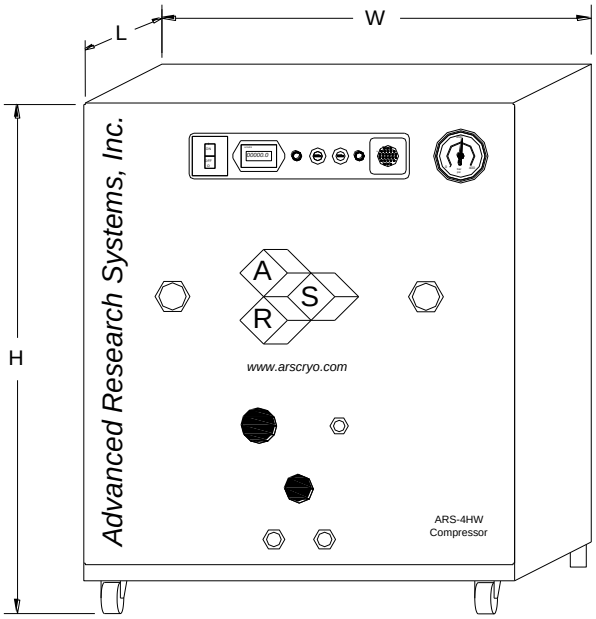
CS204*B Outline Drawing



True UHV - Moderate Power

DE204SB with 16” Extension

ARS-2HW/ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature		12 - 40 C (54 - 104 F)	
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

Optical Cryostat - High Power Economy

The **CS204*E-FMX-1AL** offers a wide range of flexibility at a low cost, making it an excellent choice for most sample and device testing. This system offers similar features as the CS202*E-DMX-1AL, however it offers almost twice the cooling capacity making this system less sensitive to experimental and parasitic heat load changes, sample size, number of wires, windows, etc.

Applications

- Optical
- Raman
- UV, VIS, IR
- FTIR
- Electro & Photoluminescence
- Resistivity/Hall Probe Experiments
- Diamond Anvil Cell
- Magneto-Optical
- PITS / DLTS
- Thermal, Electrical and Magnetic Susceptibility
- Magneto Optical Kerr Effect (MOKE)

Features

- Cryogen Free, Low Power
- Low cost aluminum construction
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/1)
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-204AE)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with 4 window ports for optical and electrical measures (FMX-1AL)
- Aluminum radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (2W @ 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Optical Cryostat - High Power Economy

Cooling Technology-

DE-202	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-204AE	< 9K - 350K
DE-204SE	< 4K - 350K
DE-204PE	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	36 mm (1.43 in.)
Height	39 mm (1.53 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	1
Window Material	www.arscryo.com/Products/WindowMaterials.html

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, Aluminum
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	338 mm (13.3 in)
Diameter	80 mm (3.15 in) at the sample space
Width	63.5 mm (2.5 in) at the sample space

Radiation Shield -

Material	Aluminum
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

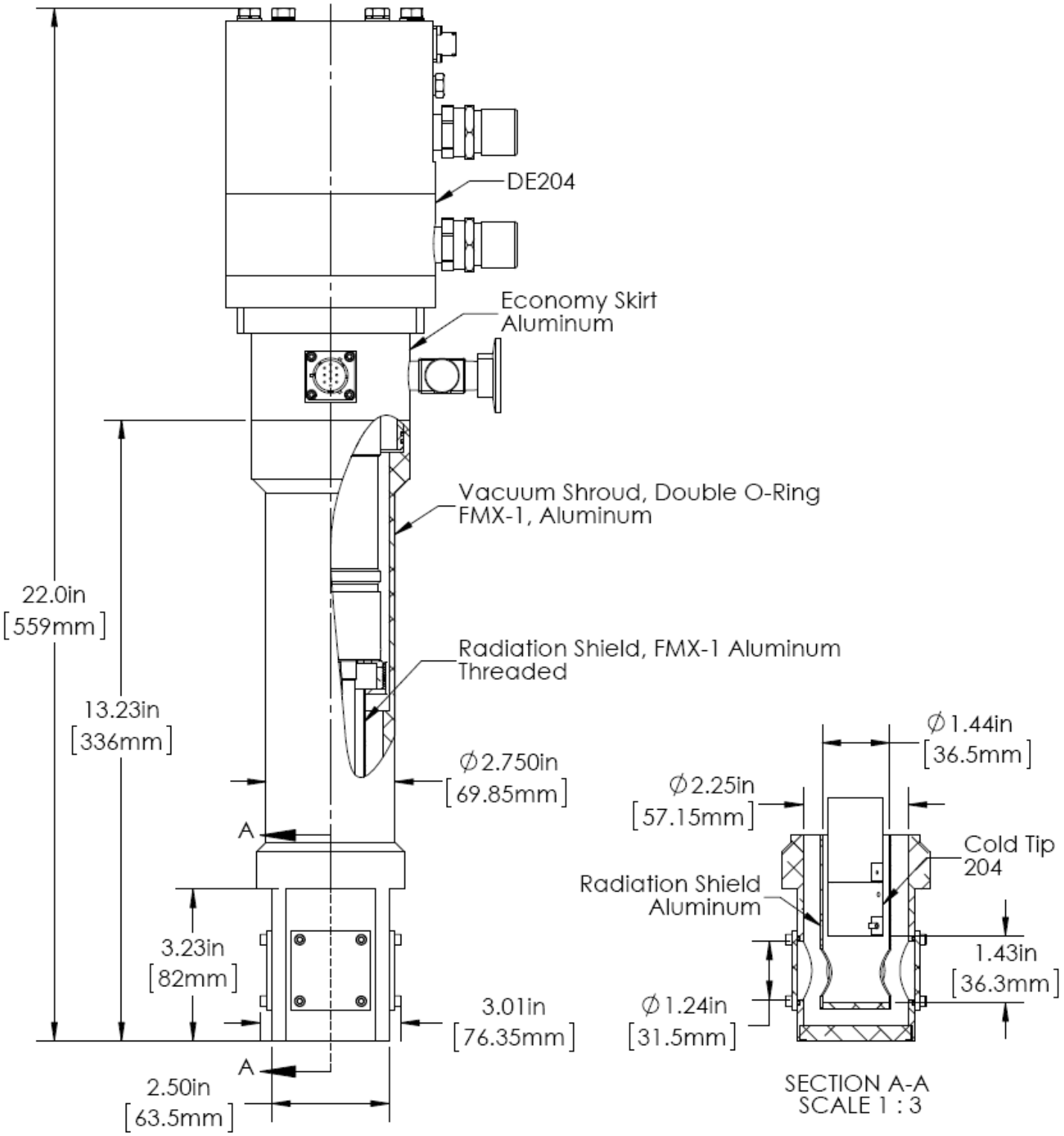
Cryostat Footprint -

Overall Length	576 mm (22.67 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-204AE**		**DE-204A(T)E**		**DE-204PE**		**DE-204SE**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

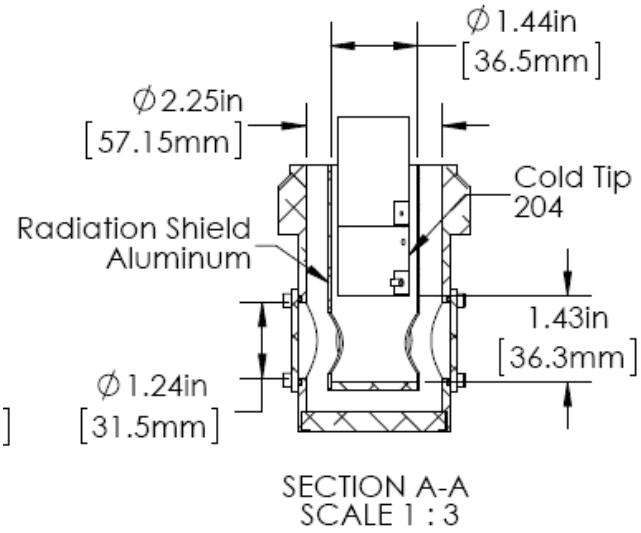
Optical Cryostat - High Power Economy

DE204*E-FMX-1AL Outline Drawing

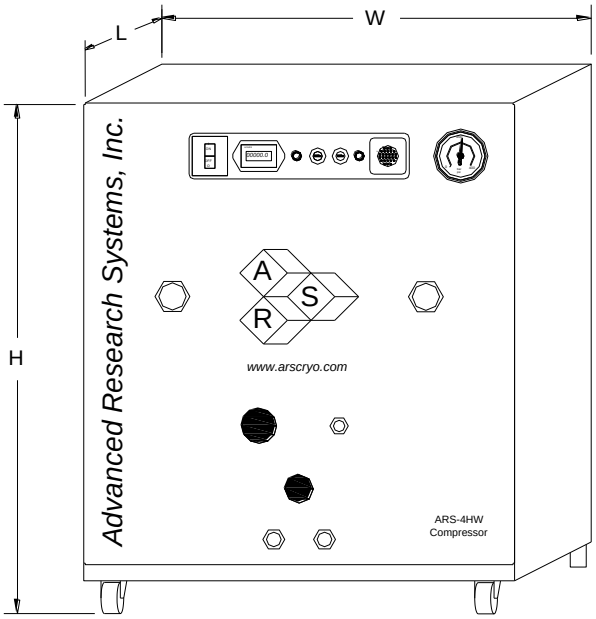


Optical Cryostat - High Power Economy

Sample Space



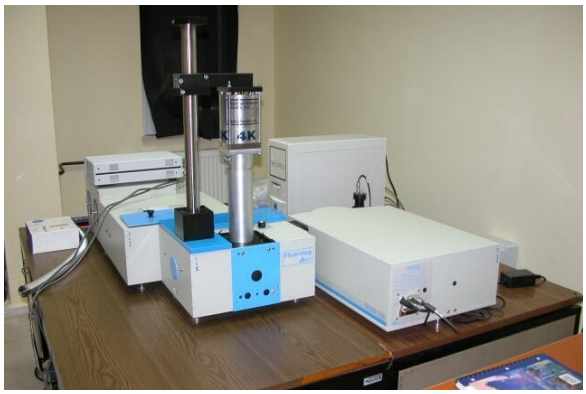
ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

Optical Cryostat - High Power Economy

Optical Spectroscopy



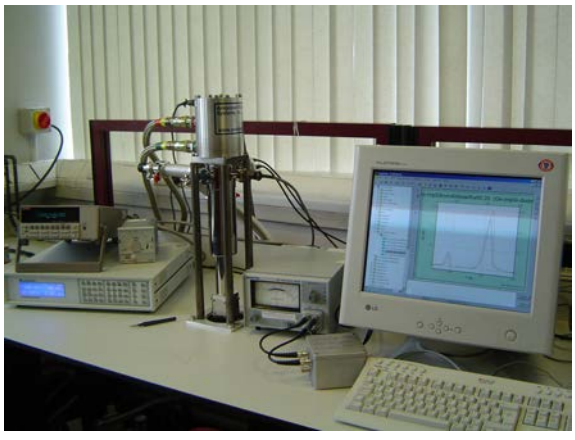
CS202SE-DMX1-AL Installed on Jobyn Yvon Spectrometer.

Courtesy: Prof. Dr. Suleyman, Gazi University

Micro PL. Adjustable sample to window distance for short focal length experiments.

Courtesy: Mr. DongHyun Kim

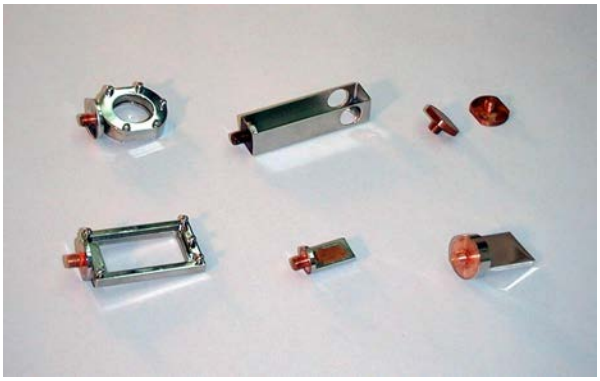
High Performance Stainless Steel Upgrade



Displex installed for spectroscopy.

Courtesy: Dr. M. Gad , Sheffield Hallam University

Optional Sample Holders



A wide range of sample holders are available for large bulk, thin film or liquid samples. Backscattering, reflection and transmission experiments.

See selection guide for more details.

Narrow Gap Magnet Cryostat – Non Optical

The **CS204*E-FMX-1AL** offers a wide range of flexibility at a low cost, making it an excellent choice for most sample and device testing. This system is well suited for optical, electrical, and magnetic sample testing.

Applications

- Resistivity/Hall Probe Experiments
- Thermal, Electrical and Magnetic Susceptibility
- Heat Capacitance
- Seebeck Effect
- DLTS

Features

- Cryogen Free, Low Power
- Low cost aluminum construction
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-204AE)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with 4 window ports for electrical experiments (FMX-3)
- Aluminum radiation shield
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (2W @ 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Narrow Gap Magnet Cryostat – Non Optical

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-204AE	< 9K - 350K
DE-204SE	< 4.2K - 350K
DE-204PE	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	41 mm (1.62 in.)
Height	45 mm (1.78 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	N/A
Diameter	N/A
Clear View	N/A
#/F	N/A
Window Material	N/A

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, Aluminum
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	338 mm (13.3 in)
Diameter	51 mm (2 in) at the sample space
Width	51 mm (2 in) at the sample space

Radiation Shield -

Material	Aluminum
Attachment	Threaded
Optical Access	N/A

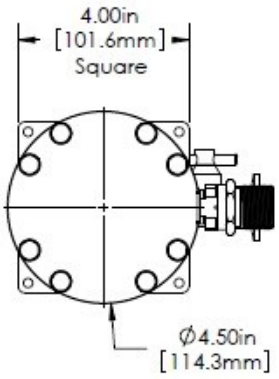
Cryostat Footprint -

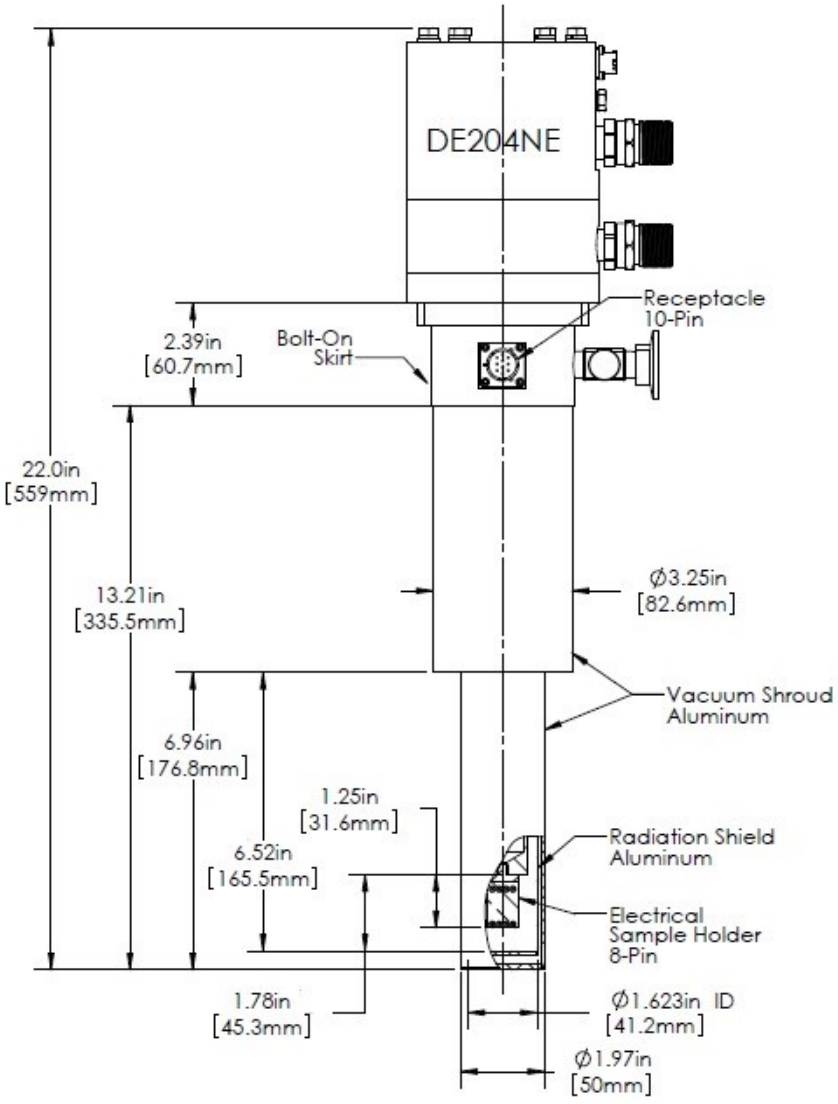
Overall Length	544 mm (22 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

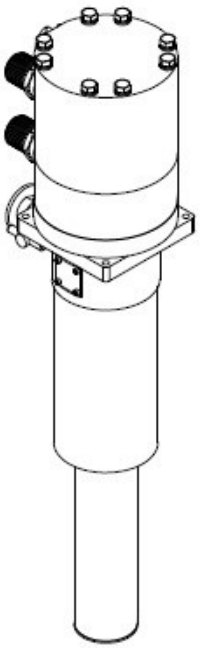
Cryocooler Model		DE-204AE		DE-204A(T)E		DE-204PE		DE-204SE	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

Narrow Gap Magnet Cryostat – Non Optical

DE204AE-FMX-3-1 Outline Drawing



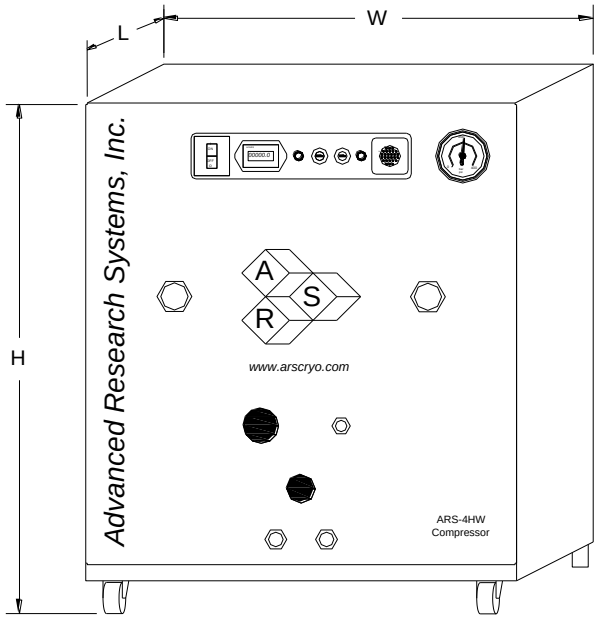




Narrow Gap Magnet Cryostat – Non Optical

Vacuum Shroud, Radiation Shield, Cold Head

ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

Cryogenic Gas Trap

The **CS204*E-FMX-19 NGA** is a Cryogenic Gas Trap. This systems interfaces to the Mass Spectrometer line via a Swagelok or 1.33" Mini Conflat Flange. The system cools down a stainless steel canister (trap) that is either bare polished or containing activated charcoal. The cryogenic trap line is constructed for UHV environments and is made out of welded stainless steel.

Applications

- Noble Gas Analysis
- Cryo-Adsorption of Gases
- Separation of He and Ne
- Separation of Ar from Kr and Xe

Features

- Cryogen Free, Low Power
- UHV Construction of the Cryogenic Gas Trap
- Traps can be supplied with or without charcoal adsorber
- Fully customizable

Typical Configuration

- Cold head (DE-204AE)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Noble Gas Interface
- VCR or 1.33" Mini Conflat Interface
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 50 ohm thermofoil heater
  - Silicon diode sensor curve matched to (±0.5K) for control
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (2W @ 10K)
- 450K High Temperature Interface
- 800K High Temperature Interface
- Turbo upgrade for faster cooldown times
- Custom temperature sensor configuration (please contact our sales staff

The above picture shows a cryocooler with a the Noble Gas Analysis Interface

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Cryogenic Gas Trap

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-204AE	< 9K - 350K
DE-204SE	< 4K - 350K
DE-204PE	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Radiation Shield-

Material	OFHC Copper
Attachment	Bolt On

Cryostat Footprint -

Overall Length	881 mm (34.7 in)
Motor Housing Diameter	114 mm (4.5 in)

Temperature Instrumentation and Control - (Standard) -

Heater	50 ohm Thermofoil Heater anchored to the coldtip
Control Sensor	Curve Matched Silicon Diode installed on the coldtip
Free Length Sensor	Calibrated Silicon Diode with free length wires
Contact ARS for other options	

Instrumentation Access-

Instrumentation Skirt	Bolt-On, Aluminum
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	881mm (34.7 in)
Diameter	77 mm (3. n) at the sample space
Width	77 mm (3in) at the sample space

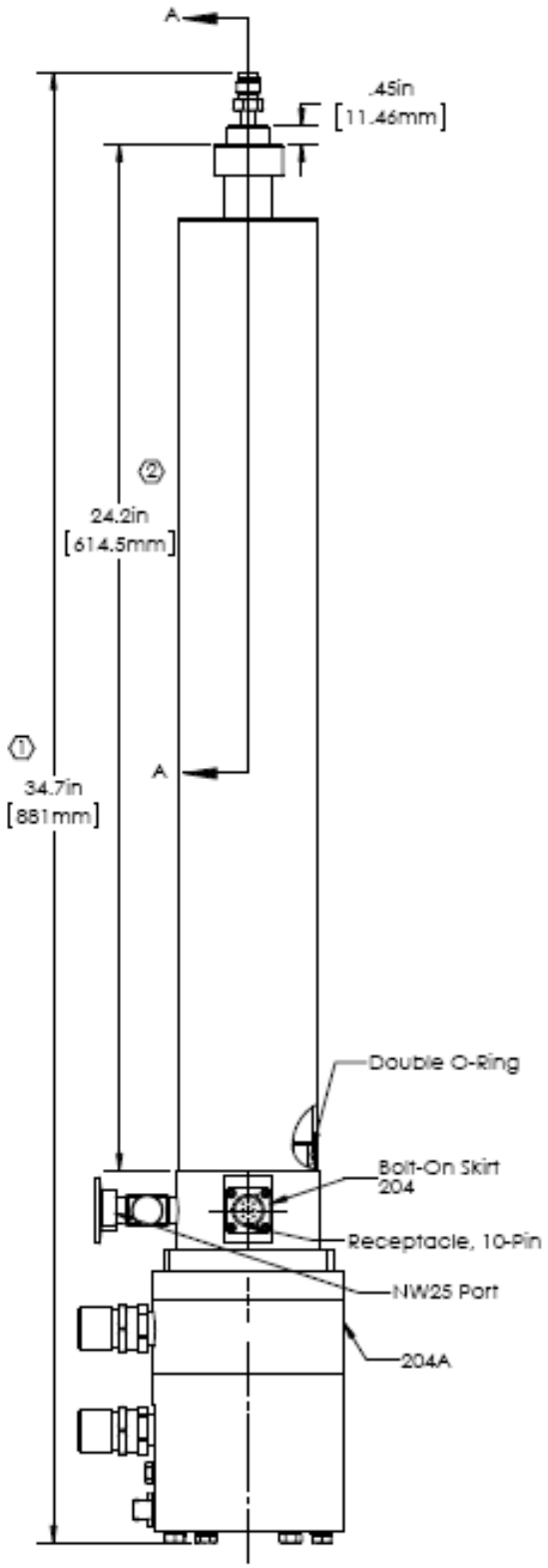
Sample Compartment Interface -

VCR	1/4”
Mini Conflat	1.33”

Cryocooler Model		**DE-204AE**		**DE-204A(T)E**		**DE-204PE**		**DE-204SE**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

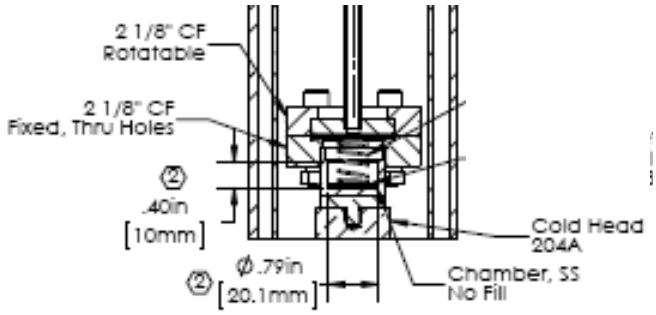
Cryogenic Gas Trap

DE204*E-FMX-19 NGA Outline Drawing

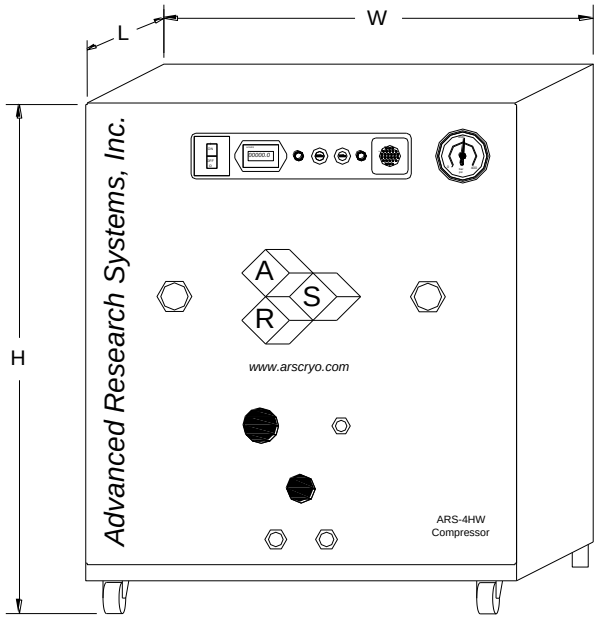


Cryogenic Gas Trap

Sample Space



ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

UHV Cryostat - Ultra Low Vibrations

The **CS204*F-DMX-20B** opens up a wide range of possibilities never before possible with a closed cycle cryocooler. The ARS manufactured DMX-20B interface, like our “B” series cold heads is a True UHV System (10^{-11} Torr) where all of the rubber o-ring seals have been replaced with welded joings and metal seals. A CF flange is The DE204*F-DMX-20B uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE204 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Sample vibration levels of 3-5nm have been demonstrated by users. Due to the exchange gas being less conductive, the base temperature will increase by 1-2K and the cooling capacity is roughly cut in half at varying temperatures.

Applications

- Low Vibration UHV applications
- Microscopy Applications
- Surface Science
- Nanomaterials

Features

- **Ultra Low Vibrations (3-5 nm)**
- True UHV (10^{-11} Torr)
- Bakeable to 200C with cold head removed
- Open Sample Space
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-204AF)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- 6” Rotatable CF flange
- Nickel Plated OFHC copper radiation shield terminating 0.125” short of the cold tip
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4.5” CF flange available but uses non standard ID and may not fit existing chambers
- 8” CF flange avilable
- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (3W @ 10K)
- 450K High Temperature Interface
  (Not required with the DMX-20 interface, but the 450K interface is helpful for high temperature performance)
- 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)
- Sample holder upgrades (custom sample holders available)

The above picture shows a cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows the compressor for the system. What is not shown is a required vacuum pump, Helium Hoses (included with system), temperature controller and Helium Gas bottle with regulator for the exchange gas.

UHV Cryostat - Ultra Low Vibrations

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*- DMX-20 adds 1-2K to base temperature

DE-204AF	< 10K - 350K
DE-204P4	< 4.2K - 350K
DE-202SF	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*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/Products/SampleHolders.html

Chamber Interface -

Flanges	CF, ISO
Size	4.5”, 6”, 8” 10” (4.5” CF flange non standard may not fit all chambers)

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	Welded Stainless Steel
Pump out Port	0
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	Open End Radiation Shield terminateds 0.125” short of cold tip (customer specified)

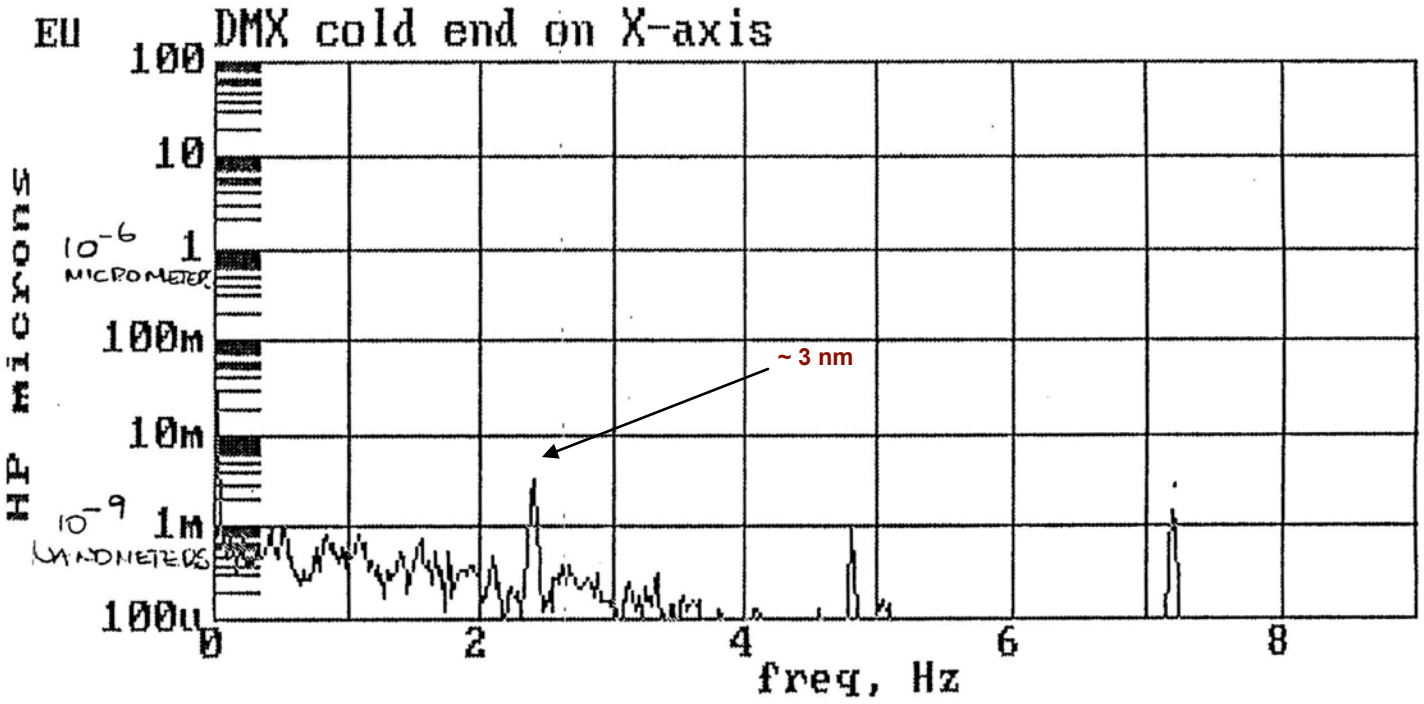
Cryostat Footprint -

Overall Length	590 mm (23.24 in) 295 mm (11.63 in) standard flange to tip length
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-204AF		DE-204A(T)F		DE-204PF		DE-204SF	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

UHV Cryostat - Ultra Low Vibrations

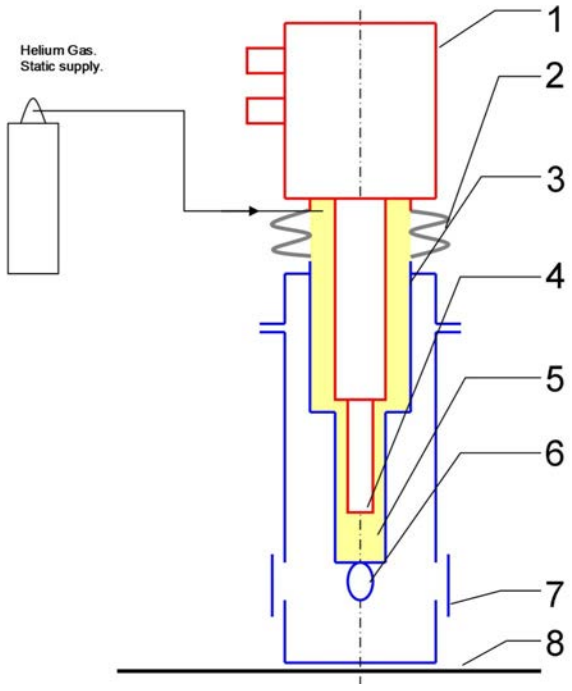
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

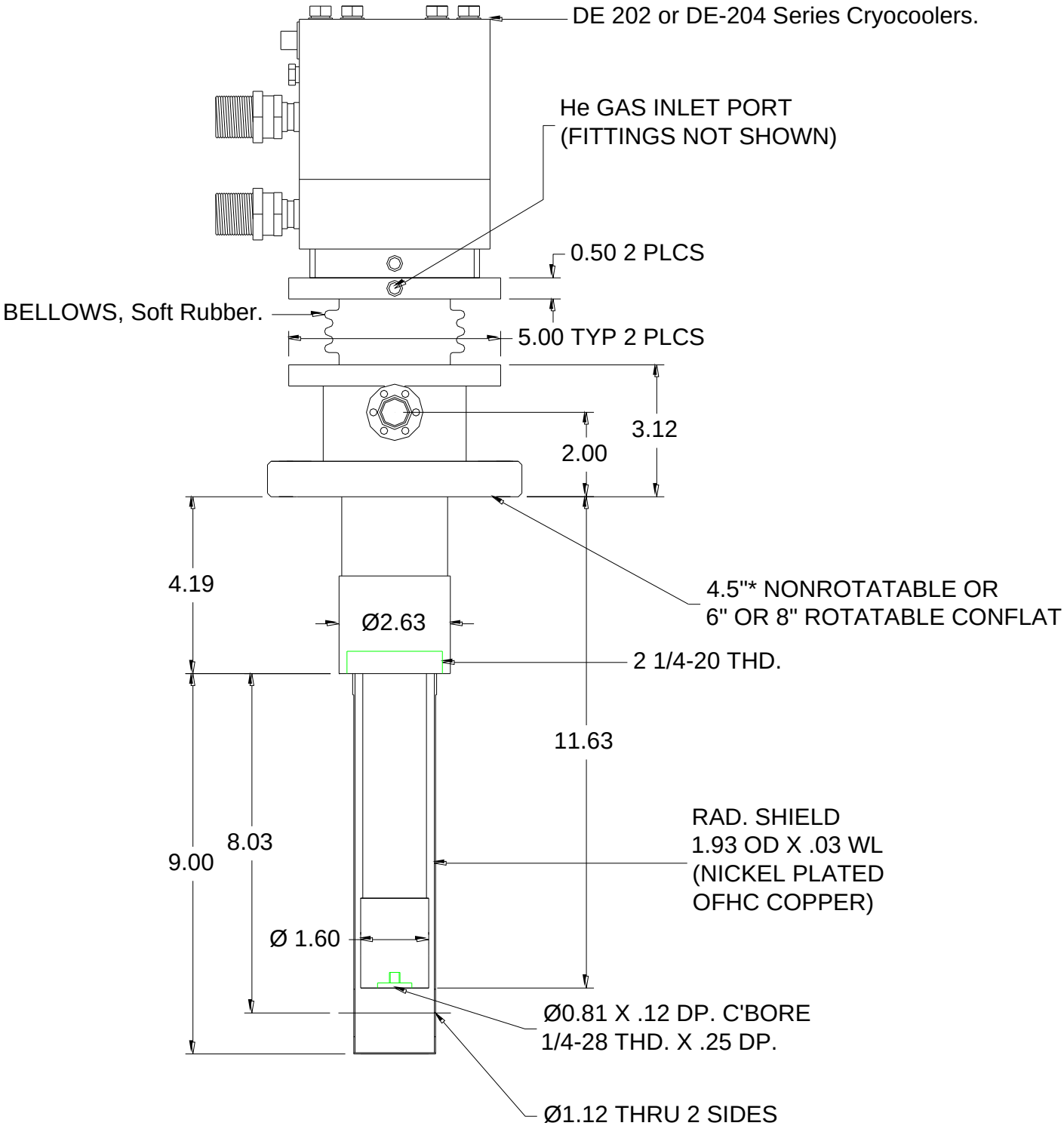
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

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 X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
5. Convective pockets of Helium Exchange Gas cools the sample space.
6. The sample is only in contact with the X-20 Interface
7. Windows for Optical Experiments
8. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



UHV Cryostat - Ultra Low Vibrations

DE204*F-DMX-20B Outline Drawing

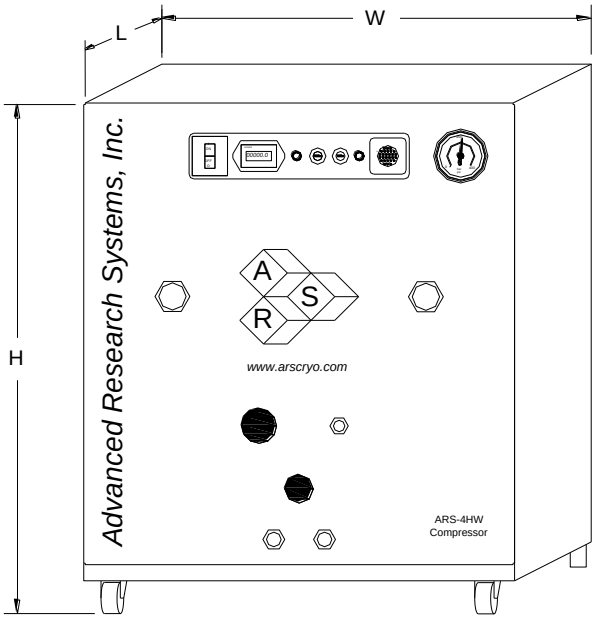


UHV Cryostat - Ultra Low Vibrations

Direct Mounting

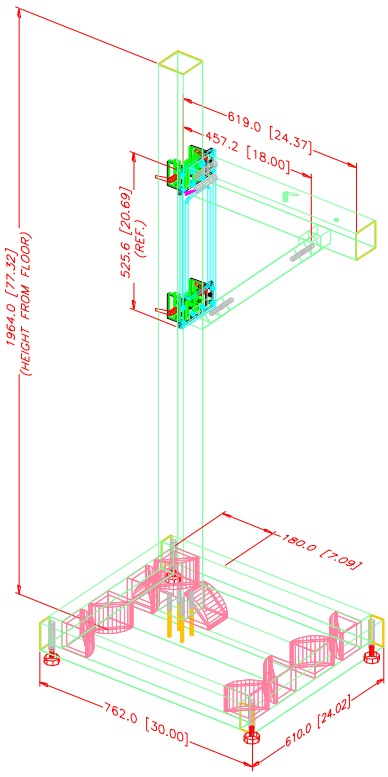
The DMX-20 can be direct mounted on the Cryocooler. The vibrations at the sample will go up to 140 nm. It can be useful if the sample has to be translated in XYZ.

ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

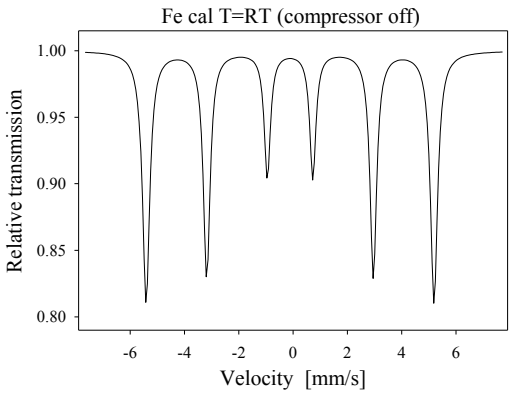
Floor Stand



UHV Cryostat - Ultra Low Vibrations

Mossbauer Spectra with DMX-20

Cryocooler Off



Calculated parameters:

WID=0.269 mm/s
W13=1.17

W23=1.08

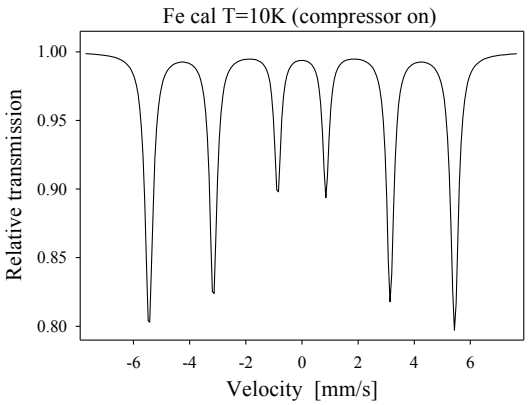
ISO=0.000 mm/s

BHF=32.94T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

Cryocooler On



Calculated parameters:

WID=0.270 mm/s
W13=1.21

W23=1.11

ISO=+0.115 mm/s

BHF=33.81T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

When the system is properly mounted to the wall and the table and properly adjusted then the effect of vibrations induced by the working compressor is very small (almost negligible).

The broadening (rather no broadening!) is fully reproducible and is well below 2%. Such broadening has practically no effect and in almost all cases can be ignored. However, compare the lin ewidths calculated in the same way!

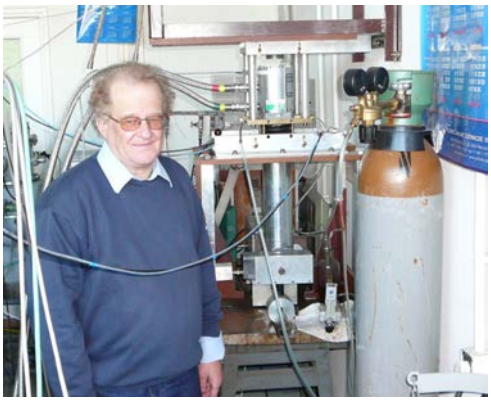
The Displex system is virtually vibration free!

Prof. Dr. habil. Michal Kopcewicz

Institute of Electronic Materials Technology

WARSAW, Poland

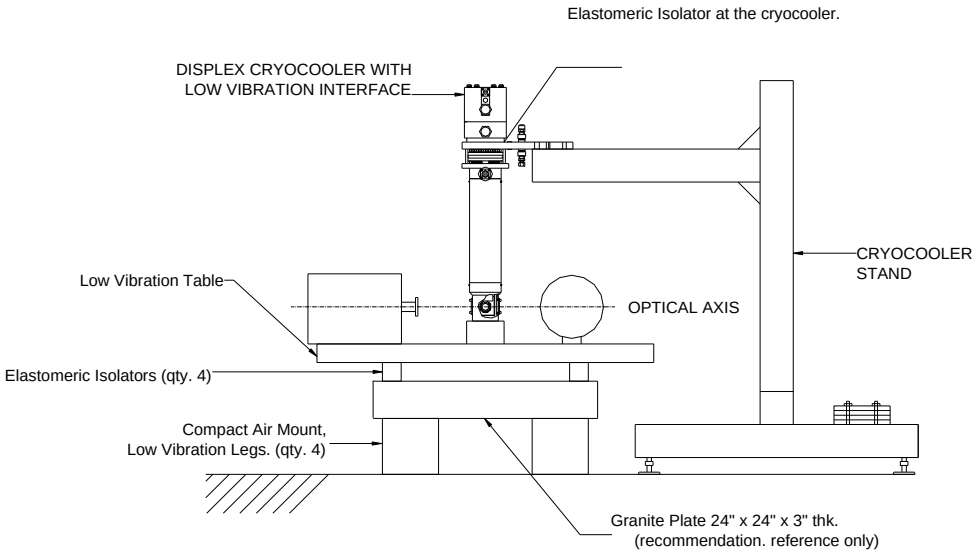
Mossbauer Cryostat, DMX-20



Prof. Dr. habil. Michal Kopcewicz

UHV Cryostat - Ultra Low Vibrations

Possible Mossbauer Configuration



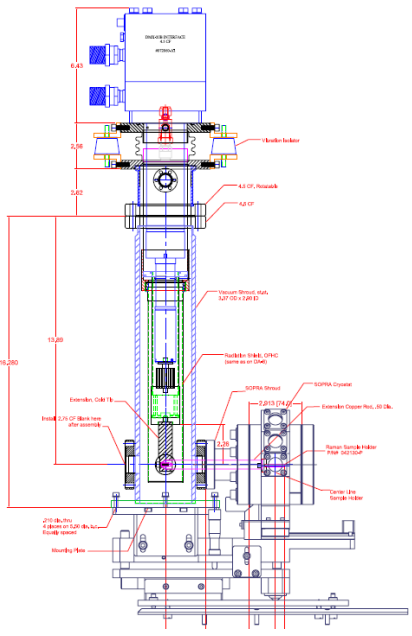
For maximum isolation proper mounting of the system is important. ARS offers a special ULV stand to isolate the ultra low vibration cryostat from the vibrating components of the cooler and the floor vibrations.

The cryocooler stand can be adjusted for the proper height, this holds the cooler.

The cryostat is mounted on the low vibration table. which consists of a high mass granite block (User supplied), resting on 4 air legs (optional ARS offering). Additional elastomeric isolators additional filter the unwanted frequencies from the floor to the cryostat.

System can be tested by shutting off the cryocooler only and watching the vibration effect on the experiment.

Ellipsometry



Low Vibration system for SOPRA Ellipsometer

UHV Cryostat - Ultra Low Vibrations

SEM Setup

The picture shows the Displex and its interface. All items showing stainless steel in the photo are modifications to our JSM-5910 SEM. Please also note the published papers on my website, which demonstrate CL results that were acquired with this cooling system.

The sample temperature, is between 40 K and 50 K.

Courtesy; Prof. Dan Rich, Ben Gurion University, Beer Sheva, Israel.

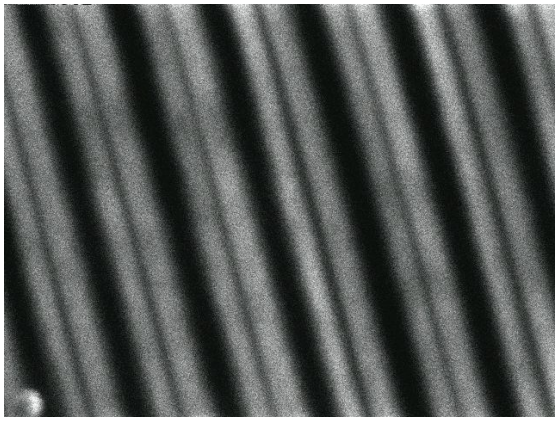
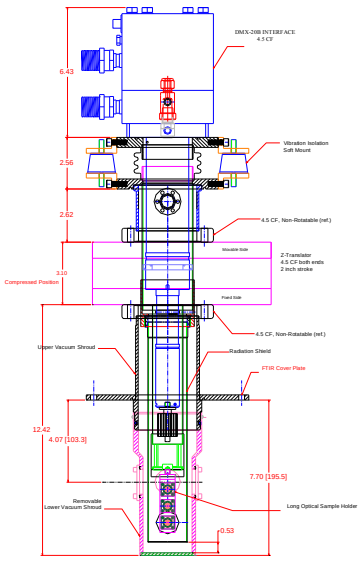


Image of a InGaN/GaN quantum well grown on a patterned GaN substrate. The patterning consists of stripes with a periodicity of 10 microns.

Monochromatic CL image (Mag. 2000) taken with a 390 nm detection wavelength.

The degradation of image quality from room temperature and 50K suggests that the vibration is less than 10nm.

FTIR Setup

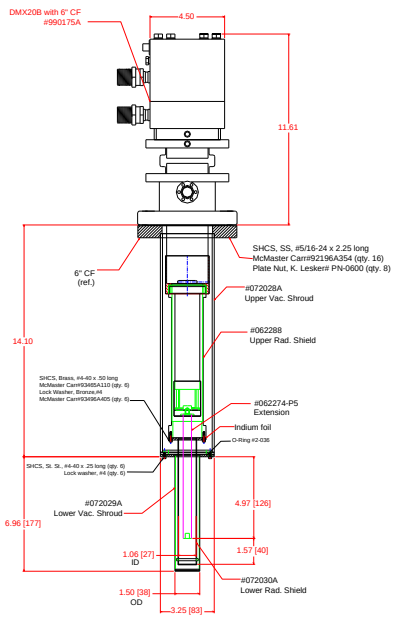


Low Vibration system for FTIR spectrometer. Sample holder with 3 samples can be translated in Z direction.

Low Vibration system for BOMEM, DA8 FTIR spectrometer.

UHV Cryostat - Ultra Low Vibrations

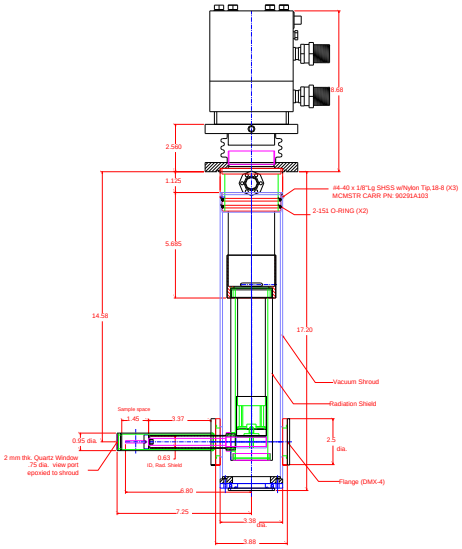
Magneto Electrical Experiments



The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

Magneto Optical Experiments (MOKE)



Low Vibration Side looking window can be placed in a MOKE, (Magneto Optical Kerr Effect). Sample can be located in any plane. The pole spacing can be as low as 1 inch.

Small diameter vacuum housing can be inserted into a narrow gap (high field). The optical window allows collection of light from the sample. The window can be very close to the sample for short focal length objective.

Cryogenic Gas Trap

The **CS204*E-FMX-19 NGA** is a Cryogenic Gas Trap. This systems interfaces to the Mass Spectrometer line via a Swagelok or 1.33" Mini Conflat Flange. The system cools down a stainless steel canister (trap) that is either bare polished or containing activated charcoal. The cryogenic trap line is constructed for UHV environments and is made out of welded stainless steel.

Applications

- Noble Gas Analysis
- Cryo-Adsorption of Gases
- Separation of He and Ne
- Separation of Ar from Kr and Xe

Features

- Cryogen Free, Low Power
- UHV Construction of the Cryogenic Gas Trap
- Traps can be supplied with or without charcoal adsorber
- Fully customizable

Typical Configuration

- Cold head (DE-204AE)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Noble Gas Interface
- VCR or 1.33" Mini Conflat Interface
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 50 ohm thermofoil heater
  - Silicon diode sensor curve matched to (±0.5K) for control
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (2W @ 10K)
- 450K High Temperature Interface
- 800K High Temperature Interface
- Turbo upgrade for faster cooldown times
- Custom temperature sensor configuration (please contact our sales staff

The above picture shows a cryocooler with a the Noble Gas Analysis Interface

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Cryogenic Gas Trap

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-204AE	< 9K - 350K
DE-204SE	< 4K - 350K
DE-204PE	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Radiation Shield-

Material	OFHC Copper
Attachment	Bolt On

Cryostat Footprint -

Overall Length	881 mm (34.7 in)
Motor Housing Diameter	114 mm (4.5 in)

Temperature Instrumentation and Control - (Standard) -

Heater	50 ohm Thermofoil Heater anchored to the coldtip
Control Sensor	Curve Matched Silicon Diode installed on the coldtip
Free Length Sensor	Calibrated Silicon Diode with free length wires
Contact ARS for other options	

Instrumentation Access-

Instrumentation Skirt	Bolt-On, Aluminum
Pump out Port	1 - NW 25
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	881mm (34.7 in)
Diameter	77 mm (3. n) at the sample space
Width	77 mm (3in) at the sample space

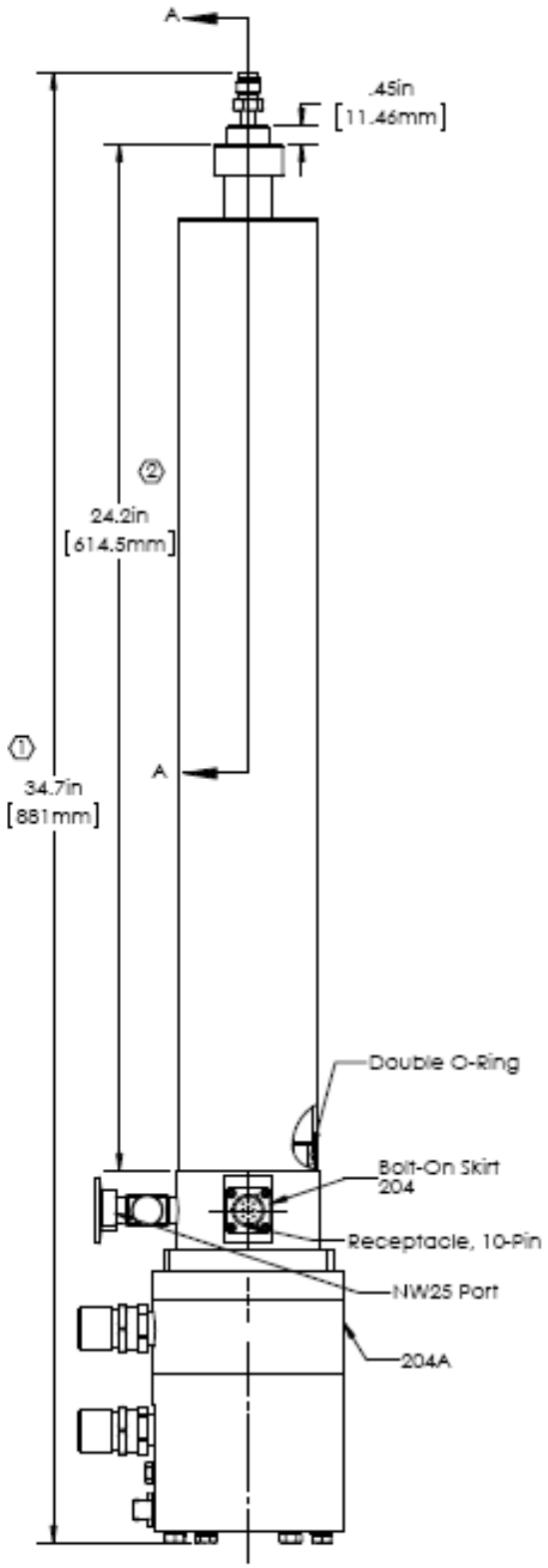
Sample Compartment Interface -

VCR	1/4”
Mini Conflat	1.33”

Cryocooler Model		**DE-204AE**		**DE-204A(T)E**		**DE-204PE**		**DE-204SE**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

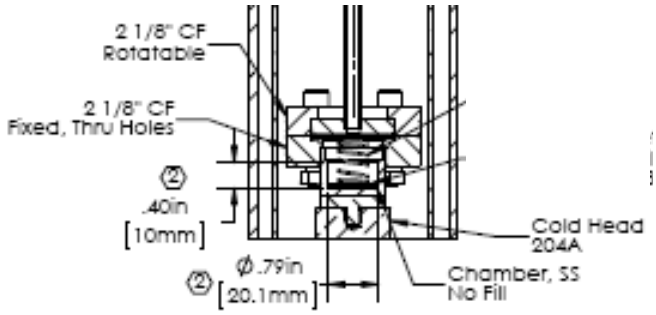
Cryogenic Gas Trap

DE204*E-FMX-19 NGA Outline Drawing

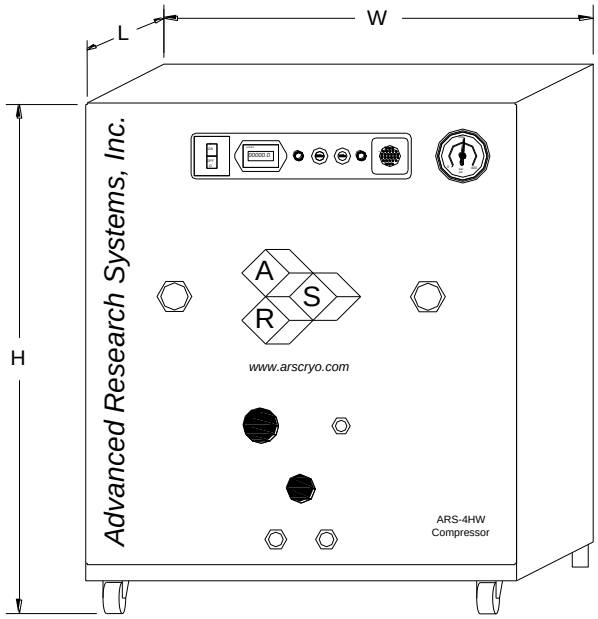


Cryogenic Gas Trap

Sample Space



ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

UHV Cryostat - Ultra Low Vibrations

The **CS204*F-DMX-20B** opens up a wide range of possibilities never before possible with a closed cycle cryocooler. The ARS manufactured DMX-20B interface, like our “B” series cold heads is a True UHV System (10^{-11} Torr) where all of the rubber o-ring seals have been replaced with welded joings and metal seals. A CF flange is The DE204*F-DMX-20B uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE204 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Sample vibration levels of 3-5nm have been demonstrated by users. Due to the exchange gas being less conductive, the base temperature will increase by 1-2K and the cooling capacity is roughly cut in half at varying temperatures.

Applications

- Low Vibration UHV applications
- Microscopy Applications
- Surface Science
- Nanomaterials

Features

- **Ultra Low Vibrations (3-5 nm)**
- True UHV (10^{-11} Torr)
- Bakeable to 200C with cold head removed
- Open Sample Space
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-204AF)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- 6” Rotatable CF flange
- Nickel Plated OFHC copper radiation shield terminating 0.125” short of the cold tip
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4.5” CF flange available but uses non standard ID and may not fit existing chambers
- 8” CF flange avilable
- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (3W @ 10K)
- 450K High Temperature Interface
  (Not required with the DMX-20 interface, but the 450K interface is helpful for high temperature performance)
- 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)
- Sample holder upgrades (custom sample holders available)

The above picture shows a cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows the compressor for the system. What is not shown is a required vacuum pump, Helium Hoses (included with system), temperature controller and Helium Gas bottle with regulator for the exchange gas.

UHV Cryostat - Ultra Low Vibrations

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*- DMX-20 adds 1-2K to base temperature

DE-204AF	< 10K - 350K
DE-204P4	< 4.2K - 350K
DE-202SF	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*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/Products/SampleHolders.html

Chamber Interface -

Flanges	CF, ISO
Size	4.5”, 6”, 8” 10” (4.5” CF flange non standard may not fit all chambers)

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	Welded Stainless Steel
Pump out Port	0
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	Open End Radiation Shield terminateds 0.125” short of cold tip (customer specified)

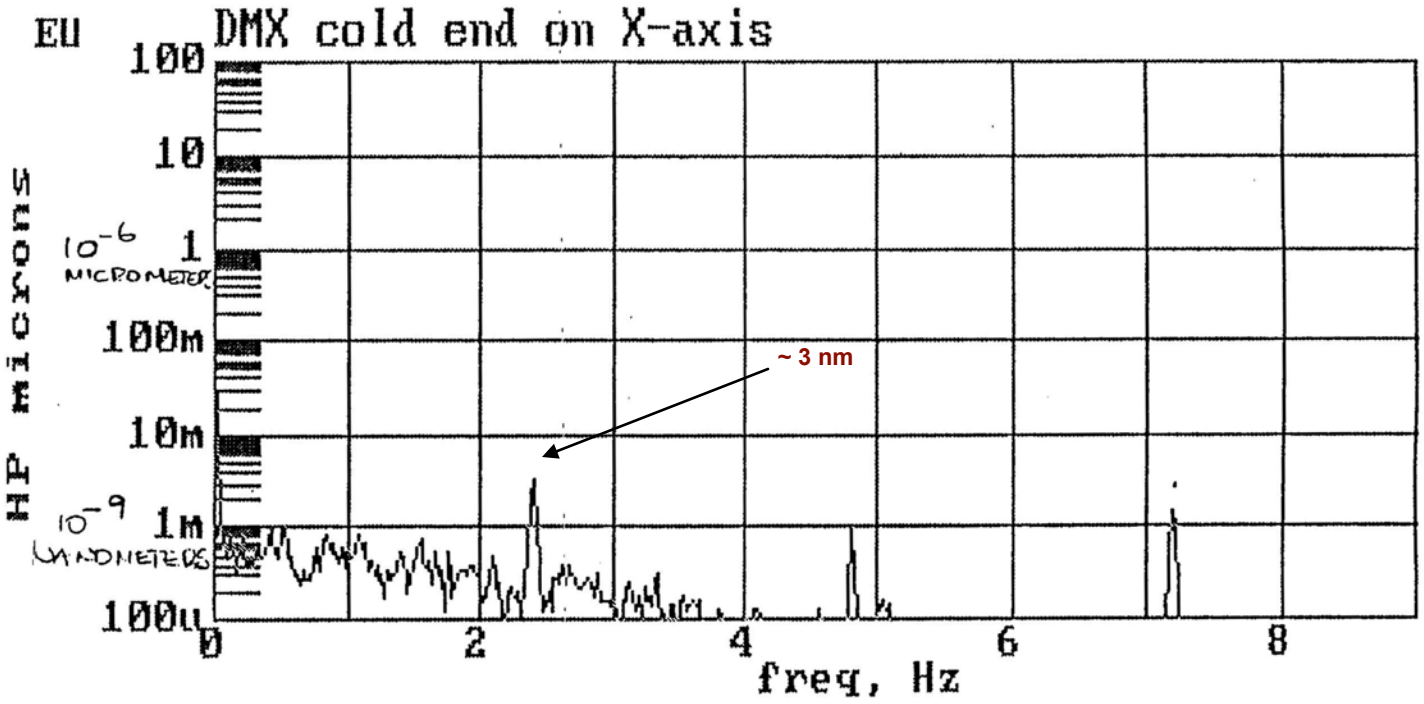
Cryostat Footprint -

Overall Length	590 mm (23.24 in) 295 mm (11.63 in) standard flange to tip length
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-204AF		DE-204A(T)F		DE-204PF		DE-204SF	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

UHV Cryostat - Ultra Low Vibrations

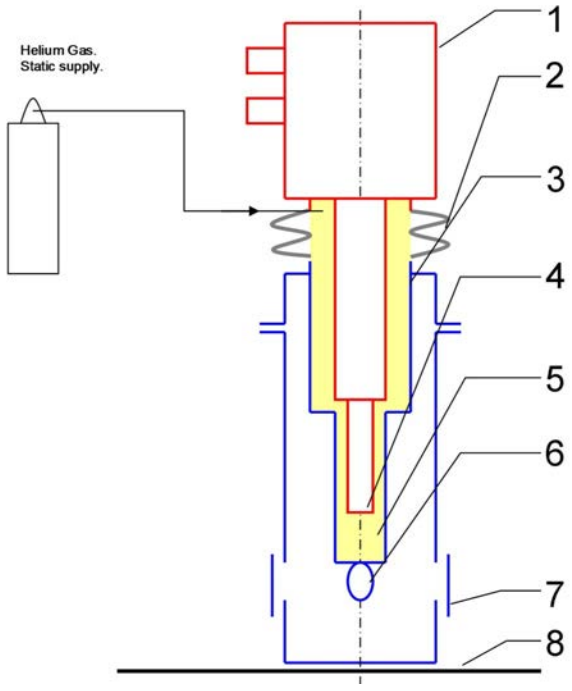
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

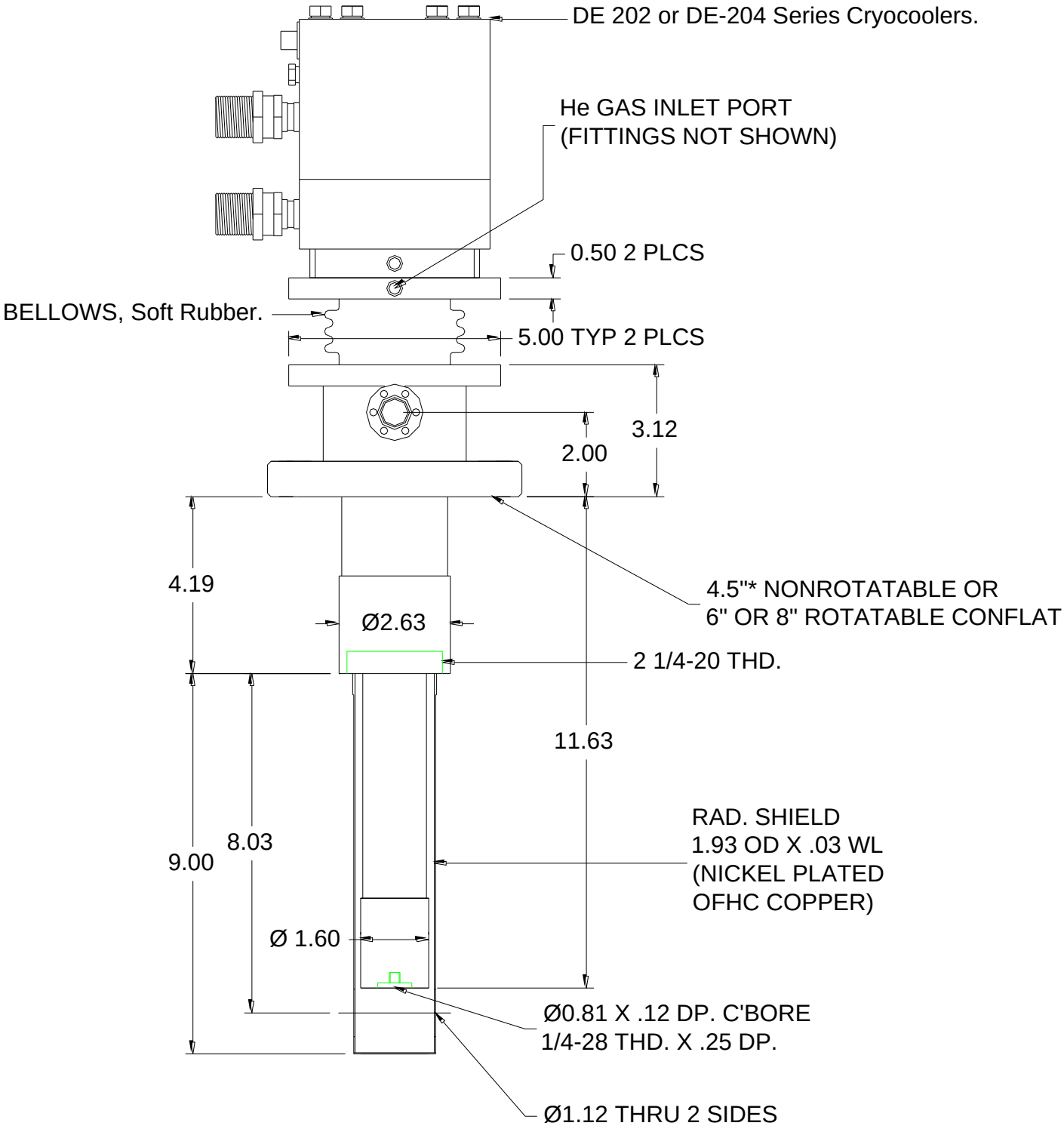
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

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 X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
5. Convective pockets of Helium Exchange Gas cools the sample space.
6. The sample is only in contact with the X-20 Interface
7. Windows for Optical Experiments
8. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



UHV Cryostat - Ultra Low Vibrations

DE204*F-DMX-20B Outline Drawing

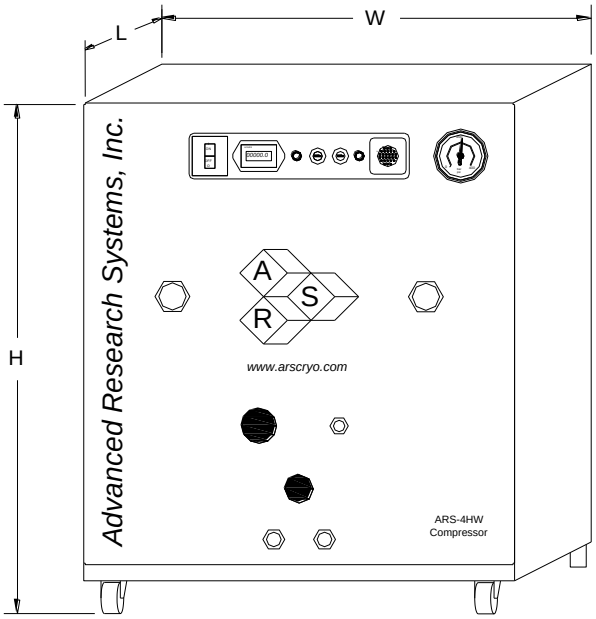


UHV Cryostat - Ultra Low Vibrations

Direct Mounting

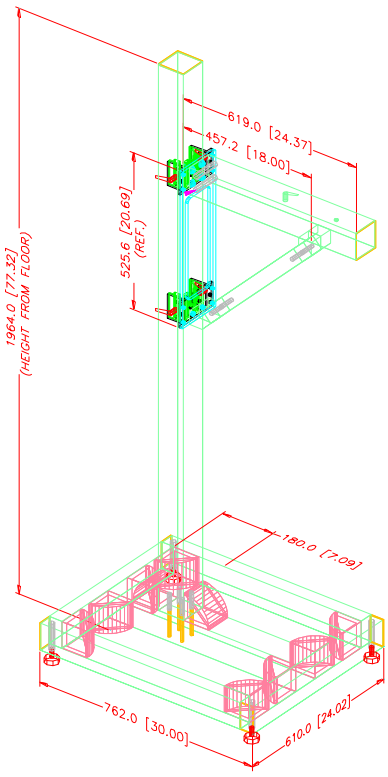
The DMX-20 can be direct mounted on the Cryocooler. The vibrations at the sample will go up to 140 nm. It can be useful if the sample has to be translated in XYZ.

ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

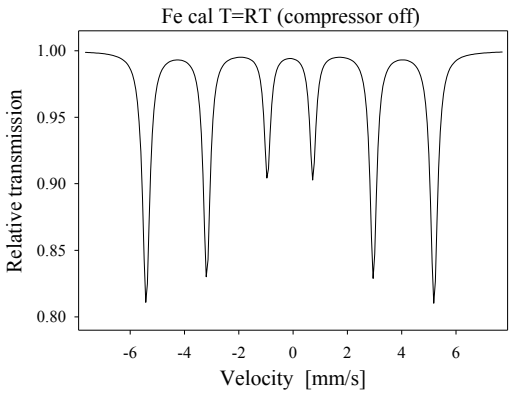
Floor Stand



UHV Cryostat - Ultra Low Vibrations

Mossbauer Spectra with DMX-20

Cryocooler Off



Calculated parameters:

WID=0.269 mm/s
W13=1.17

W23=1.08

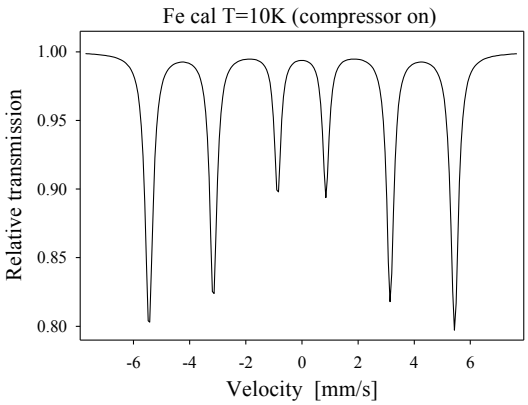
ISO=0.000 mm/s

BHF=32.94T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

Cryocooler On



Calculated parameters:

WID=0.270 mm/s
W13=1.21

W23=1.11

ISO=+0.115 mm/s

BHF=33.81T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

When the system is properly mounted to the wall and the table and properly adjusted then the effect of vibrations induced by the working compressor is very small (almost negligible).

The broadening (rather no broadening!) is fully reproducible and is well below 2%. Such broadening has practically no effect and in almost all cases can be ignored. However, compare the lin ewidths calculated in the same way!

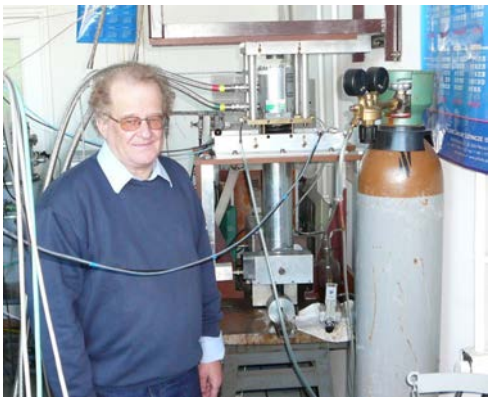
The Displex system is virtually vibration free!

Prof. Dr. habil. Michal Kopcewicz

Institute of Electronic Materials Technology

WARSAW, Poland

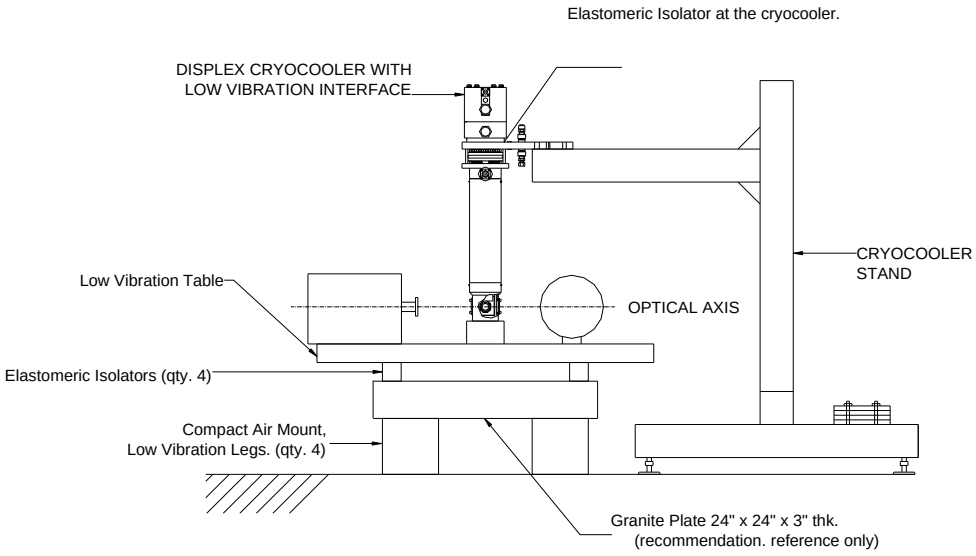
Mossbauer Cryostat, DMX-20



Prof. Dr. habil. Michal Kopcewicz

UHV Cryostat - Ultra Low Vibrations

Possible Mossbauer Configuration



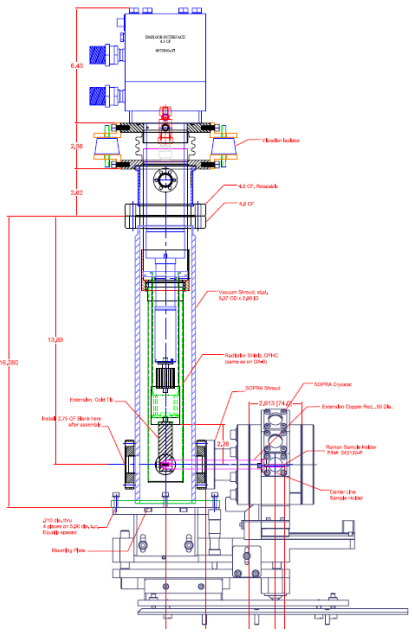
For maximum isolation proper mounting of the system is important. ARS offers a special ULV stand to isolate the ultra low vibration cryostat from the vibrating components of the cooler and the floor vibrations.

The cryocooler stand can be adjusted for the proper height, this holds the cooler.

The cryostat is mounted on the low vibration table. which consists of a high mass granite block (User supplied), resting on 4 air legs (optional ARS offering). Additional elastomeric isolators additional filter the unwanted frequencies from the floor to the cryostat.

System can be tested by shutting off the cryocooler only and watching the vibration effect on the experiment.

Ellipsometry



Low Vibration system for SOPRA Ellipsometer

UHV Cryostat - Ultra Low Vibrations

SEM Setup

The picture shows the Displex and its interface. All items showing stainless steel in the photo are modifications to our JSM-5910 SEM. Please also note the published papers on my website, which demonstrate CL results that were acquired with this cooling system.

The sample temperature, is between 40 K and 50 K.

Courtesy; Prof. Dan Rich, Ben Gurion University, Beer Sheva, Israel.

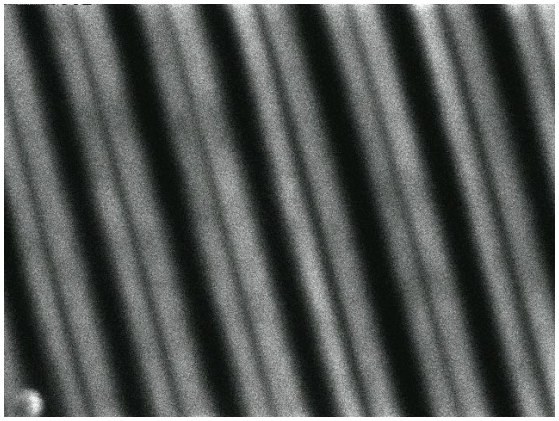
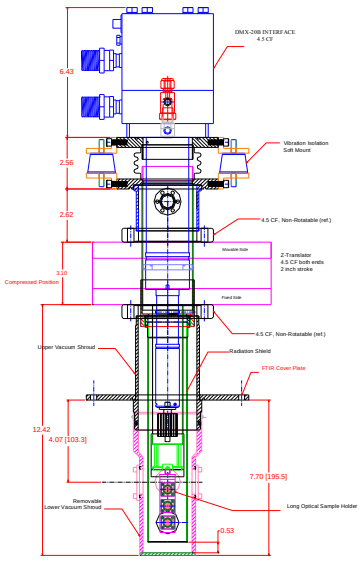


Image of a InGaN/GaN quantum well grown on a patterned GaN substrate. The patterning consists of stripes with a periodicity of 10 microns.

Monochromatic CL image (Mag. 2000) taken with a 390 nm detection wavelength.

The degradation of image quality from room temperature and 50K suggests that the vibration is less than 10nm.

FTIR Setup

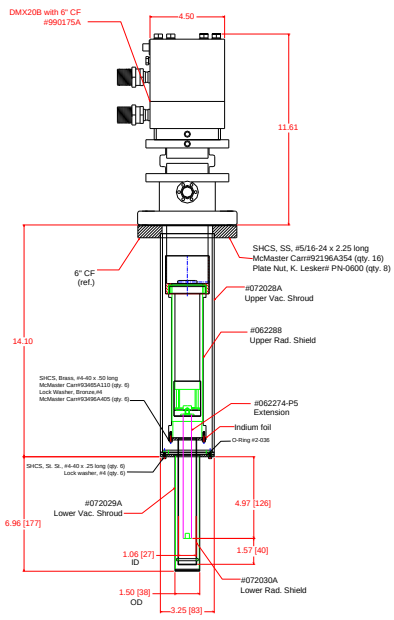


Low Vibration system for FTIR spectrometer. Sample holder with 3 samples can be translated in Z direction.

Low Vibration system for BOMEM, DA8 FTIR spectrometer.

UHV Cryostat - Ultra Low Vibrations

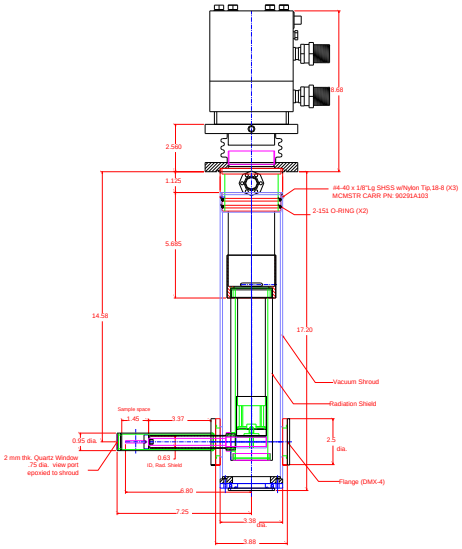
Magneto Electrical Experiments



The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

Magneto Optical Experiments (MOKE)



Low Vibration Side looking window can be placed in a MOKE, (Magneto Optical Kerr Effect). Sample can be located in any plane. The pole spacing can be as low as 1 inch.

Small diameter vacuum housing can be inserted into a narrow gap (high field). The optical window allows collection of light from the sample. The window can be very close to the sample for short focal length objective.

Optical Cryostat - Microscopy

The **DE204*F-DMX-20-OM** is our Ultra Low Vibration Closed Cycle Cryostat for Optical Micrscopy applications such as MicroRaman and Micro Photoluminescence**.** The DE204*F-DMX-20-OM uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE204 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Sample vibrations of 3-5 nm have been demonstrated by users. 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 (3-5 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-204AF)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- DMX-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 feed through
  - 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 feed through
  - 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 4K DE204 Cryocooler installed on a DMX-20-OM interface.

The above picture shows the compressor for the system. What is not shown is a required vacuum pump, Helium Hoses (included with system), temperature controller and Helium Gas bottle with regulator for the exchange gas.

Optical Cryostat - Microscopy

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Sample Vibrations-

Independent Mounting	3 - 5 nm
Direct Soft Mount	< 140 nm

Temperature*- DMX-20-OM adds 4-5K to base temperature

DE-204AF	< 10K - 350K
DE-204PF	< 4.2K - 350K
DE-202SF	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 800K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*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/Products/SampleHolders.html

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/Products/WindowMaterials.html

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 sales staff 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)

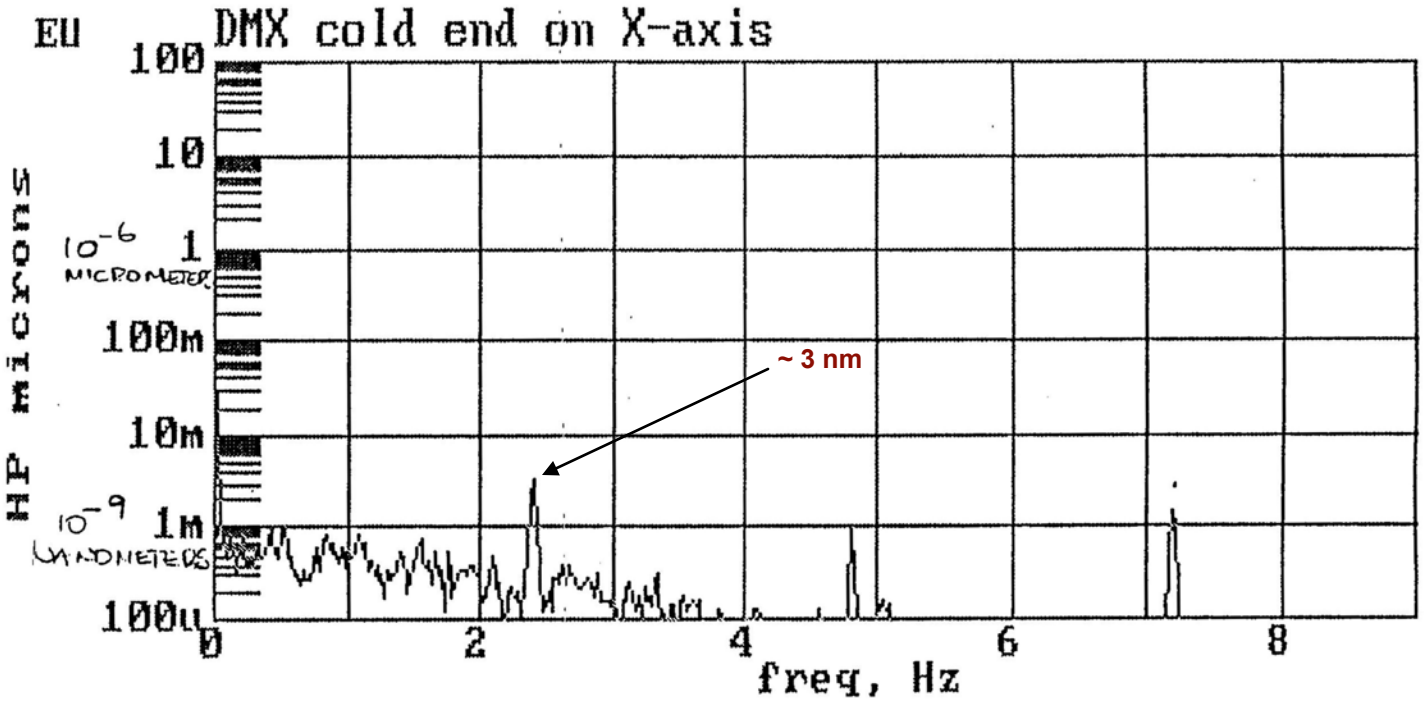
Cryostat Footprint -

Overall Length	645mm (25.4 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-204AF**		**DE-204A(T)F**		**DE-204PF**		**DE-204SF**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity*	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time*	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

Optical Cryostat - Microscopy

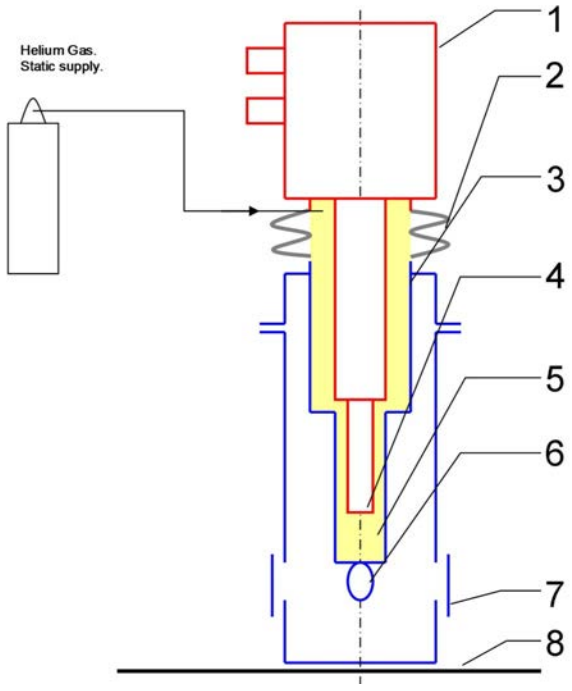
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

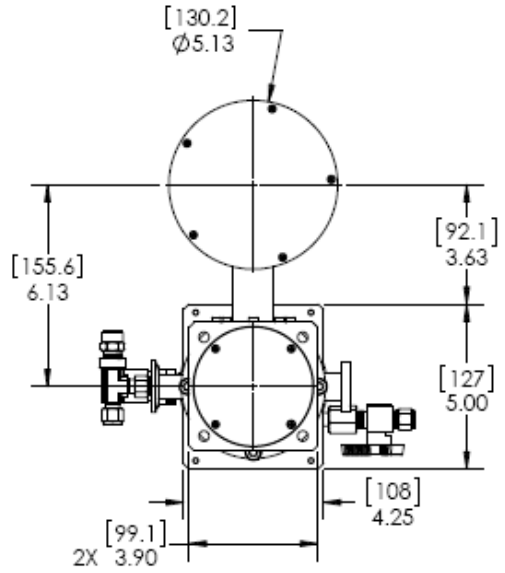
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

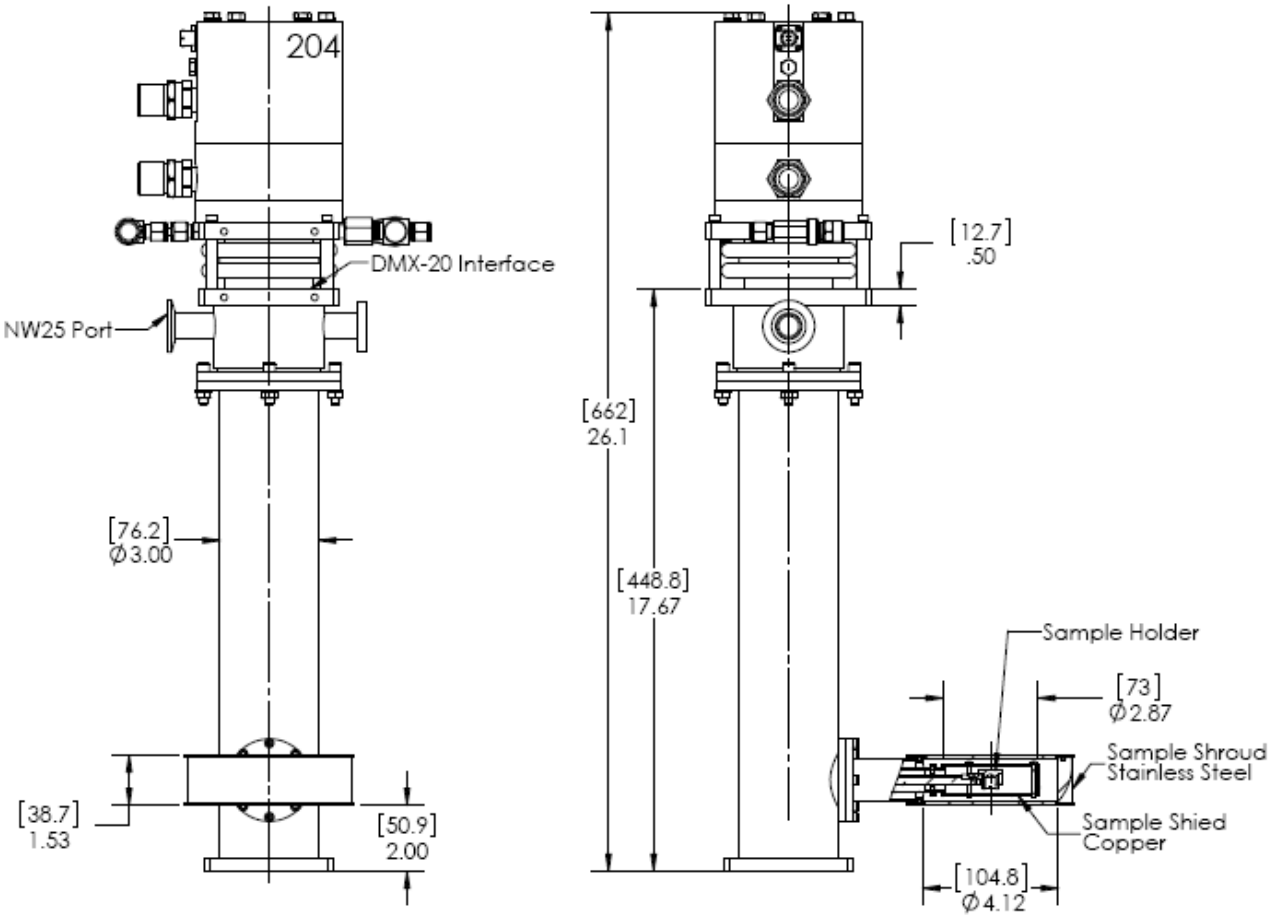
1. The Cryocooler is supported from a Floor Stand
2. The soft rubber bellows minimize vibrations transmitted to the sample while keeping in the Helium Exchange Gas
3. The X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending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



Optical Cryostat - Microscopy

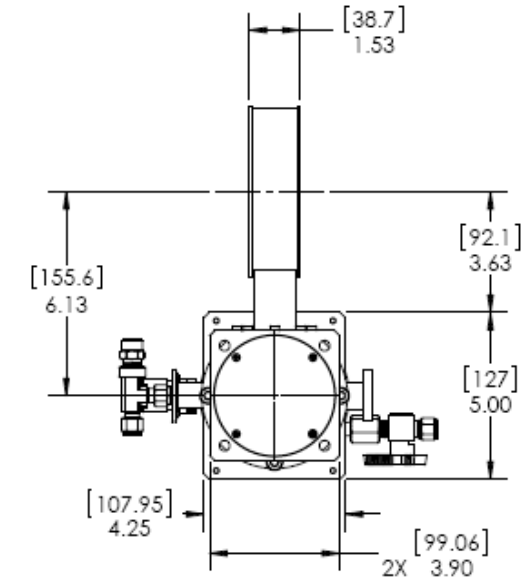
DE204*F-DMX-20-OM– Outline Drawing

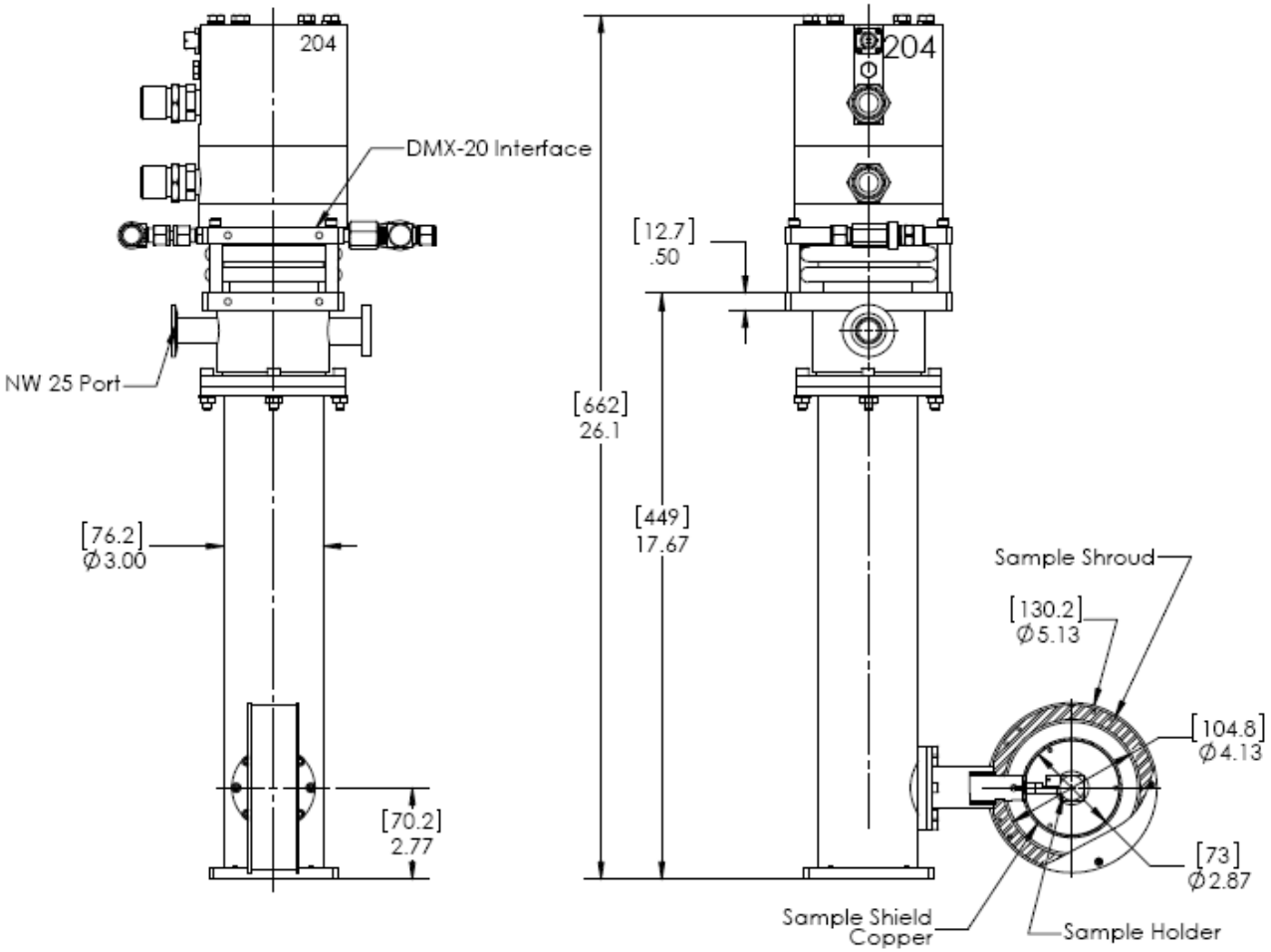




Optical Cryostat - Microscopy

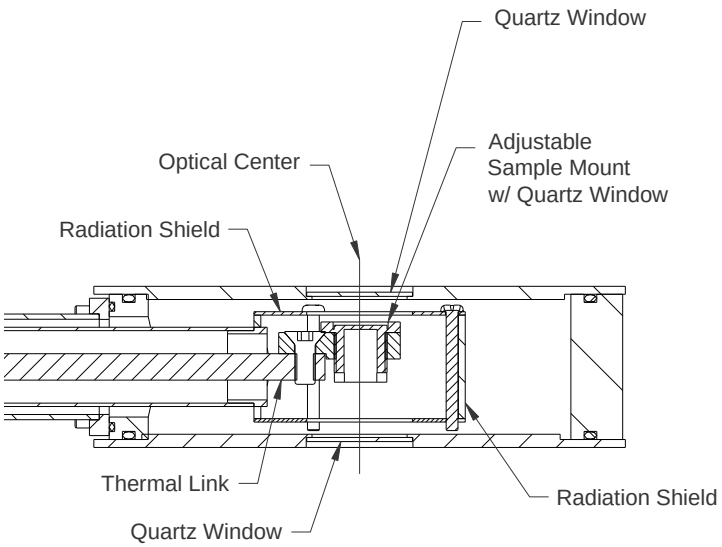
DE204*F-DMX-20-OM– Rotated Outline Drawing



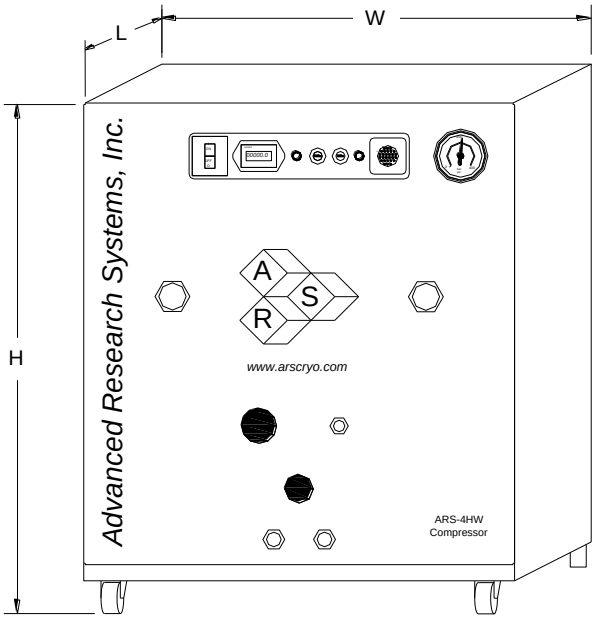


Optical Cryostat - Microscopy

Sample Space

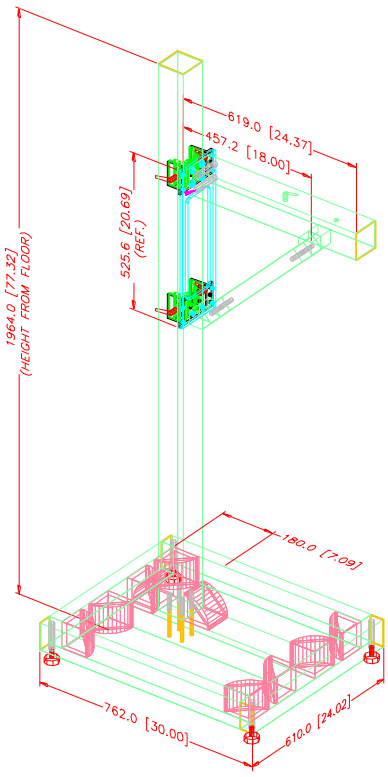


ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

Floor Stand



Optical Cryostat - Microscopy

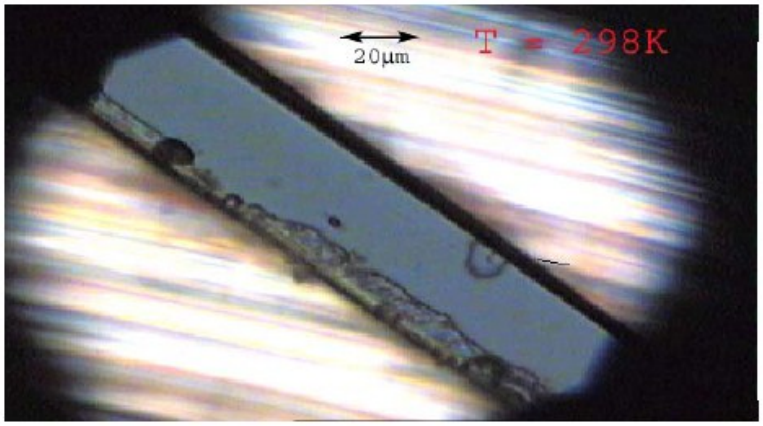
DE204SF-DMX-20-OM

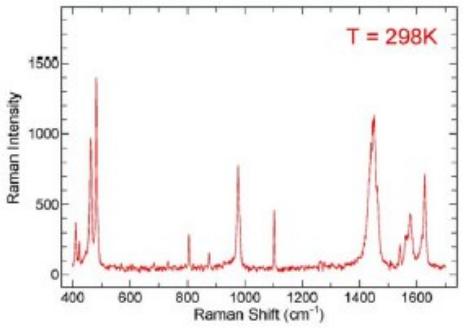
This is to inform you about our recent tests on the closed-cycle cryostat designed for Raman and infrared experiments under the microscope.

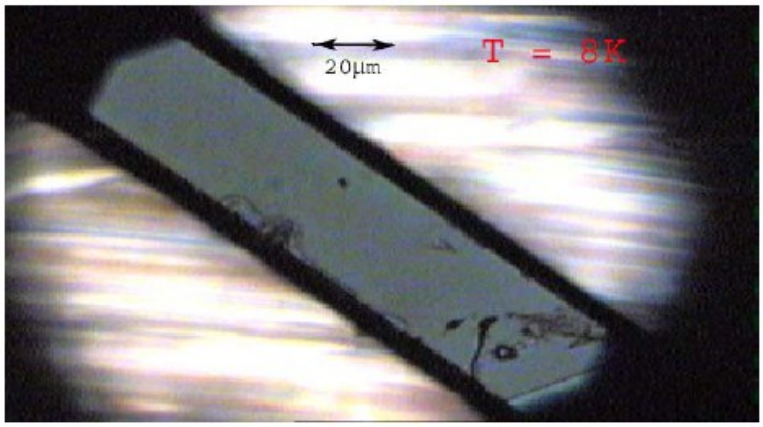
Here you can find two photos taken, one at room temperature with the system off, and the second one at 8K and their relative Raman spectra. As you can see from the pictures, no vibration can be detected and the Raman spectra are pretty nice. This sample was also interesting because it displays a phase transition on cooling down: Raman spectra at different temperatures clearly show the onset of this phase transition.

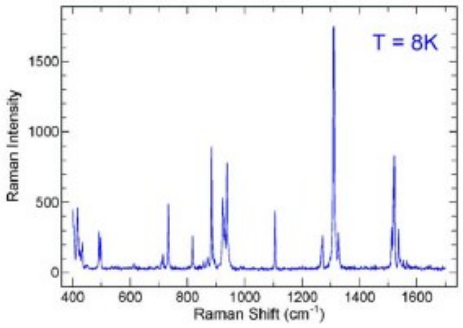
In conclusion we are really satisfied.

Dr Matteo Masino
Dip. Chimica Generale ed Inorganica









Needle crystal is a charge-transfer molecular crystal.

(tetrathiafulvalene-chloranil)

Optical Cryostat - Microscopy

SEM Setup

The picture shows the Displex and its interface. All items showing stainless steel in the photo are modifications to our JSM-5910 SEM. Please also note the published papers on my website, which demonstrate CL results that were acquired with this cooling system.

The sample temperature, is between 40 K and 50 K.

Courtesy; Prof. Dan Rich, Ben Gurion University, Beer Sheva, Israel.

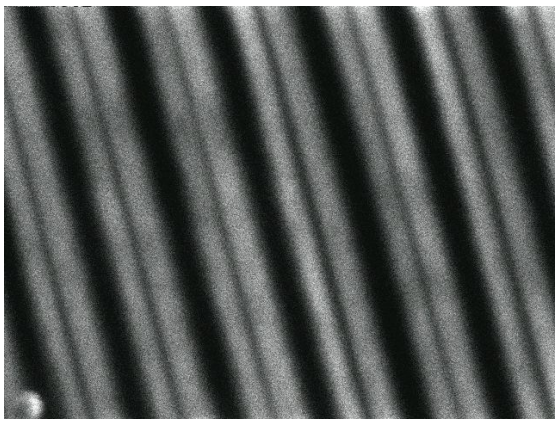


Image of a InGaN/GaN quantum well grown on a patterned GaN substrate. The patterning consists of stripes with a periodicity of 10 microns.

Monochromatic CL image (Mag. 2000) taken with a 390 nm detection wavelength.

The degradation of image quality from room temperature and 50K suggests that the vibration is less than 10nm.

Courtesy; Prof. Dan Rich, Ben Gurion University, Beer Sheva, Israel.

Magnet Post (MOKE)

DE204SF-DMX-20-OM-MP

Small diameter vacuum housing can be inserted into a narrow gap (high field). The optical window allows collection of light from the sample. The window can be very close to the sample for short focal length objective.

Optical Cryostat - Ultra Low Vibrations

The **CS204*F-DMX-20** opens up a wide range of possibilities never before possible with a closed cycle cryocooler. The DE204*F-DMX-20 uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE204 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Sample vibration levels of 3-5nm have been demonstrated by users. Due to the exchange gas being less conductive, the base temperature will increase by 1-2K and the cooling Capacity is roughly cut in half at varying temperatures.

Applications

- Mössbauer
- Low Vibration Optical Experiments
- Quantum Dots
- Photoluminescence (PL)
- Micro-Raman (Micro-PL)
- Micro-Spectroscopy
- Magneto Optical Kerr Effect (MOKE)
- Nanoscience
- Ellipsometry

Features

- **Ultra Low Vibrations (3-5 nm)**
- Pop-Off optical block for easy in-situ sample change
- Beryllium and Kapton windows available for Mössbauer experiments
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/1.4)
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-204AF)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Aluminum vacuum shroud with 4 window ports for optical and electrical measurements with 4 window ports on a pop-off optical block
- Nickel Plated OFHC copper radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 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 cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows the compressor for the system. What is not shown is a required vacuum pump, Helium Hoses (included with system), temperature controller and Helium Gas bottle with regulator for the exchange gas.

Optical Cryostat - Ultra Low Vibrations

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*- DMX-20 adds 1-2K to base temperature

DE-204AF	< 10K - 350K
DE-204P4	< 4.2K - 350K
DE-202SF	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	47 mm (1.87 in.)
Height	39 mm (1.53 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	1.4
Window Material	www.arscryo.com/Products/WindowMaterials.html

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 sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	388 mm (15.29 in)
Diameter	86 mm (3.38 in) at the sample space
Width	86 mm (3.38 in) at the sample space

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

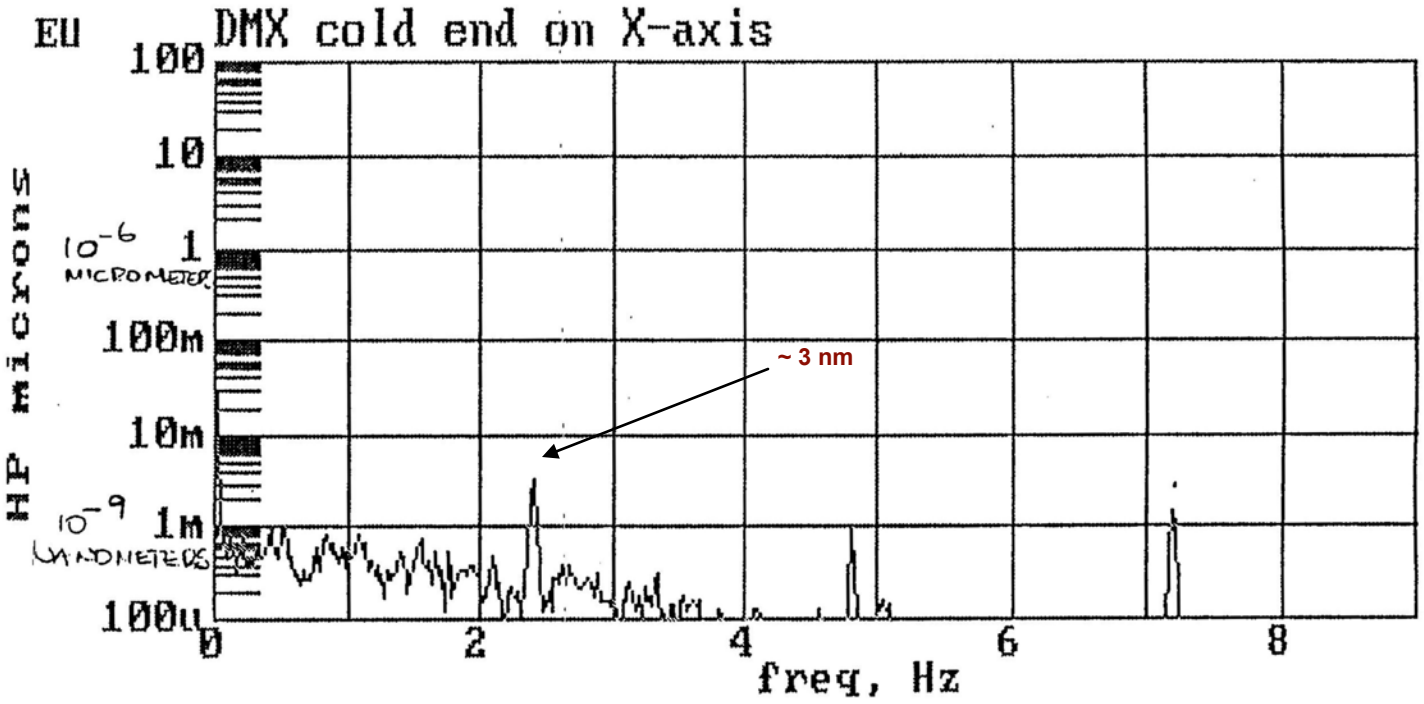
Cryostat Footprint -

Overall Length	562 mm (25.4 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		DE-204AF		DE-204A(T)F		DE-204PF		DE-204SF	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

Optical Cryostat - Ultra Low Vibrations

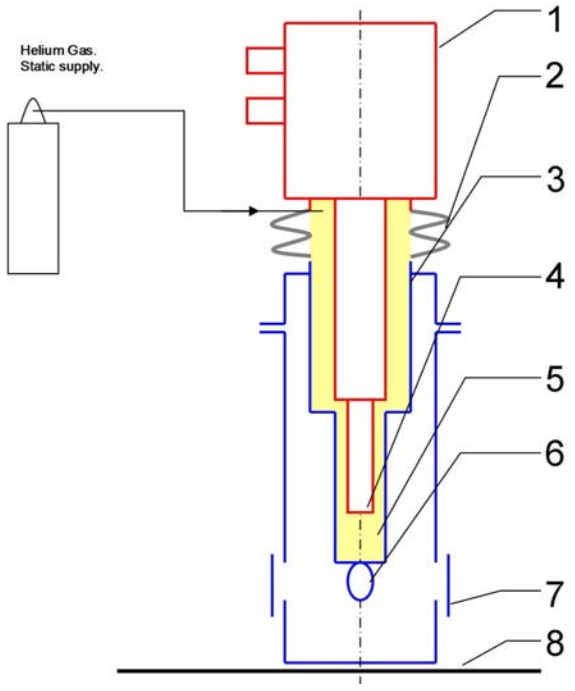
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

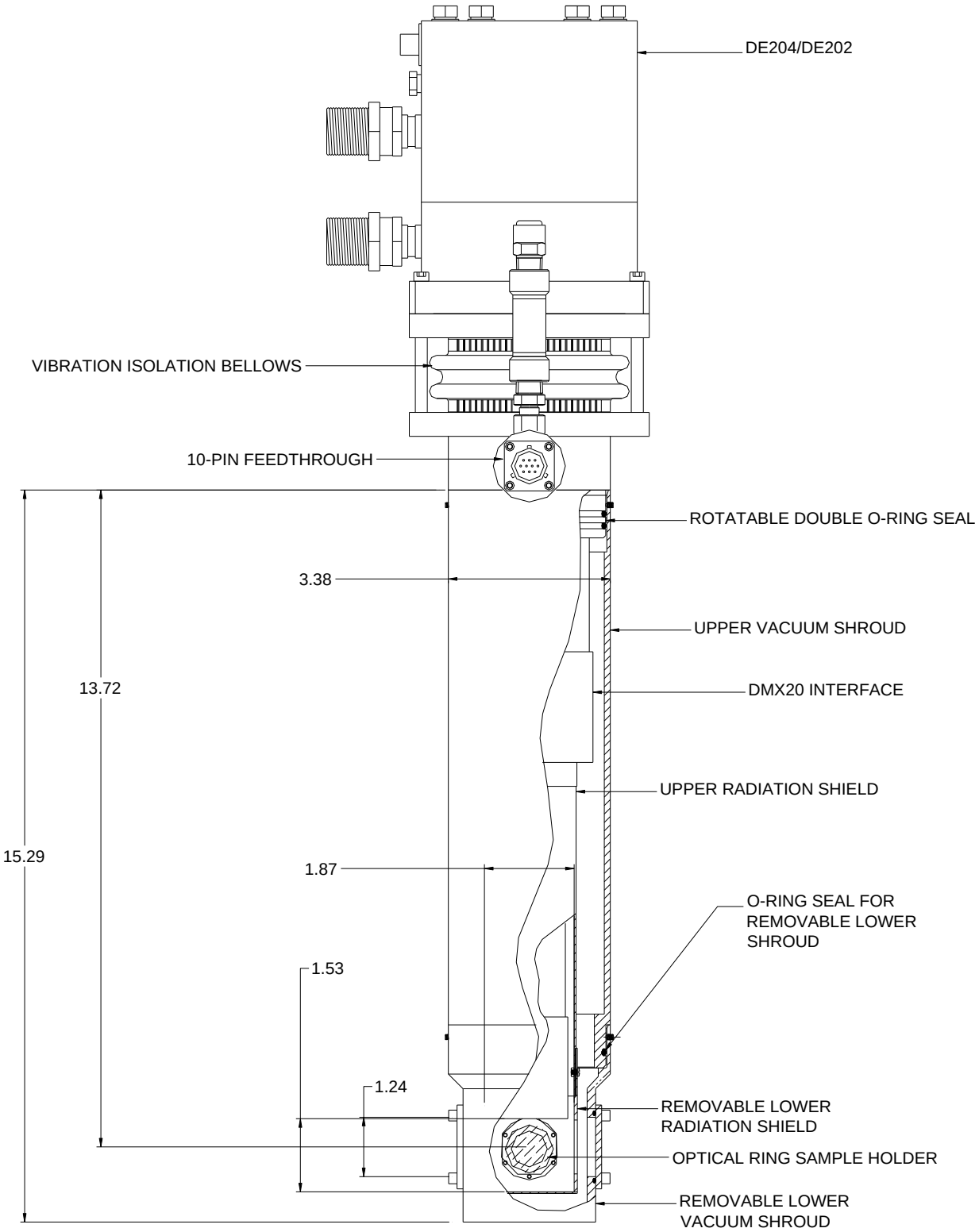
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

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 X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
5. Convective pockets of Helium Exchange Gas cools the sample space.
6. The sample is only in contact with the X-20 Interface
7. Windows for Optical Experiments
8. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



Optical Cryostat - Ultra Low Vibrations

DE204*F-DMX-20 Outline Drawing

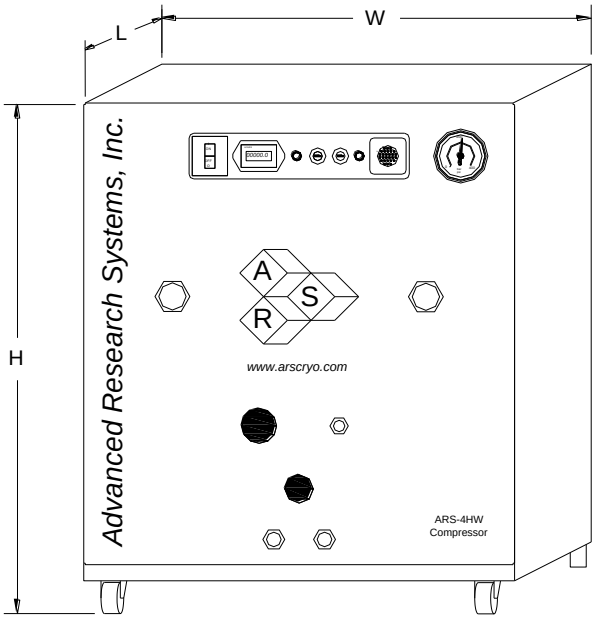


Optical Cryostat - Ultra Low Vibrations

Direct Mounting

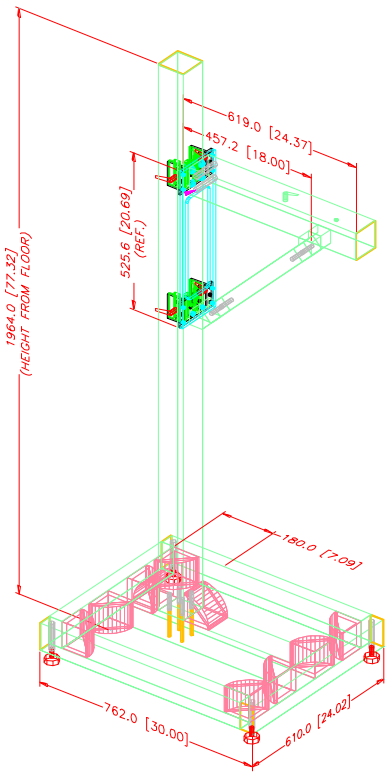
The DMX-20 can be direct mounted on the Cryocooler. The vibrations at the sample will go up to 140 nm. It can be useful if the sample has to be translated in XYZ.

ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

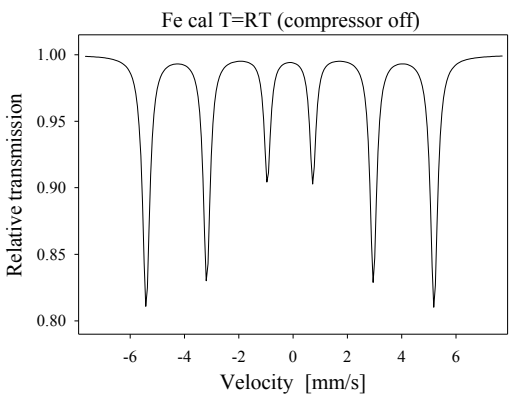
Floor Stand



Optical Cryostat - Ultra Low Vibrations

Mossbauer Spectra with DMX-20

Cryocooler Off



Calculated parameters:

WID=0.269 mm/s
W13=1.17

W23=1.08

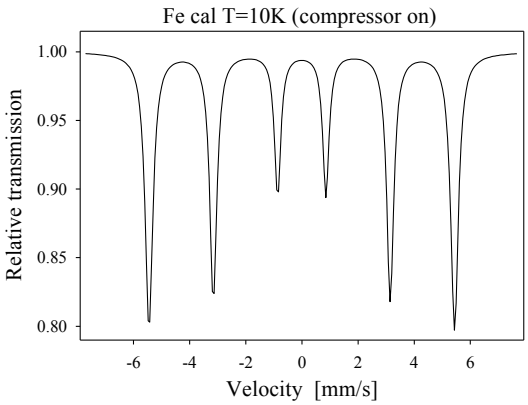
ISO=0.000 mm/s

BHF=32.94T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

Cryocooler On



Calculated parameters:

WID=0.270 mm/s
W13=1.21

W23=1.11

ISO=+0.115 mm/s

BHF=33.81T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

When the system is properly mounted to the wall and the table and properly adjusted then the effect of vibrations induced by the working compressor is very small (almost negligible).

The broadening (rather no broadening!) is fully reproducible and is well below 2%. Such broadening has practically no effect and in almost all cases can be ignored. However, compare the lin ewidths calculated in the same way!

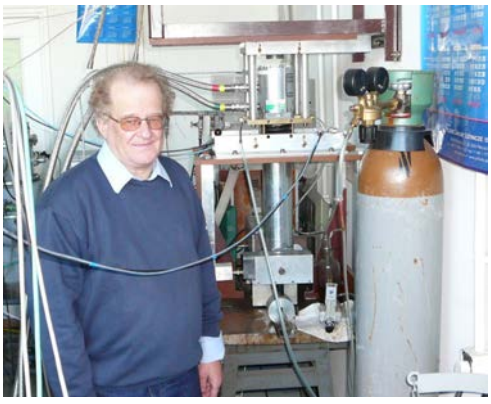
The Displex system is virtually vibration free!

Prof. Dr. habil. Michal Kopcewicz

Institute of Electronic Materials Technology

WARSAW, Poland

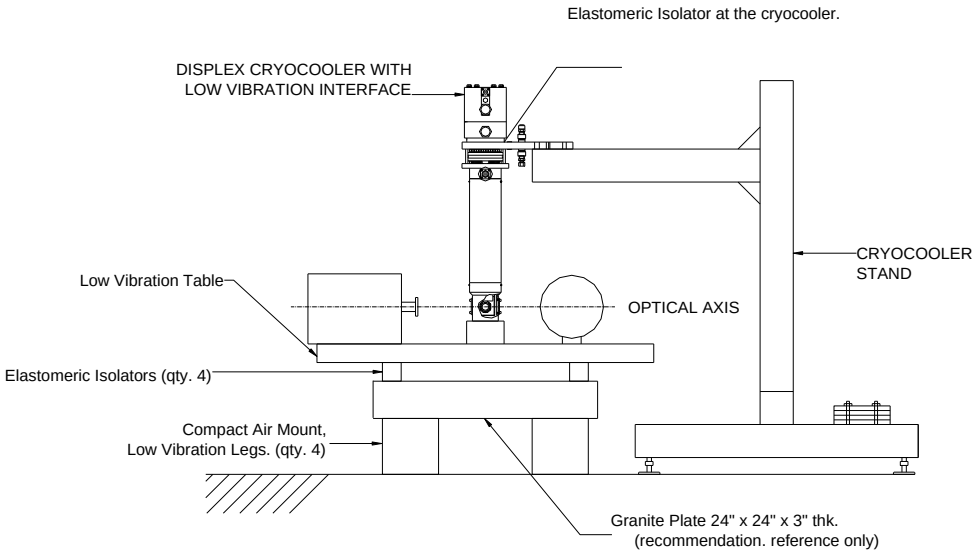
Mossbauer Cryostat, DMX-20



Prof. Dr. habil. Michal Kopcewicz

Optical Cryostat - Ultra Low Vibrations

Possible Mossbauer Configuration



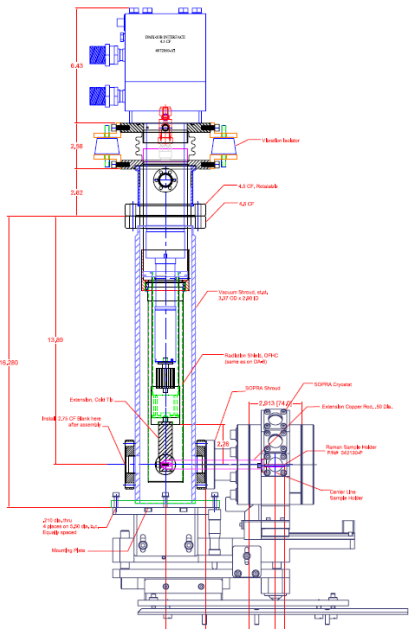
For maximum isolation proper mounting of the system is important. ARS offers a special ULV stand to isolate the ultra low vibration cryostat from the vibrating components of the cooler and the floor vibrations.

The cryocooler stand can be adjusted for the proper height, this holds the cooler.

The cryostat is mounted on the low vibration table. which consists of a high mass granite block (User supplied), resting on 4 air legs (optional ARS offering). Additional elastomeric isolators additional filter the unwanted frequencies from the floor to the cryostat.

System can be tested by shutting off the cryocooler only and watching the vibration effect on the experiment.

Ellipsometry



Low Vibration system for SOPRA Ellipsometer

Optical Cryostat - Ultra Low Vibrations

SEM Setup

The picture shows the Displex and its interface. All items showing stainless steel in the photo are modifications to our JSM-5910 SEM. Please also note the published papers on my website, which demonstrate CL results that were acquired with this cooling system.

The sample temperature, is between 40 K and 50 K.

Courtesy; Prof. Dan Rich, Ben Gurion University, Beer Sheva, Israel.

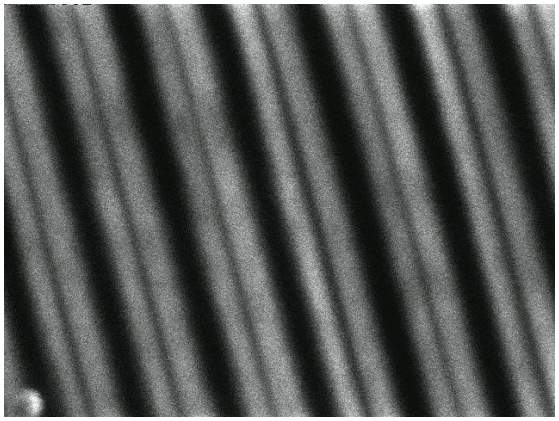
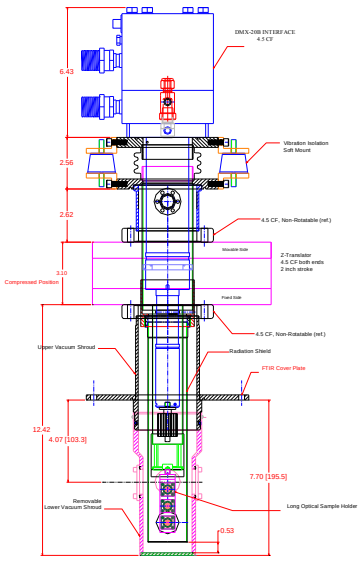


Image of a InGaN/GaN quantum well grown on a patterned GaN substrate. The patterning consists of stripes with a periodicity of 10 microns.

Monochromatic CL image (Mag. 2000) taken with a 390 nm detection wavelength.

The degradation of image quality from room temperature and 50K suggests that the vibration is less than 10nm.

FTIR Setup

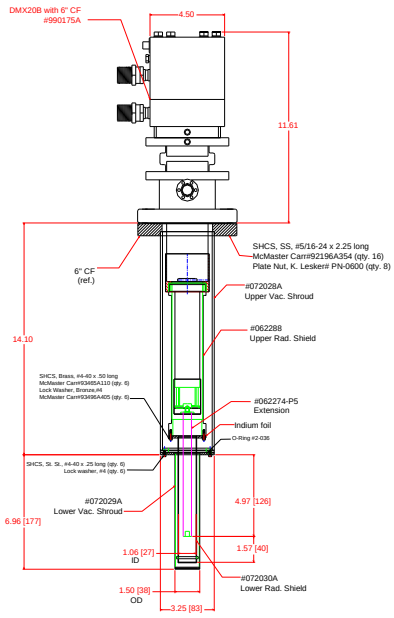


Low Vibration system for FTIR spectrometer. Sample holder with 3 samples can be translated in Z direction.

Low Vibration system for BOMEM, DA8 FTIR spectrometer.

Optical Cryostat - Ultra Low Vibrations

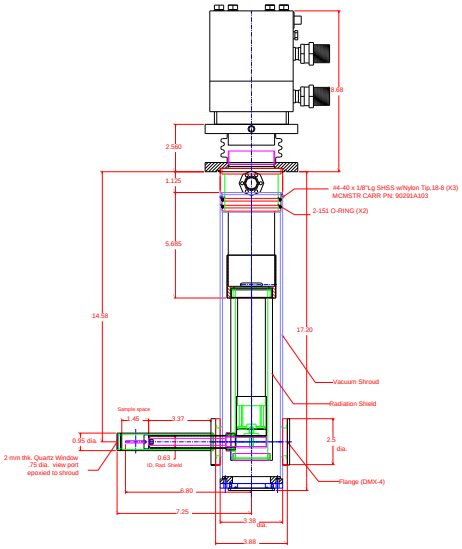
Magneto Electrical Experiments



The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

The vacuum shroud becomes narrow to permit sample insertion into a small magnet pole space.

Magneto Optical Experiments (MOKE)



Low Vibration Side looking window can be placed in a MOKE, (Magneto Optical Kerr Effect). Sample can be located in any plane. The pole spacing can be as low as 1 inch.

Small diameter vacuum housing can be inserted into a narrow gap (high field). The optical window allows collection of light from the sample. The window can be very close to the sample for short focal length objective.

Optical Cryostat - Omniplex™

The **Omniplex™**, **DE204*F-FMX-19OP,** is a top loading optical cryostat with the ARS manufactured DE-204 cryocooler. The ARS Omniplex™ systems features large optical access and quick sample change. The Omniplex™ comes with 4 window ports and with warm and cold windows. The sample stick can use any of the starndard ARS sample holders as well as receive a second set of temperature control instrumentation for fine tuning of the sample temperature. The system allows for a fast intial cooldown (~90 min to 20K and 2 1/2 hrs to base temperature).

Applications

- Optical
- Raman
- UV, VIS, IR
- Electro & Magneto Optical
- Electro & Photoluminescence
- Resistivity/Hall Probe Experiments
- Diamond Anvil Cell
- PITS / DLTS
- Thermal, Electrical and Magnetic Susceptibility
- Low Vibration applications with bellows

Features

- Cryogen Free, Low Power
- Top Loading Sample in Vapor, Fast Sample Change
- Welded Stainless Steel Vacuum Chamber
- Large clear view optical windows (1.5 in outer, 0.7 in cold windows)
- Large sample viewing angle for optical collection (F/1.9)
- Fully customizable

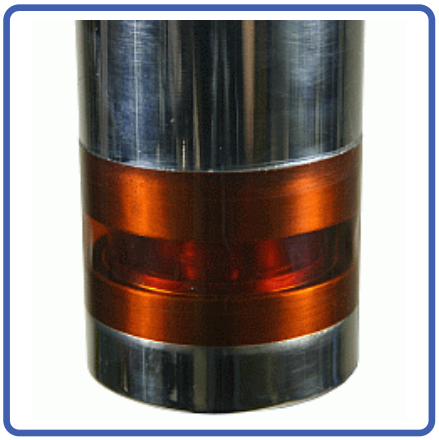
Typical Configuration

- Cold head (DE-204AF)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Omniplex™, Sample in Vapor Vacuum Chamber with Optical Tailpiece and 4 window ports
- OFHC Copper Radiation Shield
- 2 High purity Sapphire Cold Windows and 2 High Purity Quartz Warm Windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 50 ohm thermofoil heater
  - Silicon diode sensor curve matched to (±0.5K) for control
- Wiring for electrical experiments:
  - 10 pin hermetic feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.1W @ 4.2K)
- 5.5K Coldhead (1W @ 10K)
- 450K High Temperature Interface
- 800K High Temperature Interface
- Turbo upgrade for faster cooldown times
- Soft Rubber Bellows for low sample vibrations
- Load Lock Gate Valve
- Second set of temperature control instrumentation for fine sample temperature
- 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 the Optical Omniplex™ with a DE204 Closed Cycle Cryocooler Installed.



The above picture shows a 180 degree wrapped Kapton Window

Optical Cryostat - Omniplex™

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*- Interface Temperature may be ~1-2K higher

DE-204AF	< 10K - 350K
DE-204PF	< 5.5K - 350K
DE-204S	< 4.2K - 350K
With 800K Interface	Base Temp +2K - 700K
With 450K Interface	Base Temp - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	49, 36 mm (1.94, 1.44 in.)
Height	47-190mm (1.86-7.5in.) Variable
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4- 90° Apart
Diameter	50.8 mm (2 in) Outer Window
Clear View	38 mm (1.5 in) Outer Window 17 mm (0.7 in) Inner Cold Window
#/F	1.9
Window Material	www.arscryo.com/Products/WindowMaterials.html

Temperature Instrumentation and Control - (Standard) -

Heater	50ohm 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 sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	190 mm (7.5 in) At the tail piece
Diameter	89,83 mm (3.5, 3.25 in) At Sample Space
Width	107, 97 mm (4.2, 3.8 in) At Sample Space

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Bolt On
Optical Access	0, 1, 2, 3, or 4 (customer specified)

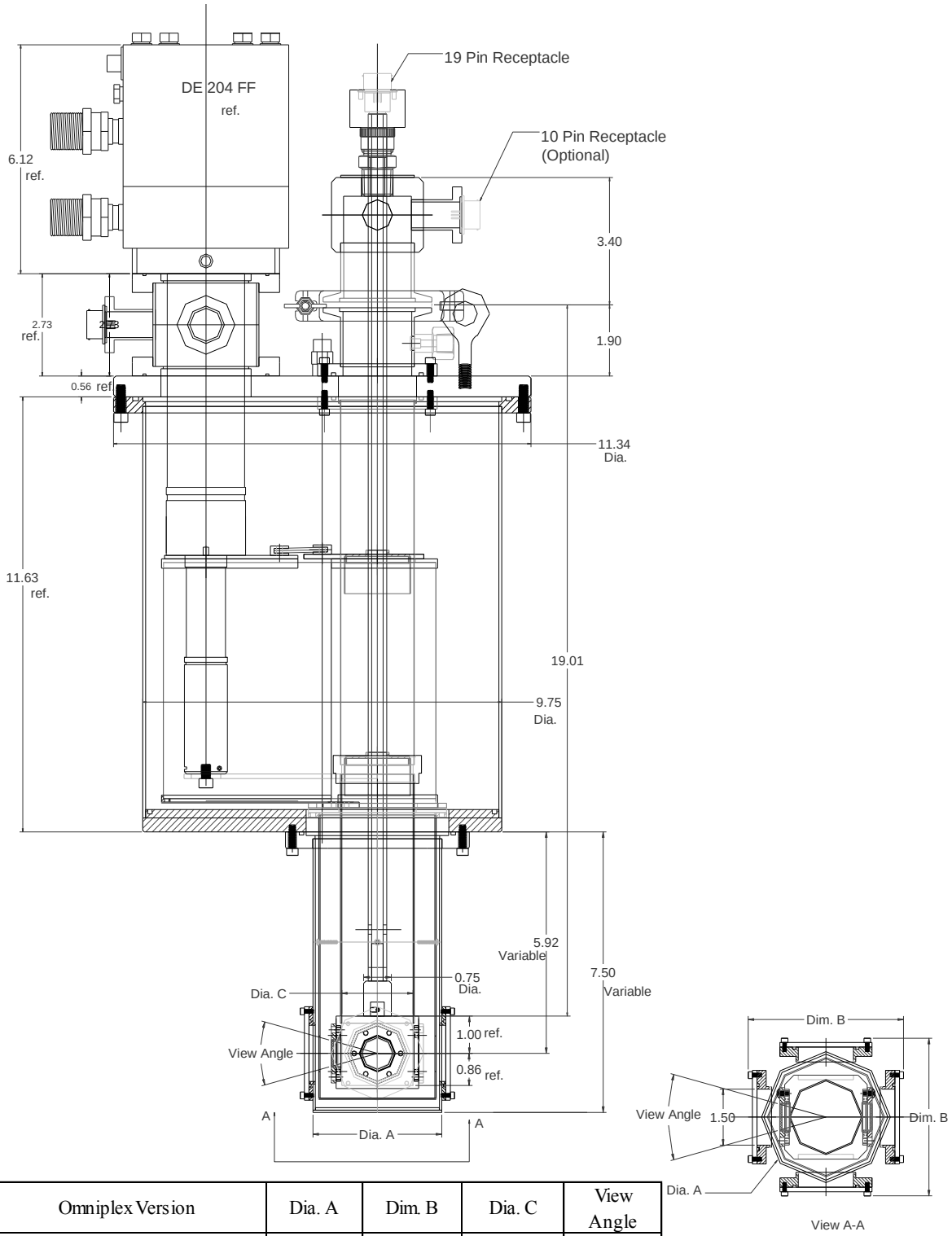
Cryostat Footprint -

Overall Length	725 mm (28.5 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	Contact our Sales Staff

Cryocooler Model		DE-204AF		DE-204A(T)F		DE-204PF		DE-204SF	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity*	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3W	2.4W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	72 min
	Base Temperature	60 min	72 min	50 min	60 min	90 min	96 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

Optical Cryostat - Omniplex™

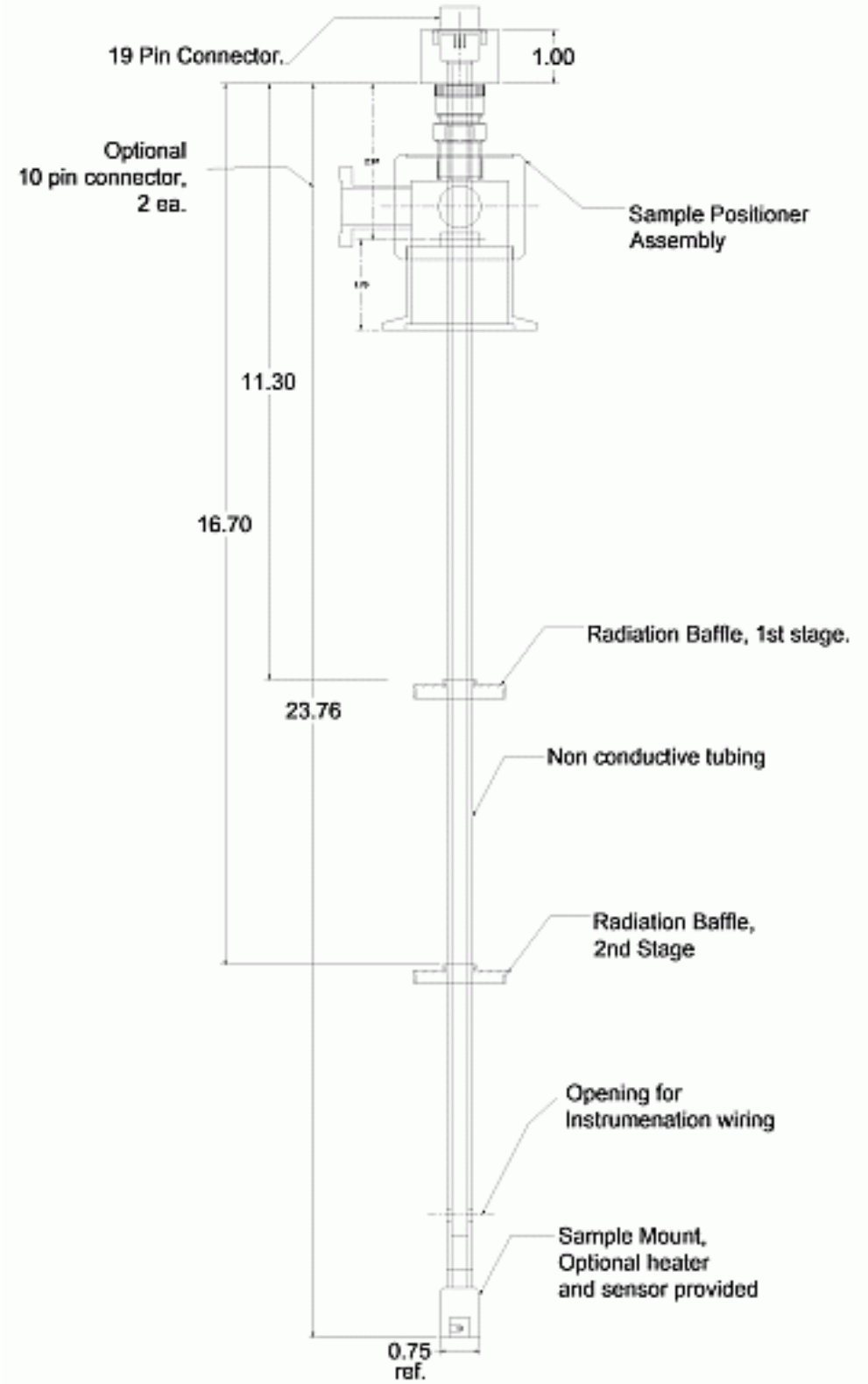
CS204*F-FMX-19OP Outline Drawing



Omniplex Version	Dia. A	Dim. B	Dia. C	View Angle
Optical - 2" dia. Sample Well	3.5	4.2	1.94	30
Optical - 1.5" dia. Sample Well	3.25	3.8	1.44	36

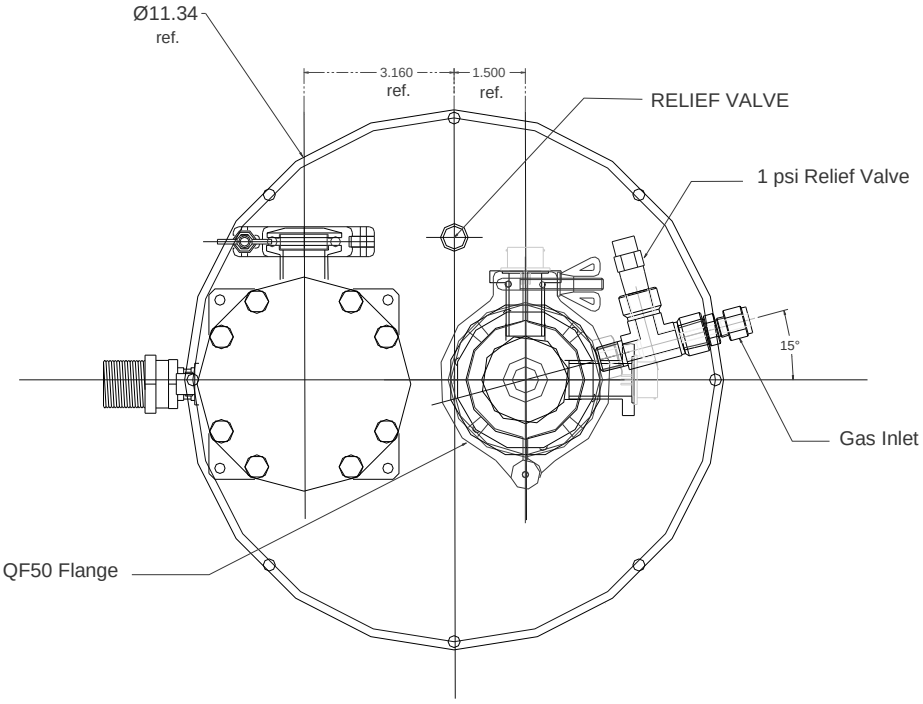
Optical Cryostat - Omniplex™

Sample Stick



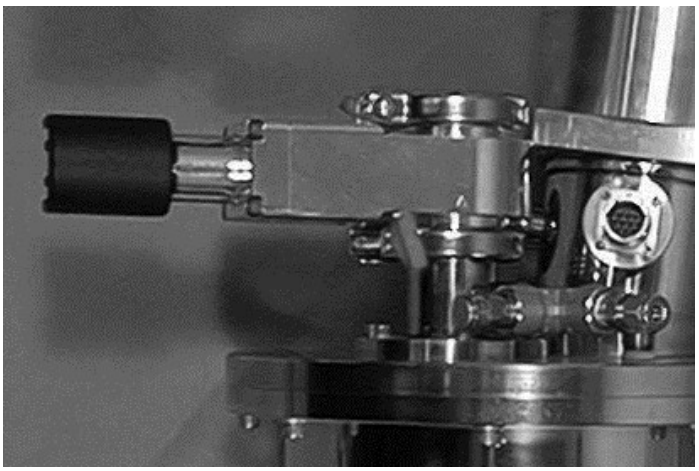
Optical Cryostat - Omniplex™

Top View



Optional Rubber Bellows

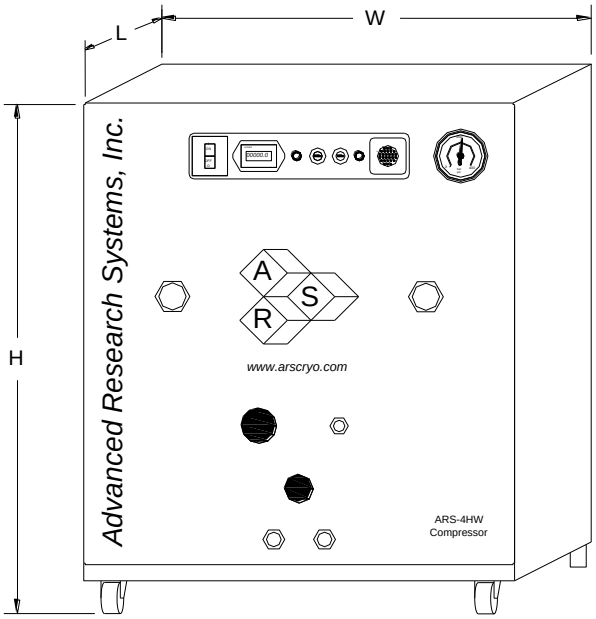
Optional Gate Valve



Optical Cryostat - Omniplex™

Optional Rubber Bladder

ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature		12 - 40 C (54 - 104 F)	
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

Optical Cryostat - High Power

The **CS204*I-FMX-1SS** is our standard intermediate cooling power cryostat for optical and electrical measurements. This high performance system offers and all stainless steel constructed vacuum shroud along with a welded stainless steel instrumentation skirt. This system is capable of achieving vacuum levels of 10^{-7} Torr with an appropriate vacuum system.

The above picture shows the FMX-1SS Vacuum Shroud.

Applications

- Optical
- Raman
- UV, VIS, IR
- FTIR
- Electro & Photoluminescence
- Resistivity/Hall Probe Experiments
- Diamond Anvil Cell
- Magneto-Optical
- PITS / DLTS
- Thermal, Electrical and Magnetic Susceptibility
- Magneto Optical Kerr Effect (MOKE)

Features

- Cryogen Free, Low Power
- Welded Stainless Steel Construction
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/1)
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-204AI)
- Compressor (ARS-4HW)
- 2 Helium Hoses
- Stainless Steel vacuum shroud with 5 window ports for optical and electrical measures Nickel Plated OFHC Copper Radiation Shield.
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

The above picture shows a coldhead, vacuum shroud, and radiation shield.

Options and Upgrades

- 4K Coldhead (0.2W @ 4.2K)
- 5.5K Coldhead (2W @ 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)

Optical Cryostat - High Power

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*-

DE-204AI	< 9K - 350K
DE-204SI	< 4K - 350K
DE-204PI	< 5.5K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	41 mm (1.63 in.)
Height	39 mm (1.55 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	5 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	1
Window Material	www.arscryo.com/Products/WindowMaterials.html

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	Welded, Stainless Steel
Pump out Port	1 - NW 25
Instrumentation Ports	3
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Welded, Stainless Steel
Length	338 mm (13.3 in)
Diameter	80 mm (3.15 in) at the sample space
Width	63.5 mm (2.5 in) at the sample space

Radiation Shield -

Material	OFHC Copper, Nickel Plated
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

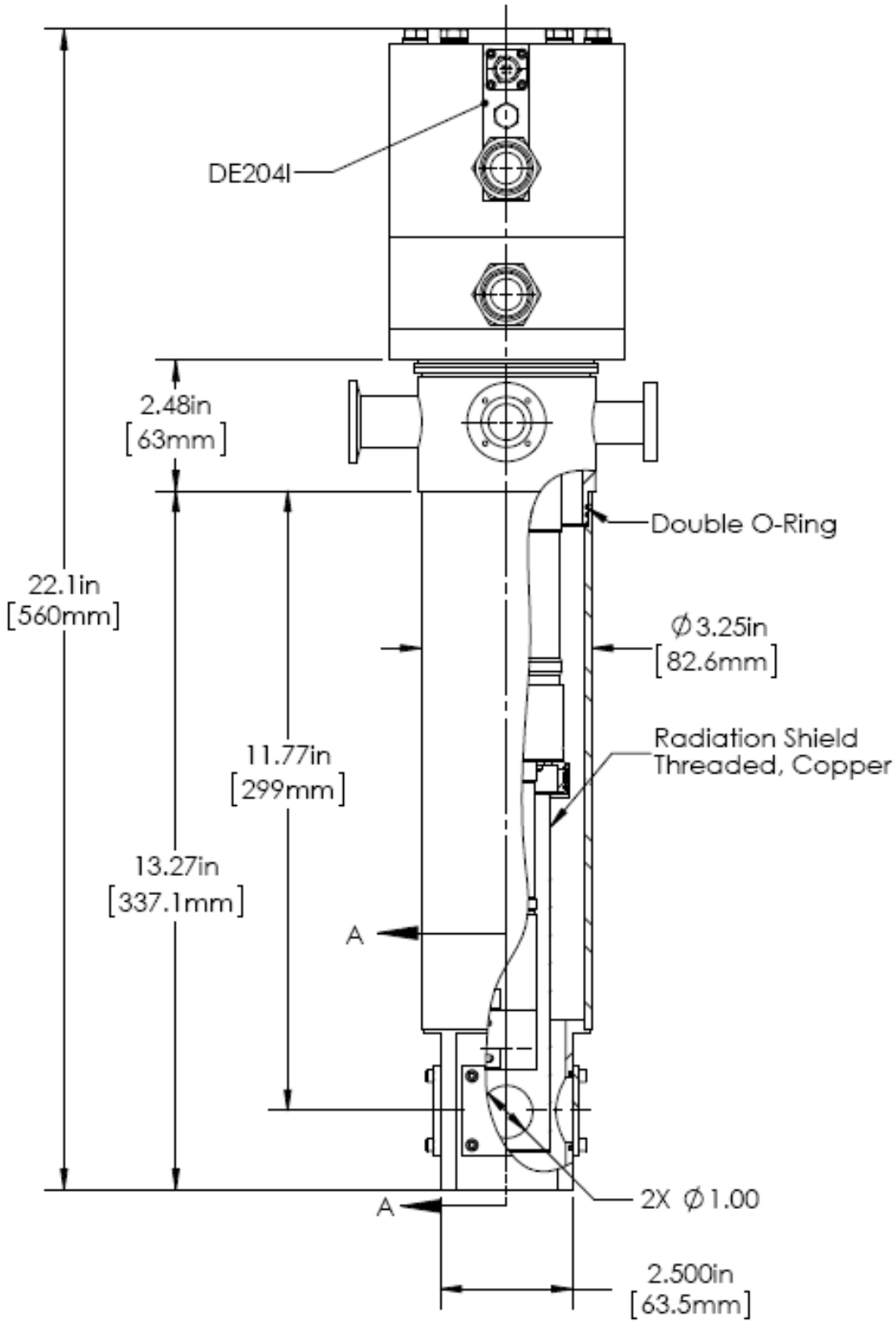
Cryostat Footprint -

Overall Length	576 mm (22.67 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-204AI**		**DE-204A(T)I**		**DE-204PI**		**DE-204SI**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K	<5.5K	<5.5K	<4.2K	<4.2K
Cooling Capacity	4.2K	-	-	-	-	-	-	0.2W	0.16W
	10K	2W	1.6W	2.7W	2.2W	3.5W	2.8W	4W	3.2W
	20K	9W	7.2W	12W	9.6W	8W	6.4W	8W	6.4W
	77K	17W	14W	23W	18.4W	14W	11W	14W	11W
Radiation Shield Cooling Capacity		18W	14W	24W	19W	18W	14W	18W	14W
Cooldown Time	20K	30 min	36 min	25 min	30 min	40 min	48 min	40 min	48 min
	Base Temperature	60 min	72 min	50 min	60 min	80 min	102 min	90 min	108 min
Compressor Model		ARS-4HW		ARS-4HW		ARS-4HW		ARS-4HW	
Typical Maintenance Cycle		12,000 hours		8,000 hours		12,000 hours		12,000 hours	

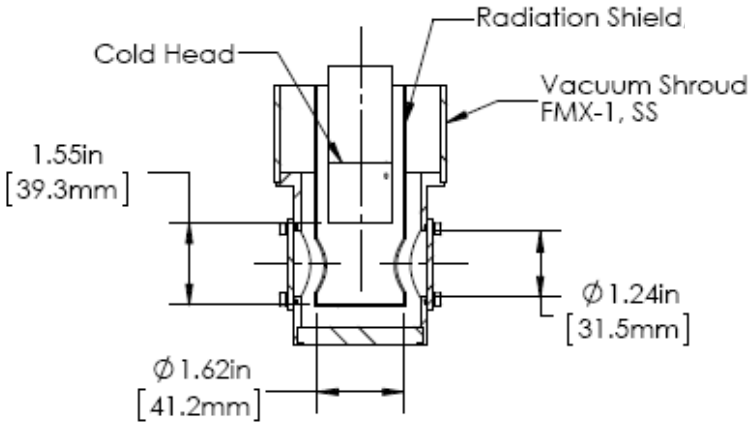
Optical Cryostat - High Power

DE204*I-FMX-1SS Outline Drawing

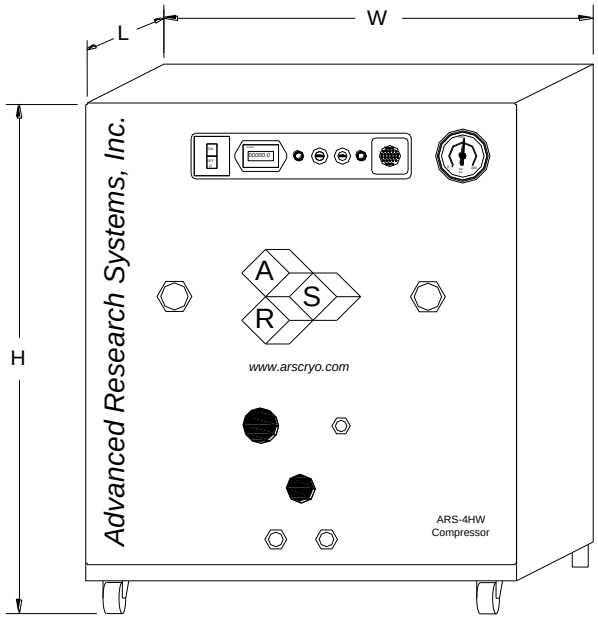


Optical Cryostat - High Power

Sample Space



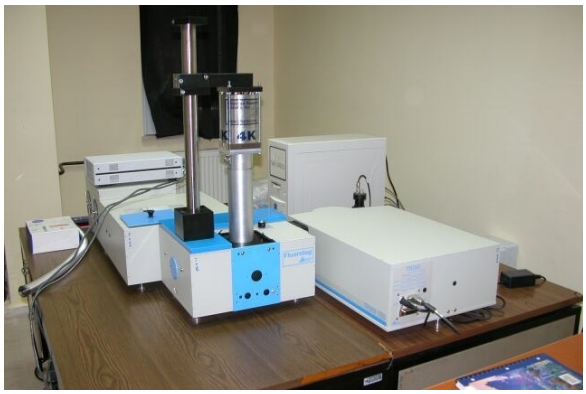
ARS-4HW Compressor



Compressor Model		ARS-4HW	
	Frequency	60 Hz	50 Hz
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
Transformer Options	10%		220 V, 230 V
	15%		240 V
Power Usage	Single Phase	3.6 kW	3.0 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Noise Level		60 dBA	
Ambient Temperature			
Cooling Water	Consumption	2.3 L / min (0.6 Gal. / min)	
	Temperature	10 - 35 C (50—95 F)	
	Connection	3/8 in. Swagelok Fitting	
Dimensions:	L	483 mm (19 in)	
	W	434 mm (17.1 in)	
	H	516 mm (20.3 in)	
Weight		72 kg (160 lbs)	
Typical Maintenance Cycle		12,000 hours	
Water Recirculation Option		CoolPac Compatible	

Optical Cryostat - High Power

Optical Spectroscopy



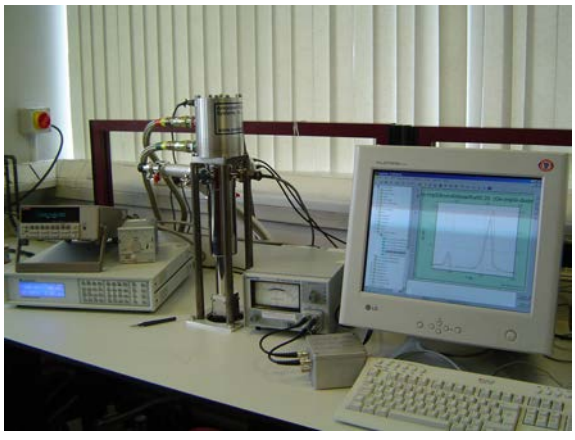
CS202SE-DMX1-AL Installed on Jobyn Yvon Spectrometer.

Courtesy: Prof. Dr. Suleyman, Gazi University

Micro PL. Adjustable sample to window distance for short focal length experiments.

Courtesy: Mr. DongHyun Kim

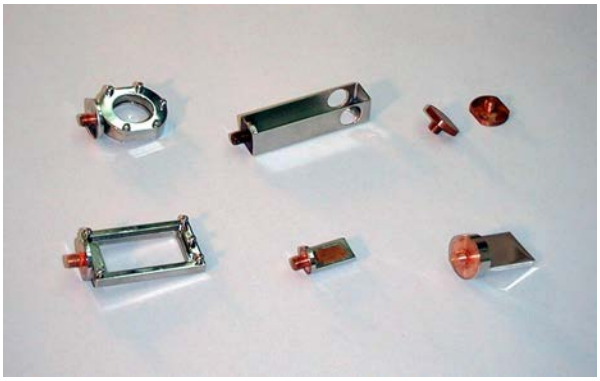
High Performance Stainless Steel Upgrade



Displex installed for spectroscopy.

Courtesy: Dr. M. Gad , Sheffield Hallam University

Optional Sample Holders



A wide range of sample holders are available for large bulk, thin film or liquid samples. Backscattering, reflection and transmission experiments.

See selection guide for more details.

True UHV - High Power

The ARS manufactured **CS210*B** is our most powerful True UHV cold head (10^{-11} Torr). As with our other True UHV cryocoolers all of the rubber o-ring seals have been replaced with welded joints and metal seals. A CF flange is directly welded to the cryocooler.

These True UHV systems are bakeable to 80C, and the 10K **CS210AB** is bakeable to 200C if the displacer is removed. (Special Training Required).

Cold tip extensions are available to put the sample right where it is needed in the chamber.

The above picture shows a True UHV Closed Cycle Cryocooler

Applications

- UHV
- Surface Science
- UHV Manipulator for XYZ motion
- Photoemission Spectroscopy

Features

- True UHV (10-11 Torr)
- Bakeable to **80C** (10K version can remove displacer and bake to 200C)
- Open Sample Space
- Optional Cold Tip Extensions
- Cryogen Free
- Operation in Any Orientation
- Fully Customizable

Typical Configuration

- Cold head (DE-210AB)
- Compressor (ARS-10HW)
- 2 Helium Hoses
- Tue UHV welded stainless steel instrumentation skirt with 6” rotatable CF flange
- Nickel Plated OFHC radiation shield terminating 0.125” short of the cold tip
- Instrumentation for temperature measurement and control:
  - 10 pin UHV feed through
  - 36 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

The above picture shows an instrumentation skirt with the electrical feedthroughs rotated 90 degrees upwards to allow for tight rotational clearances.

Options and Upgrades

- 4.5 and 8 inch rotatable CF flanges available
- 4K Coldhead (0.8W @ 4.2K)
- 450K High Temperature Interface (Contains high temperature stycast)
- 800K High Temperature Interface
- 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)

True UHV - High Power

Cooling Technology-

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

Temperature*-

DE-210AB	< 10K - 350K
DE-210SB	< 3K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*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/Products/SampleHolders.html

Chamber Interface -

Flanges	CF, ISO
Size	6”, 8”, 10”

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	True UHV Welded Stainless Steel
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Radiation Shield -

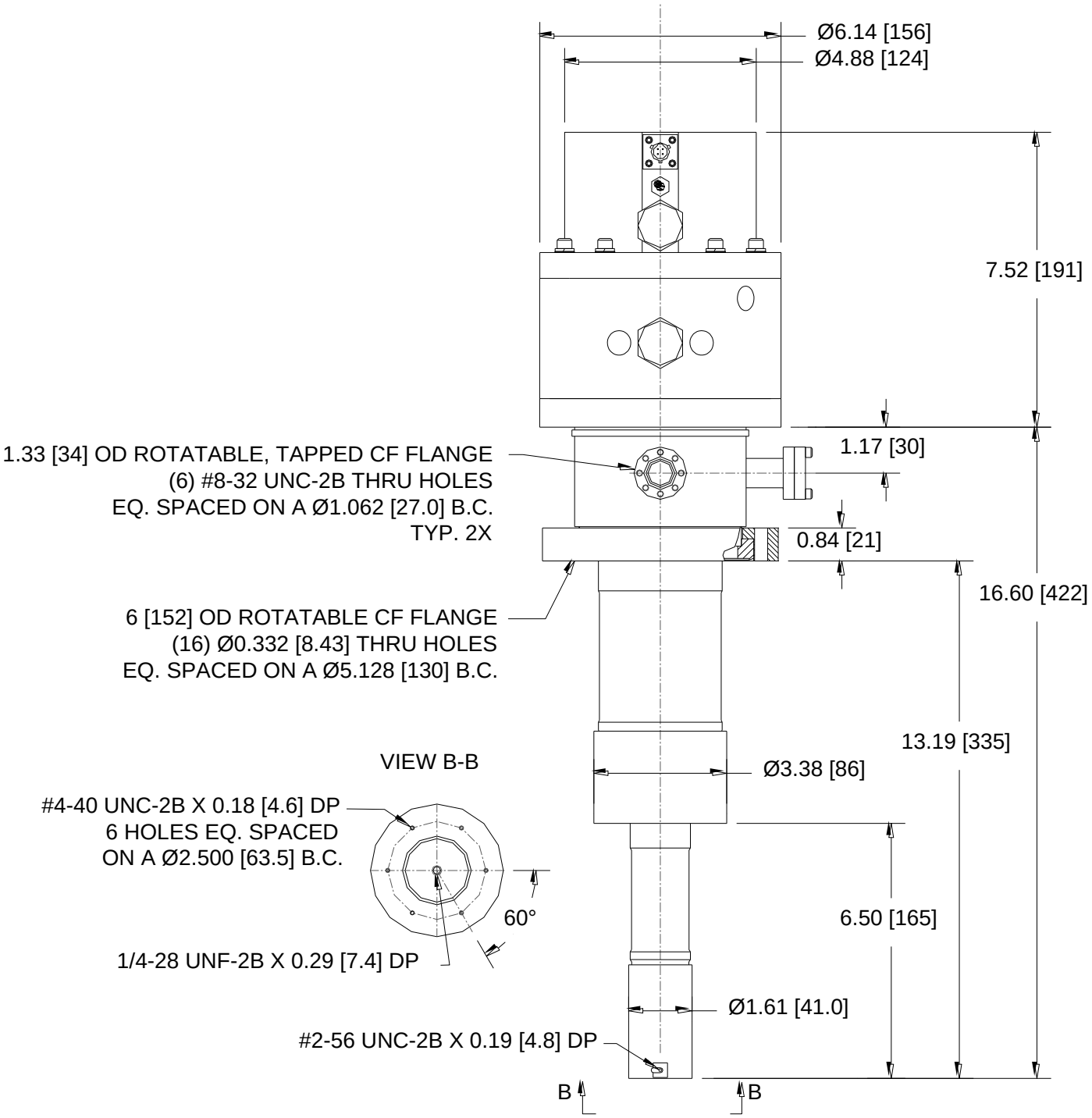
Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	Open End Radiation shield terminates 0.125” short of cold tip (customer specified)

Cryostat Footprint -

Overall Length	613 mm (24.12 in) 335 mm (13.19 in) standard flange to tip dimension
Motor Housing Diameter	156 mm (6.14 in)
Rotational Clearance	200 mm (8 in) with “G” Configuration

Cryocooler Model		**DE-210AB**		**DE-210SB**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K
Cooling Capacity*	4.2K	-	-	0.8W	0.8W
	10K	4W	4W	9W	9W
	20K	17W	17W	16W	16W
	77K	25W	25W	25W	25W
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	

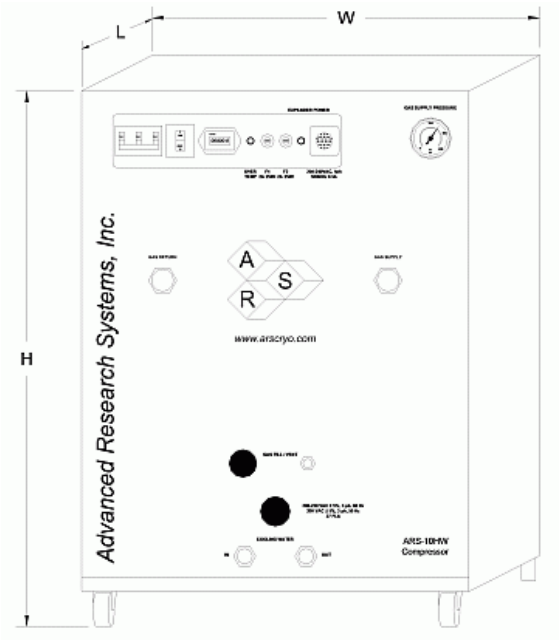
CS210*B Outline Drawing



True UHV - High Power

DE204SB with 16” Extension

ARS-10HW Compressor



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	7.7 kW	7.7 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	

Optical Cryostat - Very High Power

The **CS210*E-GMX-1SS** offers very high cooling power for fast cool downs and low base temperatures. This system is ideal when characterizing large materials with high heat loads or when the lowest possible temperature wants to be achieved. The system is capable of vacuum levels of 10^{-7} Torr with an appropriate vacuum pump. The lower vacuum reduces the sample surface contamination such as water molecules, which can be particularly detrimental to IR Spectroscopy.

Applications

- Optical
- Raman
- UV, VIS, IR
- FTIR
- Electro & Photoluminescence
- Resistivity/Hall Probe Experiments
- Diamond Anvil Cell
- Magneto-Optical
- PITS / DLTS
- Thermal, Electrical and Magnetic Susceptibility
- Magneto Optical Kerr Effect (MOKE)

Features

- Cryogen Free, High Power
- High Performance Stainless Steel Construction
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/1.6)
- Can operate in any orientation
- Fully customizable

Typical Configuration

- Cold head (DE-210SE)
- Compressor (ARS-10HW)
- 2 Helium Hoses
- Stainless Steel vacuum shroud with 4 window ports for optical and electrical measures (GMX-1SS)
- Nickel Plated OFHC radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.8W @ 4.2K)
- 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)
- Window material upgrades (custom materials available)
- Sample holder upgrades (custom sample holders available)

The above picture shows a cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows a complete system (minus the vacuum pump and temperature controller)

Optical Cryostat - Very High Power

Cooling Technology-

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

Temperature*-

DE-210AEI	< 9K - 350K
DE-210SE	< 3K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	79 mm (3.1 in.)
Height	49 mm (1.9 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	1.6
Window Material	www.arscryo.com/Products/

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	3
Instrumentation Wiring	Contact sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	508 mm (20 in)
Diameter	144 mm (5.66 in) at sample space
Width	102 mm (4.0 in) at sample space

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

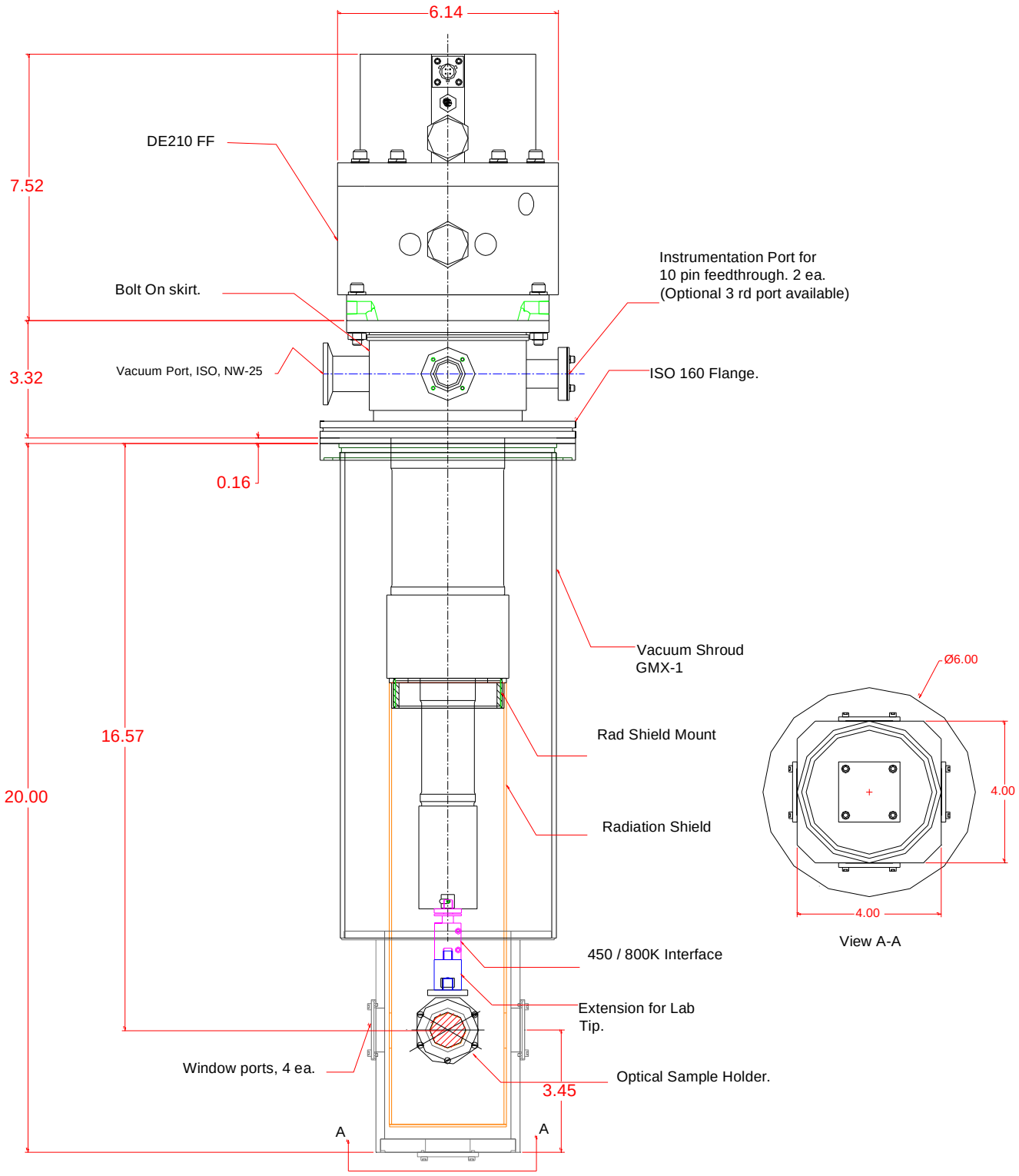
Cryostat Footprint -

Overall Length	784 mm (30.84 in)
Motor Housing Diameter	156 mm (6.14 in)

Cryocooler Model		**DE-210AE**		**DE-210SE**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K
Cooling Capacity*	4.2K	-	-	0.8W	0.8W
	10K	4W	4W	9W	9W
	20K	17W	17W	16W	16W
	77K	25W	25W	25W	25W
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	

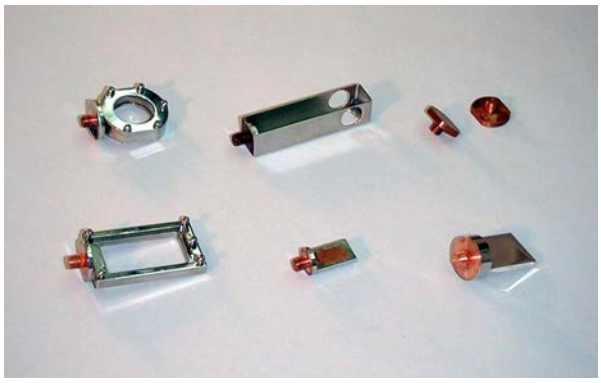
Optical Cryostat - Very High Power

DE210*E-GMX-1SS Outline Drawing



Optical Cryostat - Very High Power

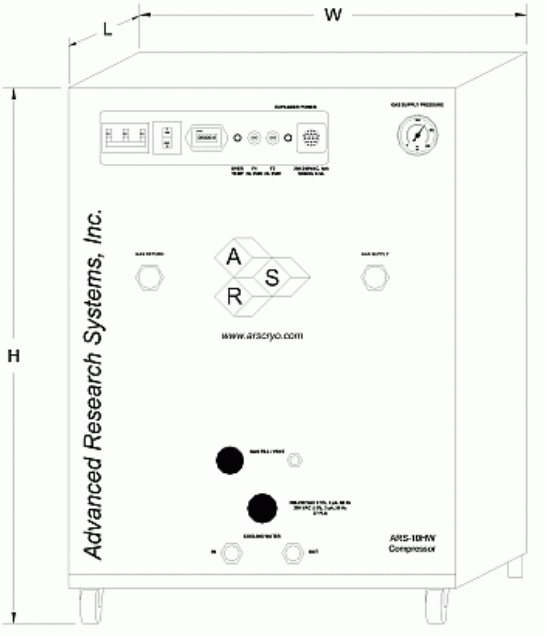
Optional Sample Holders



A wide range of sample holders are available for large bulk, thin film or liquid samples. Backscattering, reflection and transmission experiments.

See selection guide for more details.

ARS-10HW Compressor



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	7.7 kW	7.7 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	

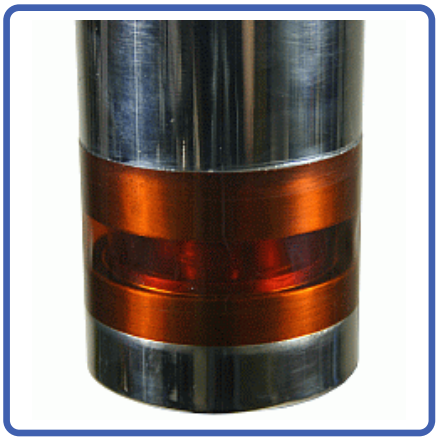
Non-Optical Cryostat - Omniplex™

The **Omniplex™**, **DE210F-GMX-19N,** is a top loading non-optical cryostat with the ARS manufactured DE-210 cryocooler for high cooling power and fast cooldown. The helium vapor is particularly useful for cooling samples that do not conduct heat well.

The ARS Omniplex™ systems feature quick sample change, fast initial cooldown (~90 min to 20K and ~ 2 1/2 hrs to base temperature) and adjustable radiation baffles to optimize sample temperatures. large optical access and quick sample change. The Omniplex™ allows for a variety of options so that it can be customized to fir the researchers needs, including custom tail pieces, load lock gate valves and low vibration interfaces.

The sample stick can use any of the starndard ARS sample holders as well as receive a second set of temperature control instrumentation for fine tuning of the sample temperature.

The above picture shows a Non-Optical Omniplex™ with a DE210 Closed Cycle Cryocooler Installed.



The above picture shows a 180 degree wrapped Kapton Window

Applications

- Resistivity
- Vibrating Sample Magnetometer (VSM)
- AC Susceptibility Experiments
- Hall Probe Experiments
- Non-Optical

Features

- Cryogen Free, Low Power
- Top Loading Sample in Vapor, Fast Sample Change
- Welded Stainless Steel Vacuum Chamber
- Fully customizable

Typical Configuration

- Cold head (DE-210AF)
- Compressor (ARS-10HW)
- 2 Helium Hoses
- Omniplex™, Sample in Vapor Vacuum Chamber
- Tail Piece
- OFHC Copper Radiation Shield
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 50 ohm thermofoil heater
  - Silicon diode sensor curve matched to (±0.5K) for control
- Wiring for electrical experiments:
  - 10 pin hermetic feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.8W @ 4.2K)
- 450K High Temperature Interface
- 800K High Temperature Interface
- Soft Rubber Bellows for low sample vibrations
- Load Lock Gate Valve
- Second set of temperature control instrumentation for fine sample temperature
- Custom wiring configurations (please contact our sales staff)
- Window material upgrades (custom materials available)
- Sample holder upgrades (custom sample holders available)

Non-Optical Cryostat - Omniplex™

Cooling Technology-

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

Temperature*- Interface Temperature may be ~1K higher

DE-210AF	< 9K - 350K
DE-210SF	< 3K - 350K
With 800K Interface	Base Temp +2K - 700K
With 450K Interface	Base Temp - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	23, 49, 78, 100 mm (0.94, 1.94, 2.94, 3.94 in.)
Height	47-190mm (1.86-7.5in.) Variable
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	N/A
Diameter	N/A
Clear View	N/A
#/F	N/A
Window Material	N/A

Temperature Instrumentation and Control - (Standard) -

Heater	50ohm 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 sales staff for options

Vacuum Shroud -

Material	Stainless Steel
Length	190 mm (7.5 in) At the tail piece
Diameter	51, 76, 102, 127 mm (2, 3, 4, 5 in) At Sample Space
Width	51, 76, 102, 127 mm (2, 3, 4, 5 in) At Sample Space

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Bolt On
Optical Access	N/A

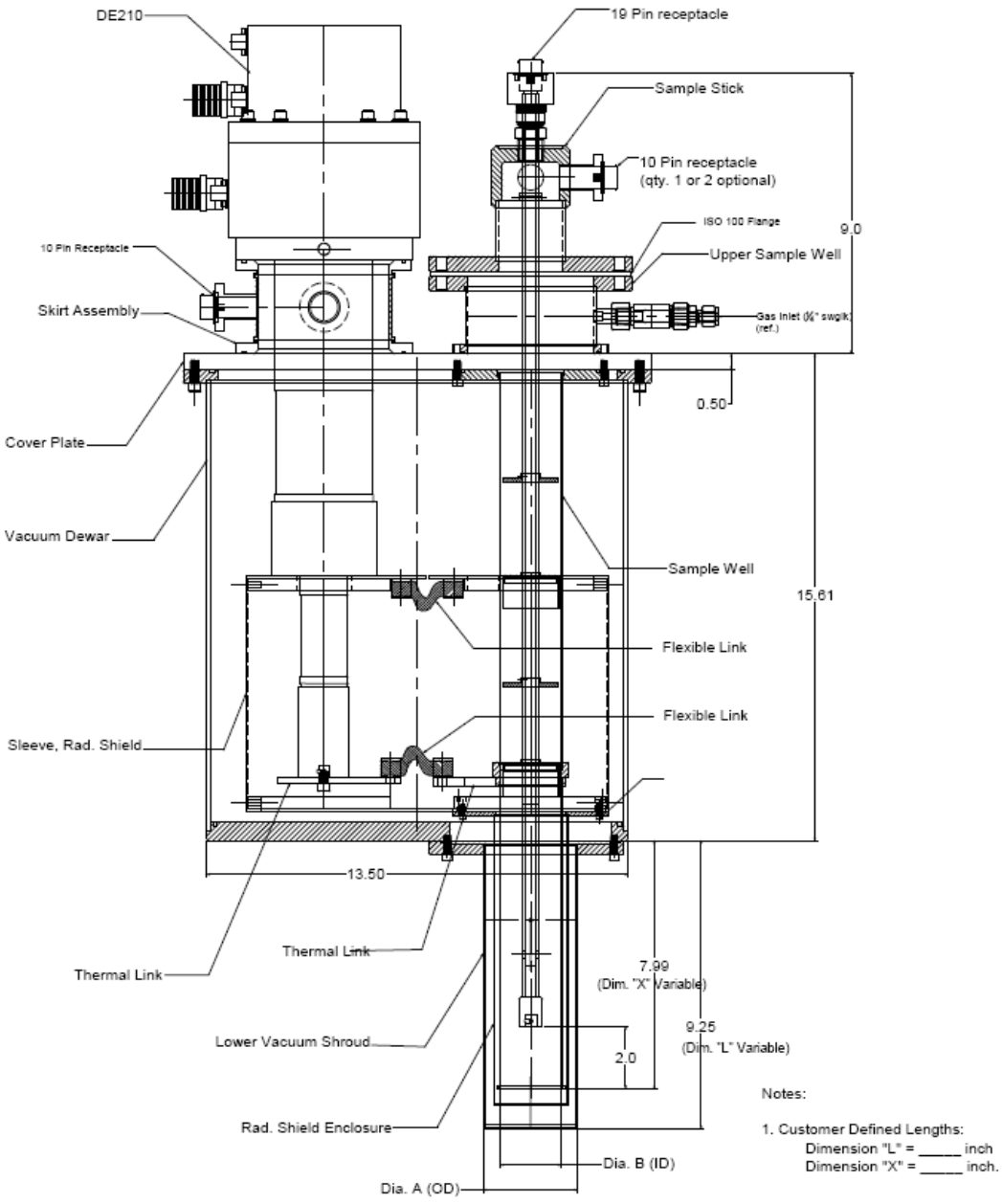
Cryostat Footprint -

Overall Length	725 mm (28.5 in)
Motor Housing Diameter	114 mm (4.5 in)
Rotational Clearance	Contact our Sales Staff

Cryocooler Model		**DE-210AF**		**DE-210SF**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<3K	<3K
Cooling Capacity*	4.2K	-	-	0.8W	0.8W
	10K	4W	4W	9W	9W
	20K	17W	17W	16W	16W
	77K	25W	25W	25W	25W
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	

Non-Optical Cryostat - Omniplex™

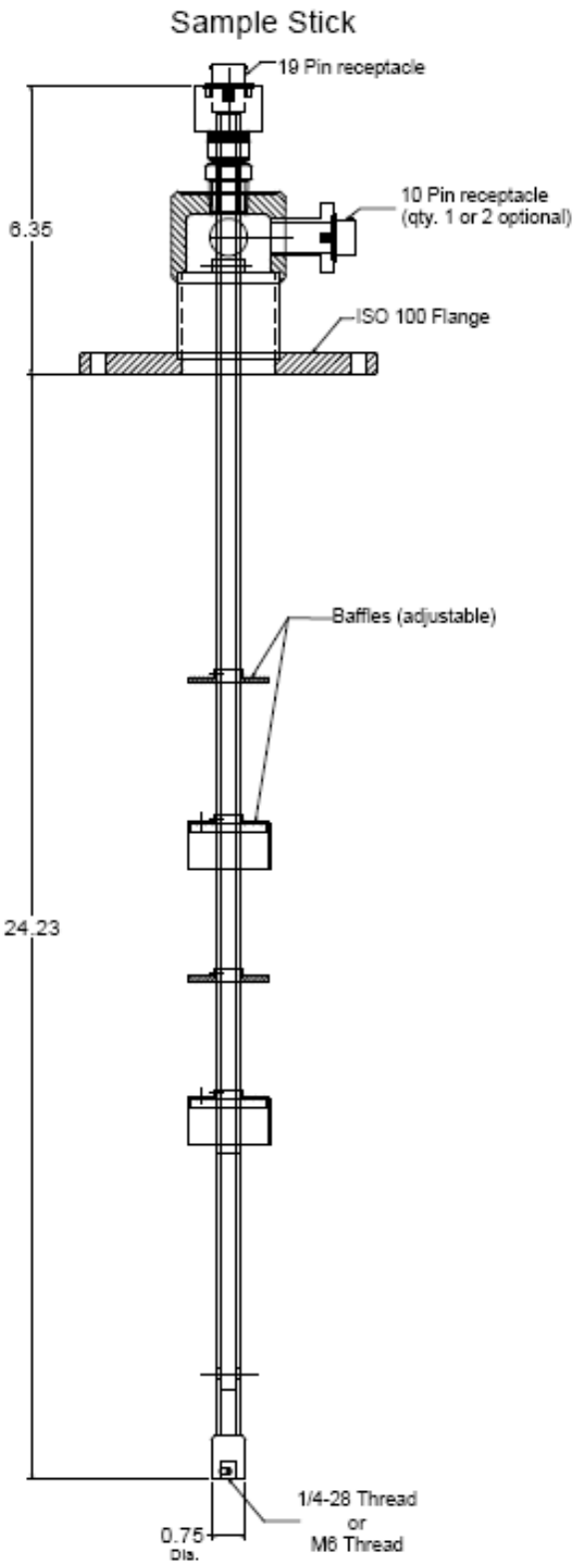
CS204*F-FMX-19N Outline Drawing



Variation	Omniplex version	Dia. A	Dia. B
062201-A1	Non-Optical, 1 ": Dia. Sample Well	2.000	0.940
062201-A2	Non-Optical, 2 ": Dia. Sample Well	3.000	1.940
062201-A3	Non-Optical, 3 ": Dia. Sample Well	4.000	2.940
062201-A4	Non-Optical, 4 ": Dia. Sample Well	5.000	3.940

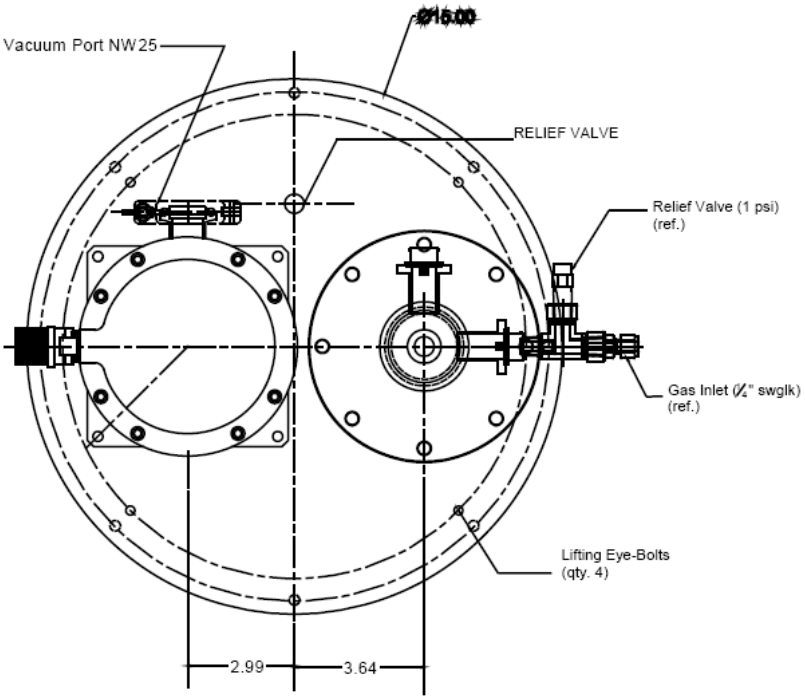
Non-Optical Cryostat - Omniplex™

Sample Stick



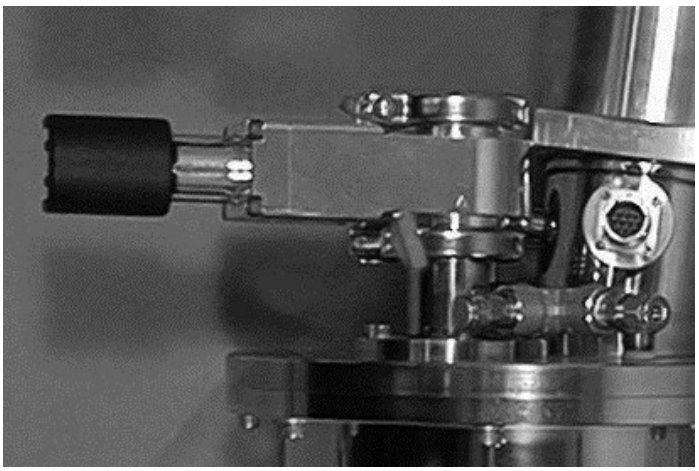
Non-Optical Cryostat - Omniplex™

Top View



Optional Rubber Bellows

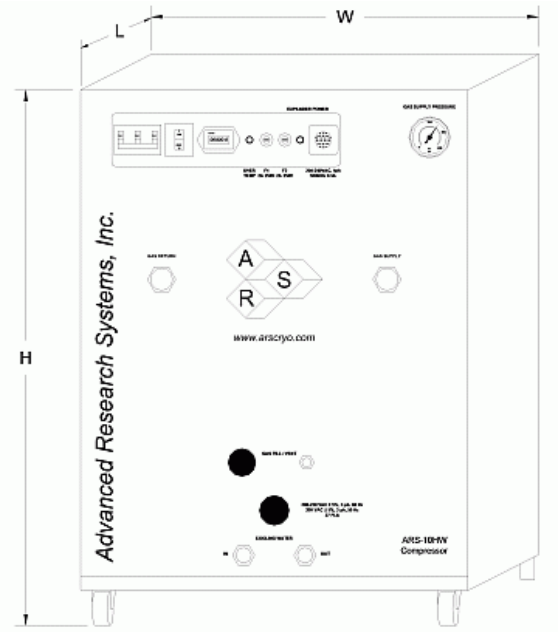
Optional Gate Valve



Non-Optical Cryostat - Omniplex™

Optional Rubber Bladder

ARS-4HW Compressor



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	7.7 kW	7.7 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	

UHV Cryostat - Ultra Low Vibrations

The **CS210*F-GMX-20B** opens up a wide range of possibilities never before possible with a closed cycle cryocooler. The ARS manufactured DMX-20B interface, like our “B” series cold heads is a True UHV System (10^{-11} Torr) where all of the rubber o-ring seals have been replaced with welded joings and metal seals. A CF flange is The DE210*F-GMX-20B uses a Helium Exchange Gas to decouple the sample from the cold tip of the DE210 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Due to the exchange gas being less conductive, the base temperature will increase by ~1K and the cooling capacity is roughly cut in half at varying temperatures.

Applications

- Low Vibration UHV applications
- Microscopy Applications
- Surface Science
- Nanomaterials

Features

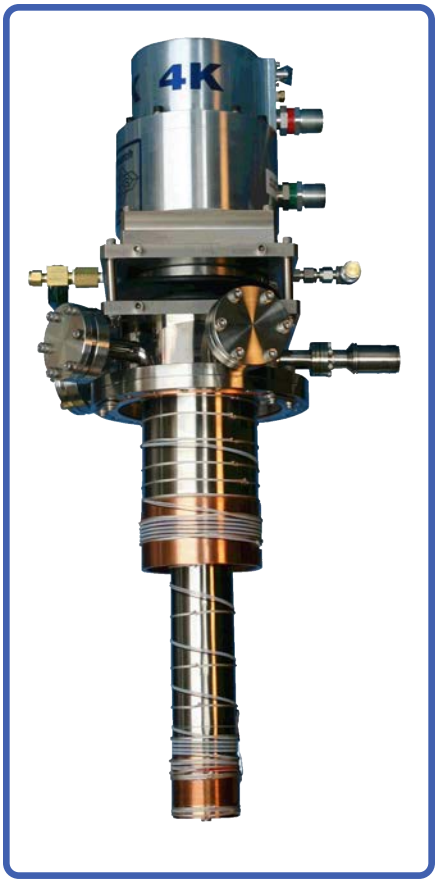
- **Ultra Low Vibrations (3-5 nm)**
- True UHV (10^{-11} Torr)
- Bakeable to 200C with cold head removed
- Open Sample Space
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-210AF)
- Compressor (ARS-10HW)
- 2 Helium Hoses
- 8” CF flange
- Nickel Plated OFHC copper radiation shield terminating 0.125” short of the cold tip
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.8W @ 4.2K)
- 450K High Temperature Interface [Contains high temperature Stycast]
  (Not required with the DMX-20 interface, but the 450K interface is helpful for high temperature performance)
- 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 a DE210SF-GMX-20B installed on an 8” Conflat Flange. This system was customized with 2 3/4” Conflats on the instrumentation skirt for a user configured system.

The above picture shows the compressor for the system. What is not shown is a required vacuum pump, Helium Hoses (included with system), temperature controller and Helium Gas bottle with regulator for the exchange gas.

UHV Cryostat - Ultra Low Vibrations

Cooling Technology-

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

Temperature*- GMX-20 adds ~1K to base temperature

DE-204AF	< 9K - 350K
DE-210SF	< 3K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and	

Sample Space -

Diameter	Large Open Radiation Shield
Height	Large Open Radiation Shield
Sample Holder Attachment	1/4 - 28 screw Bolt Circles also available
Sample Holder	www.arscryo.com/Products/ SampleHolders.html

Chamber Interface -

Flanges	CF, ISO
Size	8” 10”

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	Welded Stainless Steel
Pump out Port	0
Instrumentation Ports	2
Instrumentation Wiring	Contact sales staff for options

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Bolt On
Optical Access	Open End Radiation Shield terminateds 0.125” short of cold tip (customer specified)

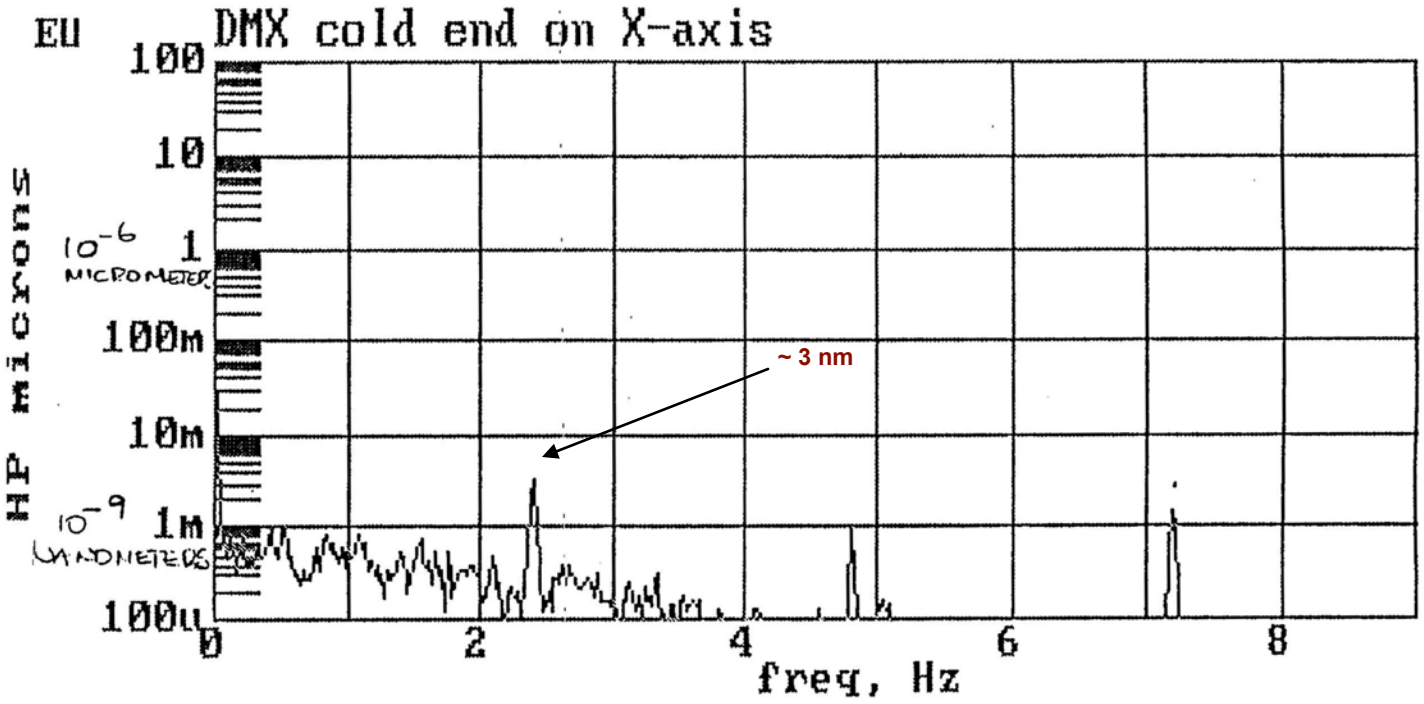
Cryostat Footprint -

Overall Length	713 mm (28.1 in) 368.8 mm (14.52 in) standard flange

Cryocooler Model		**DE-210AF**		**DE-210SF**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K
Cooling Capacity*	4.2K	-	-	0.8W	0.8W
	10K	4W	4W	9W	9W
	20K	17W	17W	16W	16W
	77K	25W	25W	25W	25W
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	

UHV Cryostat - Ultra Low Vibrations

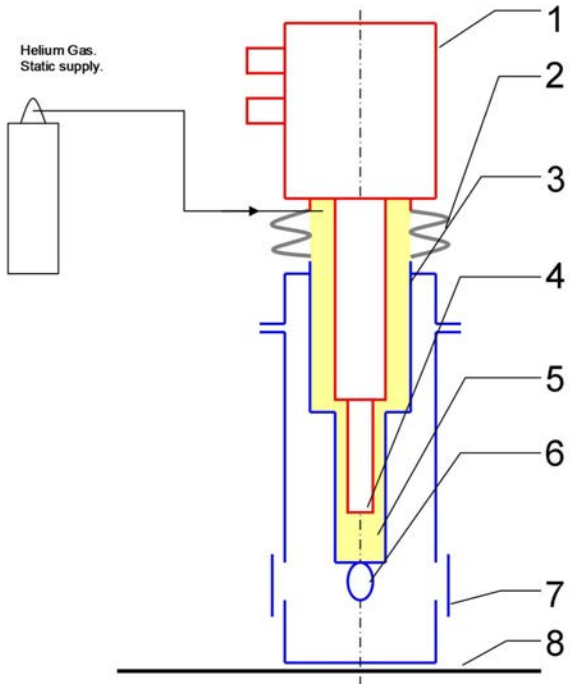
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

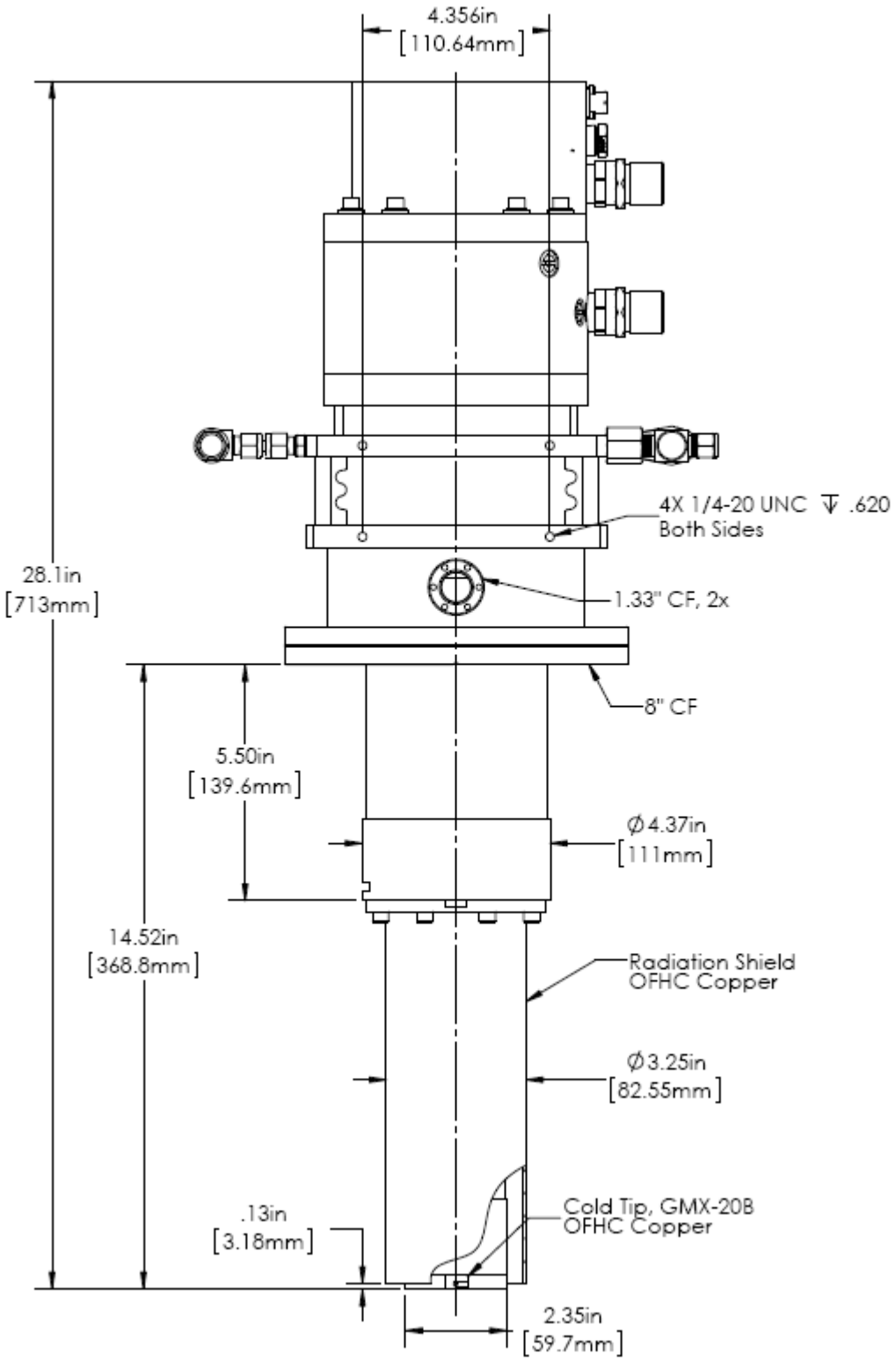
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

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 X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
5. Convective pockets of Helium Exchange Gas cools the sample space.
6. The sample is only in contact with the X-20 Interface
7. Windows for Optical Experiments
8. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



UHV Cryostat - Ultra Low Vibrations

DE204*F-DMX-20B Outline Drawing

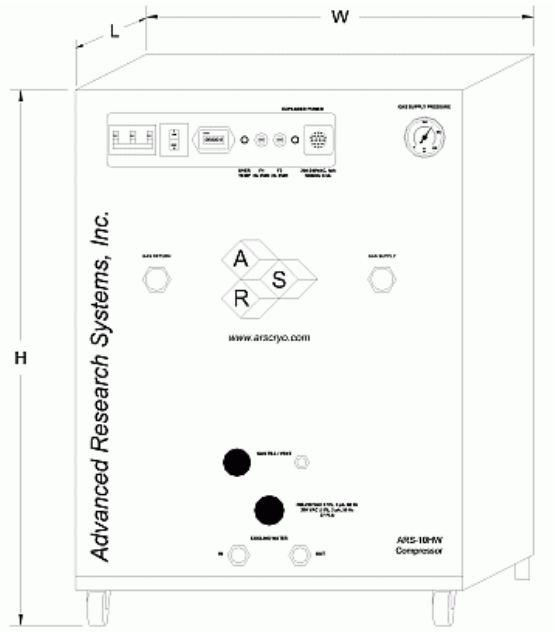


UHV Cryostat - Ultra Low Vibrations

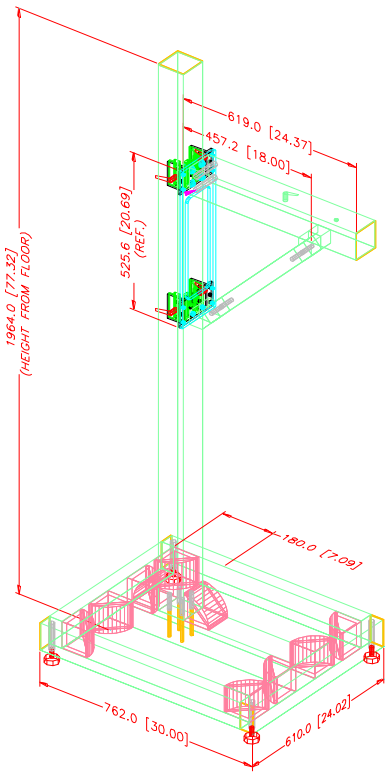
Direct Mounting

The DMX-20 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

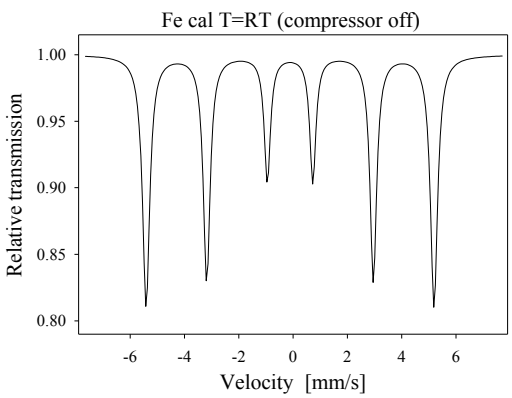


Compressor Model		ARS-10HW	
	Frequency	60 Hz, 3 Phase	50 Hz, 3 Phase
Standard Voltage	Min	208 V	190 V
	Max	230 V	210 V
High Voltage	Min	380 V	440 V
	Max	415 V	480 V
Power Usage	Three Phase	7.7 kW	7.7 kW
Refrigerant Gas		99.999% Helium Gas, Pre-Charged	
Ambient Temperature		5 - 40 C (40—104 F)	
Cooling 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	

UHV Cryostat - Ultra Low Vibrations

Mossbauer Spectra with DMX-20

Cryocooler Off



Calculated parameters:

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W23=1.08

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BHF=32.94T

Calibration spectrum:

Measurement with metallic iron foil (thickness 25 mm)

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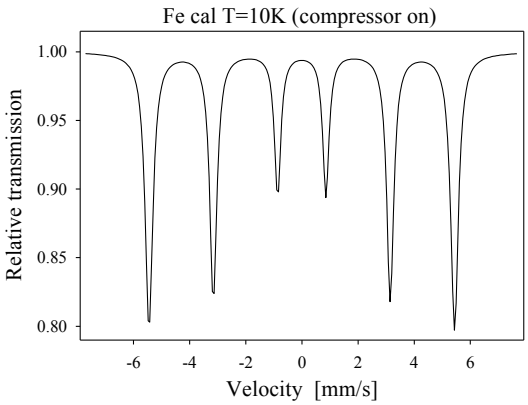

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When the system is properly mounted to the wall and the table and properly adjusted then the effect of vibrations induced by the working compressor is very small (almost negligible).

The broadening (rather no broadening!) is fully reproducible and is well below 2%. Such broadening has practically no effect and in almost all cases can be ignored. However, compare the lin ewidths calculated in the same way!

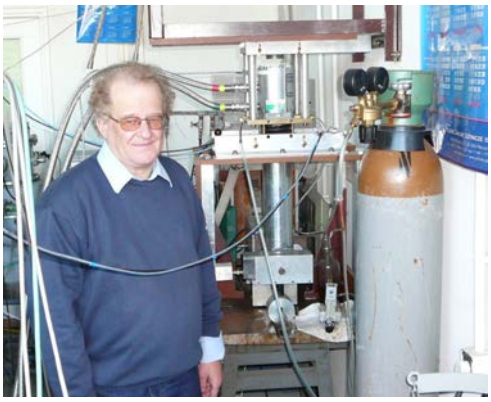
The Displex system is virtually vibration free!

Prof. Dr. habil. Michal Kopcewicz

Institute of Electronic Materials Technology

WARSAW, Poland

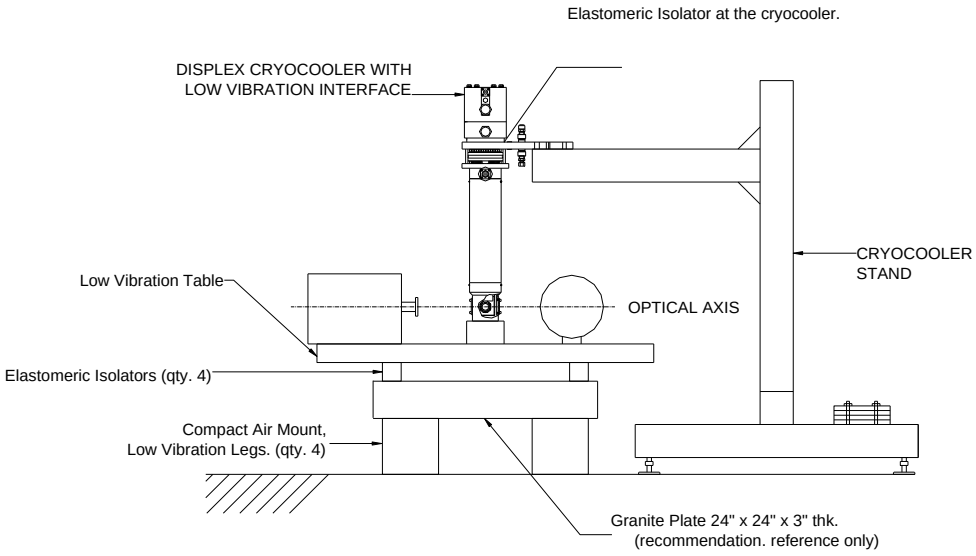
Mossbauer Cryostat, DMX-20



Prof. Dr. habil. Michal Kopcewicz

UHV Cryostat - Ultra Low Vibrations

Possible Mossbauer Configuration



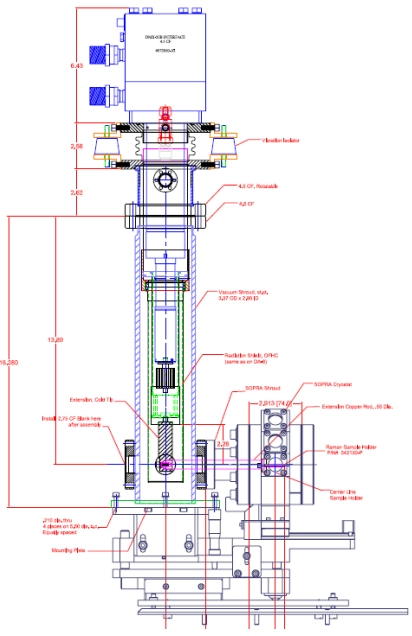
For maximum isolation proper mounting of the system is important. ARS offers a special ULV stand to isolate the ultra low vibration cryostat from the vibrating components of the cooler and the floor vibrations.

The cryocooler stand can be adjusted for the proper height, this holds the cooler.

The cryostat is mounted on the low vibration table. which consists of a high mass granite block (User supplied), resting on 4 air legs (optional ARS offering). Additional elastomeric isolators additional filter the unwanted frequencies from the floor to the cryostat.

System can be tested by shutting off the cryocooler only and watching the vibration effect on the experiment.

Ellipsometry



Low Vibration system for SOPRA Ellipsometer

UHV Cryostat - Ultra Low Vibrations

SEM Setup

The picture shows the Displex and its interface. All items showing stainless steel in the photo are modifications to our JSM-5910 SEM. Please also note the published papers on my website, which demonstrate CL results that were acquired with this cooling system.

The sample temperature, is between 40 K and 50 K.

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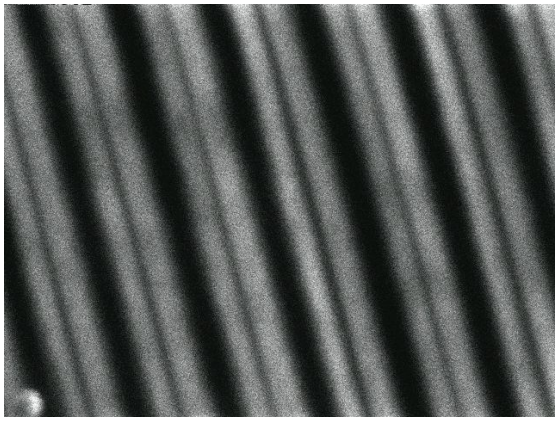
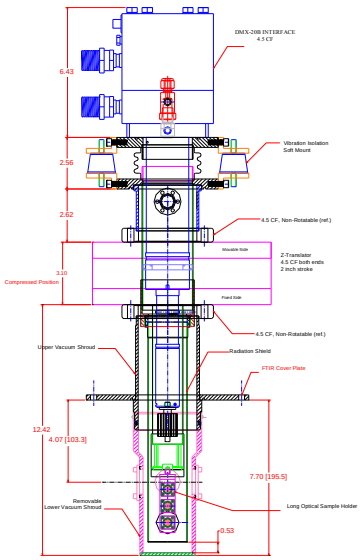


Image of a InGaN/GaN quantum well grown on a patterned GaN substrate. The patterning consists of stripes with a periodicity of 10 microns.

Monochromatic CL image (Mag. 2000) taken with a 390 nm detection wavelength.

The degradation of image quality from room temperature and 50K suggests that the vibration is less than 10nm.

FTIR Setup

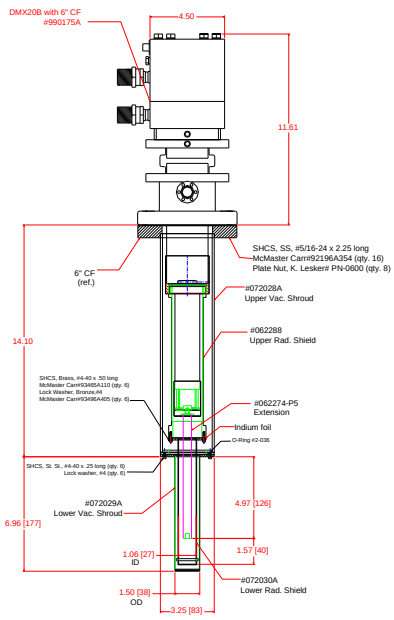


Low Vibration system for FTIR spectrometer. Sample holder with 3 samples can be translated in Z direction.

Low Vibration system for BOMEM, DA8 FTIR spectrometer.

UHV Cryostat - Ultra Low Vibrations

Magneto Electrical Experiments



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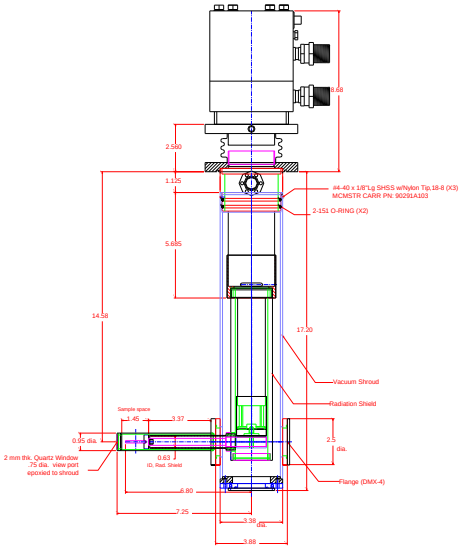
Magneto Optical Experiments (MOKE)



Low Vibration Side looking window can be placed in a MOKE, (Magneto Optical Kerr Effect). Sample can be located in any plane. The pole spacing can be as low as 1 inch.

Small diameter vacuum housing can be inserted into a narrow gap (high field). The optical window allows collection of light from the sample. The window can be very close to the sample for short focal length objective.

Optical Cryostat - Ultra Low Vibrations

The **CS210*F-GMX-20** pairs our largest cryocooler, the DE-210, with our X-20 Ultra Low Vibration interface to offer unprecedented cooling power at nanometer vibration levels. The **CS210*F-GMX-20** uses a Helium Exchange Gas to decouple the sample space from the cold tip of the DE210 Cryocooler. This prevents almost all vibration from being transmitted to the sample. Because the exchange gas is inherently less efficient than cooling by conduction, t the base temperature of the sample may be ~1K higher than the cryocooler. Additionally the GMX-20 interface requires the cold tip down orientation to facilitate convective cooling of the exchange gas.

Applications

- Mössbauer
- Low Vibration Optical Experiments
- Quantum Dots
- Photoluminescence (PL)
- Micro-Raman (Micro-PL)
- Micro-Spectroscopy
- Magneto Optical Kerr Effect (MOKE)
- Nanoscience
- Ellipsometry

Features

- **Ultra Low Vibrations (3-5 nm)**
- Pop-Off optical block for easy in-situ sample change
- Beryllium and Kapton windows available for Mössbauer experiments
- Large clear view optical windows (1.25 in)
- Large sample viewing angle for optical collection (F/1.8)
- Cold Tip Down Orientation
- Fully customizable

Typical Configuration

- Cold head (DE-210AF)
- Compressor (ARS-10HW)
- 2 Helium Hoses
- GMX-20 Ultra Low Vibration Interface
- Stainless steel vacuum shroud for optical and electrical experiments with pop-off optical block
- Nickel Plated OFHC copper radiation shield
- 2 High purity quartz windows
- Instrumentation for temperature measurement and control:
  - 10 pin hermetic feed through
  - 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 feed through
  - 4 copper wires
- Sample holder for optical and electrical experiments
- Temperature Controller

Options and Upgrades

- 4K Coldhead (0.8W @ 4.2K)
- 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)
- Window material upgrades (custom materials available)
- Sample holder upgrades (custom sample holders available)

The above picture shows a cryocooler with a vacuum shroud, radiation shield, and sample holder installed.

The above picture shows the DE210 Cryocooler installed on the GMX-20 interface with the vacuum shroud and radiation shield removed.

Optical Cryostat - Ultra Low Vibrations

Cooling Technology-

DE-204	Closed Cycle Cryocooler
Refrigeration Type	Pneumatically Driven GM Cycle
Liquid Cryogen Usage	None, Cryogen Free

Temperature*- GMX-20 adds ~1K to base temperature

DE-210AF	< 9K - 350K
DE-210SF	< 3K - 350K
With 800K Interface	(Base Temp + 2K) - 700K
With 450K Interface	(Base Temp + 2K) - 450K
Stability	0.1K
*Based on bare cold head with a closed radiation shield, and no additional sources of experimental or parasitic heat load	

Sample Space -

Diameter	61 mm (2.4 in.)
Height	39 mm (1.53 in.)
Sample Holder Attachment	1/4 - 28 screw
Sample Holder	www.arscryo.com/Products/SampleHolders.html

Optical Access-

Window Ports	4 - 90° Apart
Diameter	41 mm (1.63 in)
Clear View	32 mm (1.25 in)
#/F	1.8
Window Material	www.arscryo.com/Products/WindowMaterials.html

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 sales staff for options

Vacuum Shroud -

Material	Aluminum
Length	388 mm (15.29 in)
Diameter	86 mm (3.38 in) at the sample space
Width	86 mm (3.38 in) at the sample space

Radiation Shield -

Material	Nickel Plated OFHC Copper
Attachment	Threaded
Optical Access	0, 2, or 4 (customer specified)

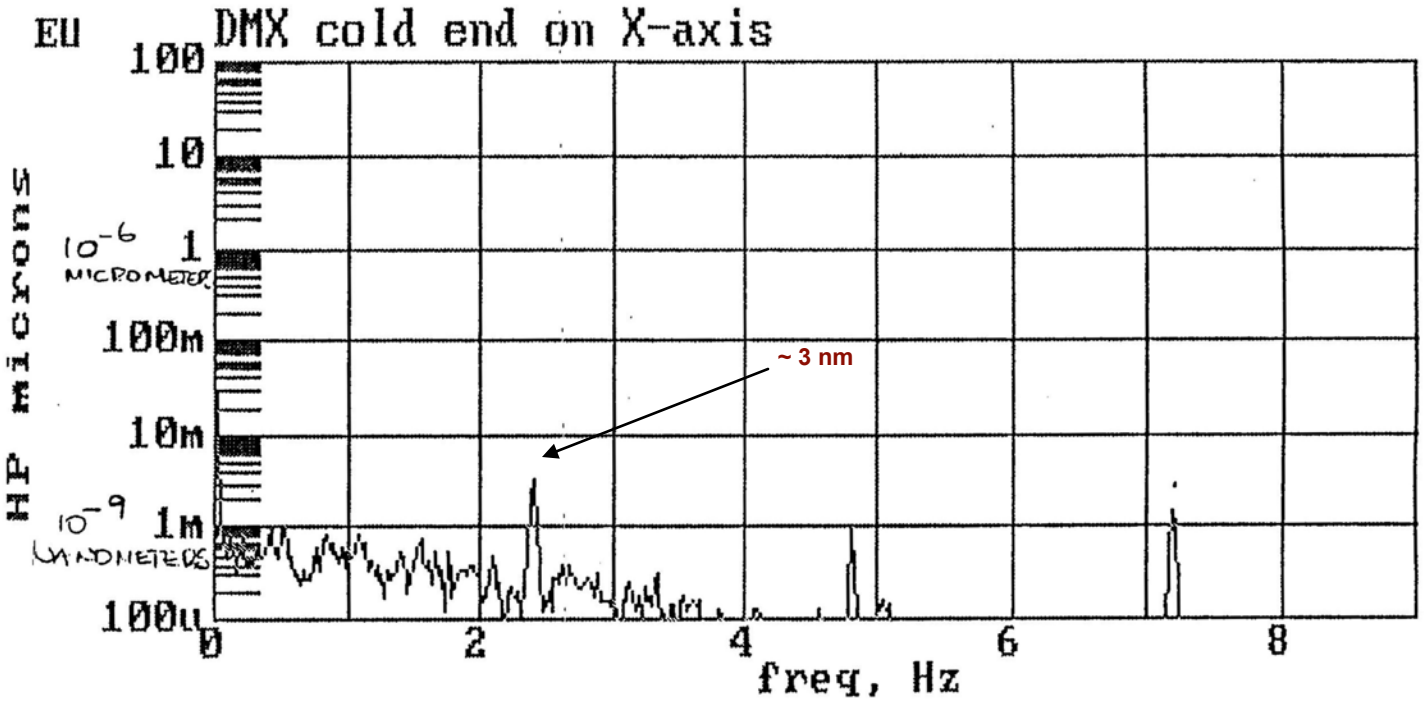
Cryostat Footprint -

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

Cryocooler Model		**DE-210AF**		**DE-210SF**	
	Frequency	60 Hz	50 Hz	60 Hz	50 Hz
Base Temperature		<9K	<9K	<9K	<9K
Cooling Capacity*	4.2K	-	-	0.8W	0.8W
	10K	4W	4W	9W	9W
	20K	17W	17W	16W	16W
	77K	25W	25W	25W	25W
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	

Optical Cryostat - Ultra Low Vibrations

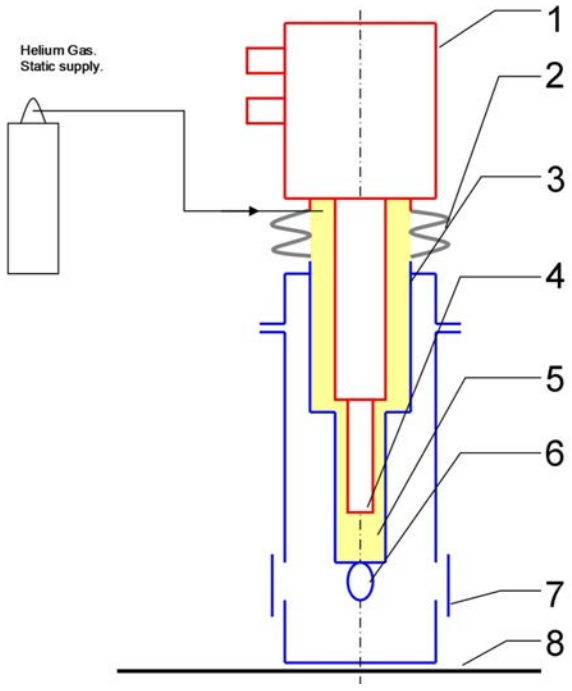
DE202*F-DMX-20 Vibration Spectra



Understanding the DMX-20 Interface

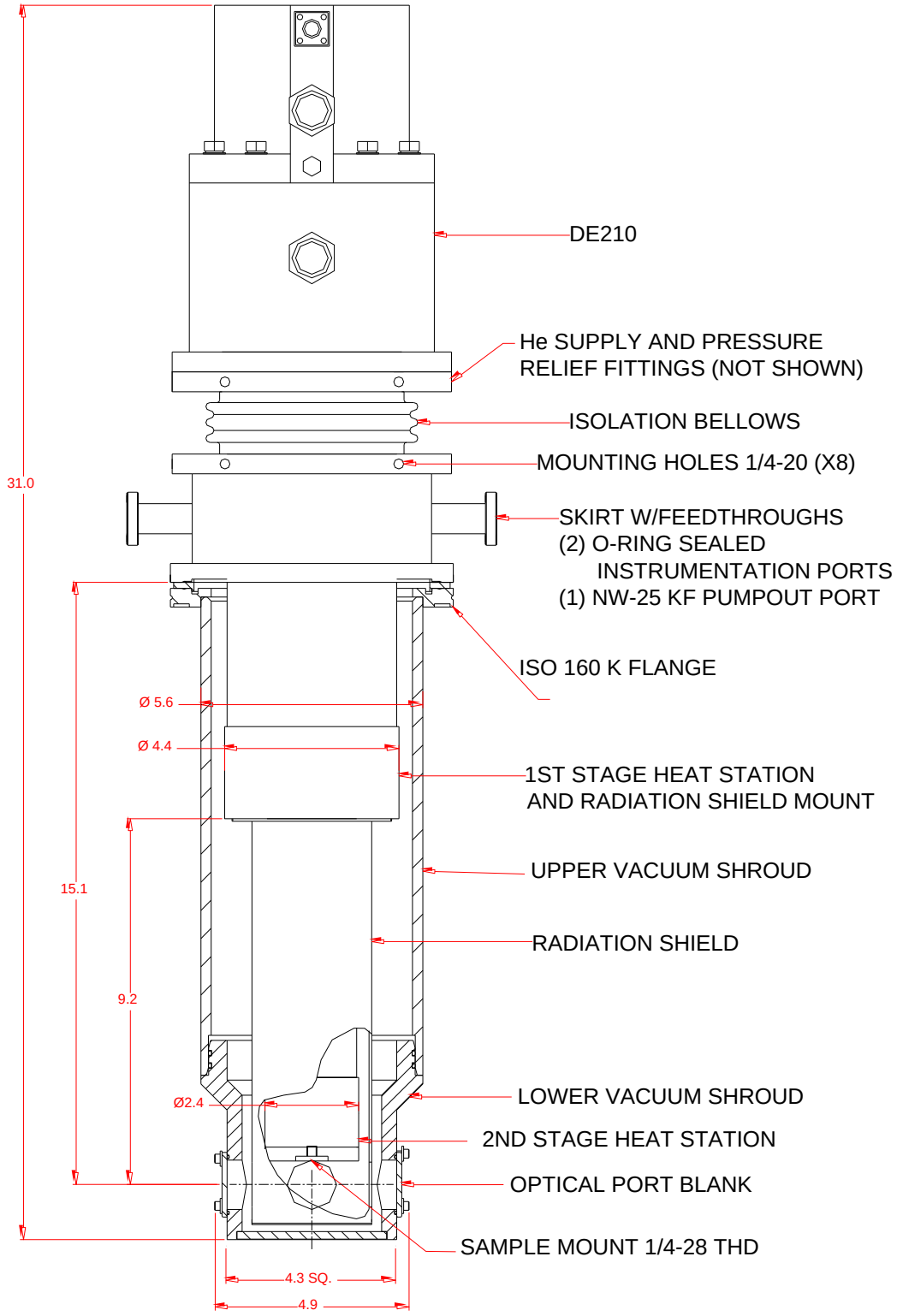
The **X-20** Interface uses a Helium Exchange Gas to decouple the sample space from the cold tip of the cryocooler. This prevents almost all vibration from being transferred to the sample space. Scientists have demonstrated vibration levels as low as 3-5 nm with the **DE202*F-DMX-20** (as shown above)

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 X-20 interface has no contact with the cryocooler except through the rubber bellows.
4. The cold tip has 10-30 micron vibrations (depending on CCR model) but no direct contact with the sample space.
5. Convective pockets of Helium Exchange Gas cools the sample space.
6. The sample is only in contact with the X-20 Interface
7. Windows for Optical Experiments
8. The X-20 Interface is mounted directly on a (user provided) Vibration Isolation Table.



Optical Cryostat - Ultra Low Vibrations

DE210*F-GMX-20 Outline Drawing

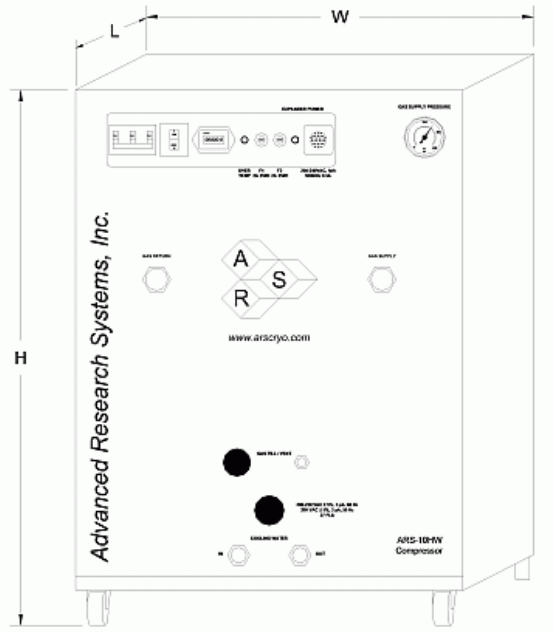


Optical Cryostat - Ultra Low Vibrations

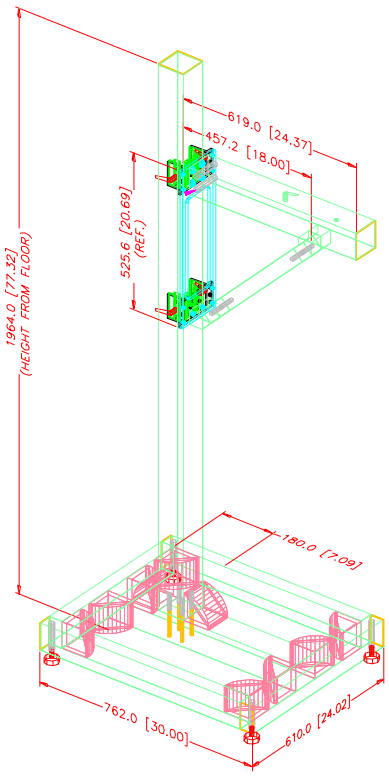
Direct Mounting

The DMX-20 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	7.7 kW	7.7 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	

Optical Cryostat - Ultra Low Vibrations

Mossbauer Spectra with DMX-20

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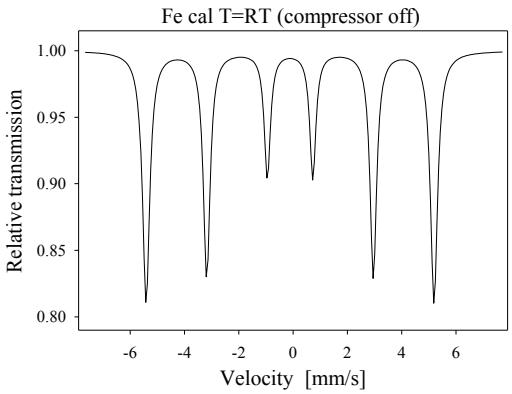

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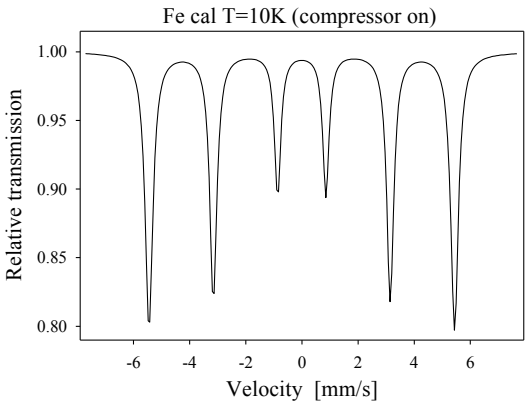

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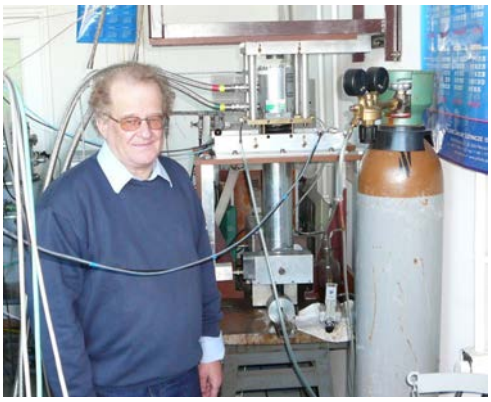

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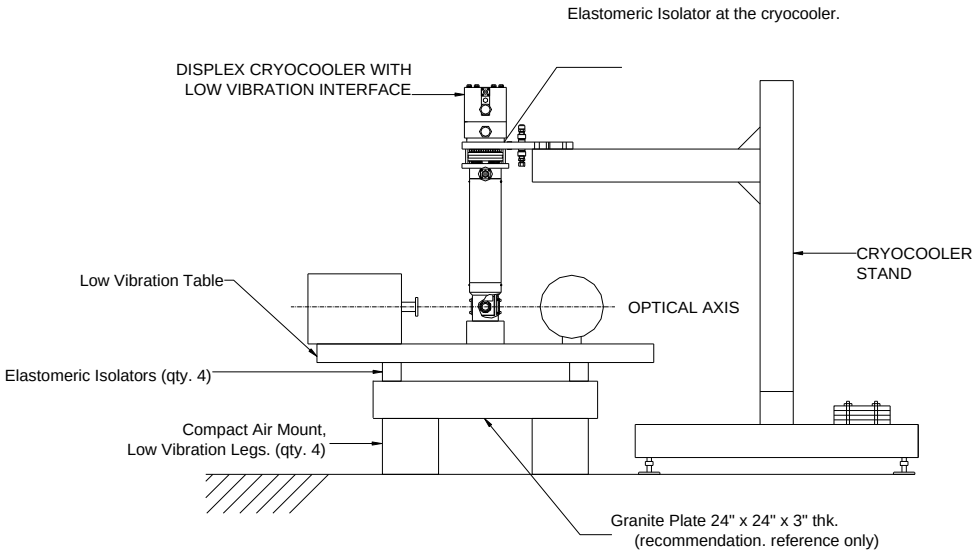
Optical Cryostat - Ultra Low Vibrations

Possible Mossbauer Configuration



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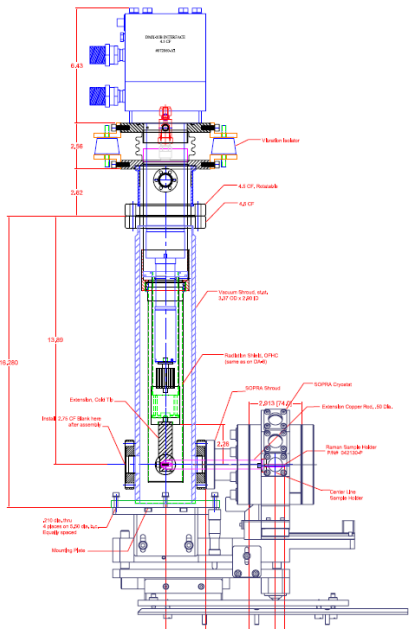

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Optical Cryostat - Ultra Low Vibrations

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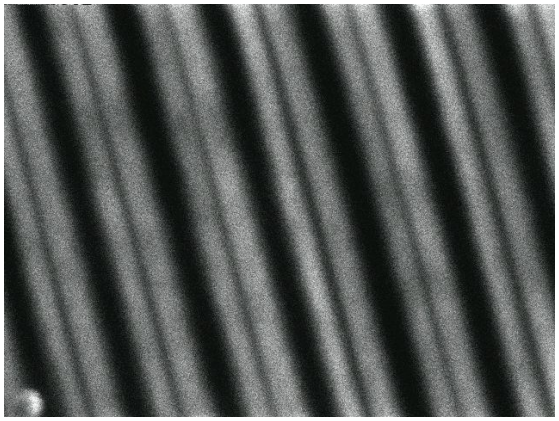

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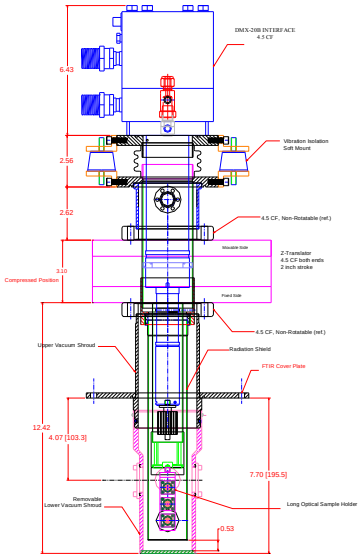

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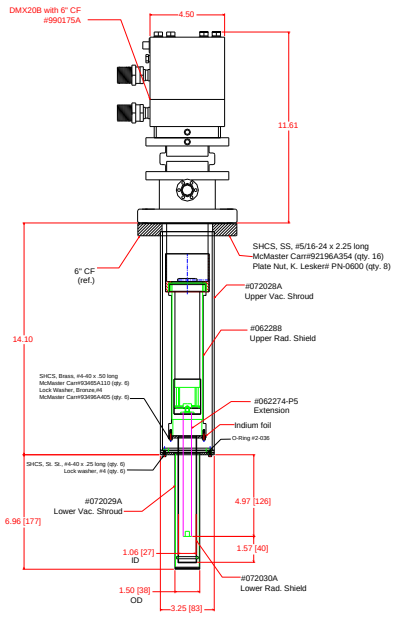
Optical Cryostat - Ultra Low Vibrations

Magneto Electrical Experiments



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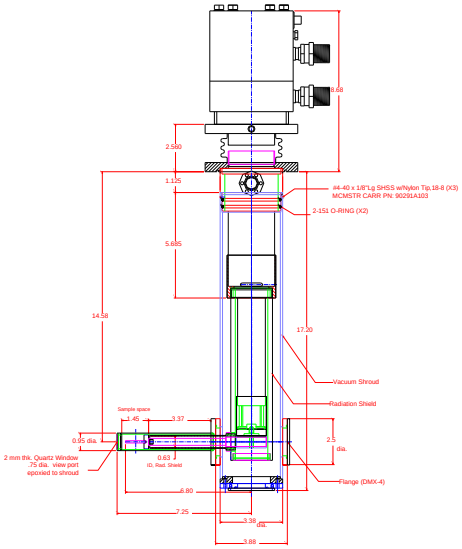

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