Microstats

Automated & Compact Optical Cryostats for Microscopy

Key Features

- ✓ Excellent temperature control
- ✓ Fully automated control
- ✓ Fast cooldown times
- ✓ User exchangeable window options
- ✓ Wide temperature ranges

Key Applications

- ✓ Micro-FTIR
- ✓ Raman spectroscopy
- ✓ Micro-luminescence
- ✓ Micro-photoluminescence
- ✓ Fluorescence spectroscopy
- ✓ Ultraviolet–Visible spectroscopy

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Introducing our Microstat Range

Our easy to use, compact and efficient **Microstat** cryostats offer a wide range of options to suit most spectroscopy and microscopy applications. They provide a wide temperature range (from 2.2 K up to 500 K) while providing excellent optical access. The **Microstat** model of choice will depend on the base temperature, available cryogen and level of stability required for your experiments.

The Microstat System

✓ Full system integration and control

All systems are fully configured to provide optimum cryogenic performance. Sample holders are included for both reflection and transmission experiments.

An extensive range of interchangeable window flanges are available for spectroscopy from near ultraviolet to extreme infrared, providing flexibility and adaptability for current and future applications.

✓ Intelligent cryogenic environmental controller

The **Mercury**iTC intelligent temperature controller combines multiple instruments into one, allowing for accurate temperature control at the heat exchanger and automated gas flow control. Plug and play expansion cards for additional sensor and heater channels, proportional integral derivative (PID) loops, stepper motor control and communication cards allow for full customisation. All functions can be accessed through the touch screen front panel, remotely or integrated into your own software scripts.
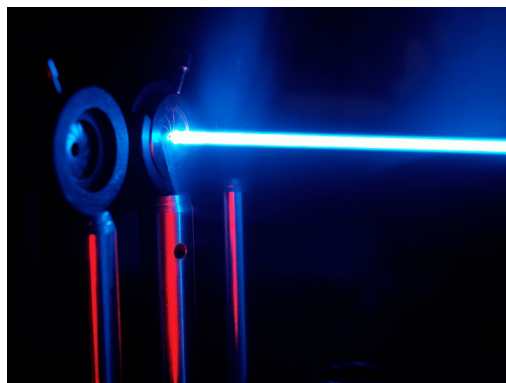
	Microstat Model	
	He	HiRes
Cooling medium	Liquid helium or liquid nitrogen	Liquid helium or liquid nitrogen
Temperature range	2.2 - 500 K	2.7 - 500 K
Temperature stability	± 0.1 K	± 0.1 K
Cooldown time	< 10 min	< 15 min
Sample space diameter x height (mm)	20 x 5	20 x 5
Working distance (mm)	4.5 to 5.5 8 for rectangular tail	2.2 to 5.7
Vibration (vertical)	< 0.1 μm	< 20 nm
Lateral sample holder drift at constant temperature	< 1 μm / hour	150 nm / hour
Cryogenic consumption (L/hr) at 4.2 K for helium at 80 K for nitrogen	< 0.45 (helium)	< 0.7 (helium)

Application Focus
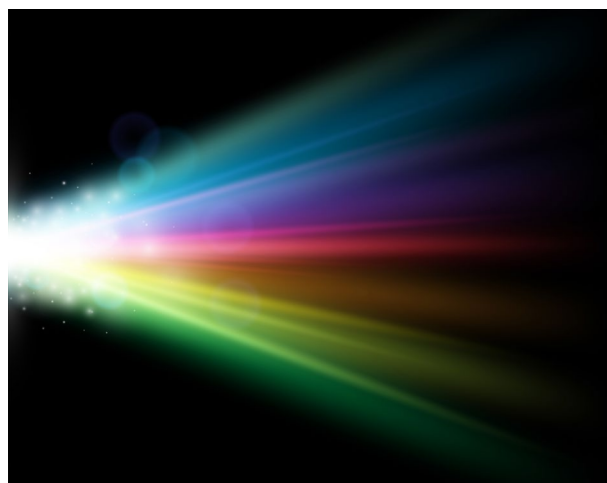
Ultraviolet–Visible Spectroscopy

Ultraviolet–visible spectroscopy or UV/Vis refers to absorption spectroscopy or reflectance spectroscopy measured across the ultraviolet to visible spectral region. **Microstat** systems are available with a wide range of window materials, including Spectrosil B/WF, suitable for UV to visible observations.

Magneto-Optical Kerr Effect

Magneto-Optical Kerr Effect (MOKE) can be used to investigate the magnetization structure of materials. Using the **Microstat**He coupled with a narrow rectangular tail-set, samples can be inserted between the poles of an electromagnet while maintaining optical access to the sample.
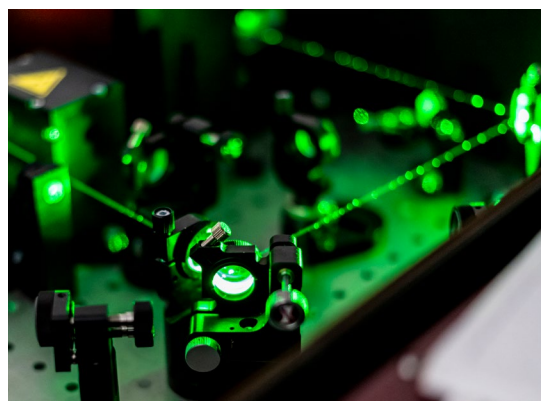

Raman Spectroscopy

The **Microstat** range of cryostats allows for Raman spectra to be recorded using microscopy objectives in a temperature-controlled sample-in-vacuum environment. Windows, both top and bottom, allow for reflection and transmission measurements. The integration of the **Microstat** range of cryostats can allow for spectral mapping of samples across a wide range of temperatures, giving localized information about your samples.
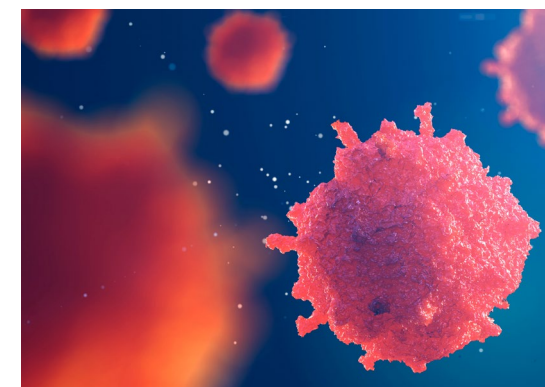

Micro-photoluminescence

Micro-photoluminescence or Micro-PL spectroscopy is a powerful tool for investigating the optical and electronic properties of single nanostructures. The **Microstat** range of cryostats allows for mapping of semiconductor microstructures with sub-micron spatial resolution and single photon counting across a wide range of temperatures.

Micro-FTIR

FTIR spectroscopy, widely used for polymer research, inorganic chemistry, pharmaceutical or drug related research, as well as solid state and semiconductor physics. The integration of the **Microstat** range of cryostats can allow for spectral mapping of samples across a wide range of temperatures, giving localized information about your samples. Window flanges are available to span the near to extreme IR.

Fluorescence Spectroscopy

The **Microstat** range of cryostats can be applied to microscopy samples using Fluorescence spectroscopy. Cryostats using liquid nitrogen or liquid helium offer temperature control to below 4 K with minimal distance between sample and objective.

MicrostatHe & HiRes

Lowest Helium Consumption and Fastest Cooldown on the Market

This helium flow cryostat has been designed as a flexible 4 K platform for use in conjunction with short working distance microscope objectives. Available as a cold finger cryostat or with a concentric heat exchanger for low vibration, excellent spatial resolution and minimal sample drift.

Features	Benefits
Superb temperature control	✓ Wide temperature range: 2.2 K to 500 K ✓ Rapid cooldown time: 4.2 K in less than 10 minutes ✓ Economical use of cryogens: the lowest consumption on the market from only 0.45 l/hr at 4.2 K ✓ Can be used with liquid nitrogen
Great connectivity	✓ Electrical measurements via 10-pin electrical feed wires, or optional miniature coax cables, to pins adjacent to the sample position
Versatile	✓ Easy integration into commercial microscopes facilitated by its compact size and short working distance of 2 mm. Interface plate available as option for attaching the **Microstat**He directly onto microscope ✓ Suitable for reflection and transmission experiments ✓ 3 in 1 flexible design with easily interchangeable tail between the **Optistat**CF-V, **Microstat**He and **Microstat**He Rectangular tail

Specifications	He		HiRes	
Window thickness	0.5 mm	1.5 mm	0.5 mm	1.5 mm
Clear access diameter	10 mm	25 mm	10 mm	25 mm
Working distance to sample holder	3.0 - 4.5 mm	3.0 - 5.5 mm	2.2 - 5.7 mm	3.2 - 6.7 mm
Angle of admittance (to surface of sample holder at centre)	102°	144°	142°	166°
Max sample thickness	5 mm		5 mm	
Max sample diameter	20 mm	20 mm	20 mm	20 mm

Creating the Optimum Product for you

Step 1

Build your Cryostat

Select from the following options to build your specific product order code. Example code shown.

MS-HE-V5-612-100-LV

Fast-track configurations

MS-HE-V5-612-100-☐

MS-☐-☐-☐-☐-☐

Cryogen	Code
Helium (He)	**HE**
Helium, high resolution, low vibration (HiRes)	**HR**
Sample Environment	**Code**
Sample in vacuum	**V5**
Transfer Line	**Code**
LLT600 90° 1.2 m flex – Manual	**612**
LLT650 90° 1.2 m flex – Automated	**652**
LLT700 180° 1.2 m flex – Manual	**712**
LLT750 180° 1.2 m flex – Automated	**752**
Wiring	**Code**
10 DC wires (10 pin)	**100**
10 DC wires + 1 Coax cables*	**101**
10 DC wires + 2 Coax cables†	**102**
10 DC wires + 4 Coax cables†	**104**
Pump Voltage	**Code**
High voltage – 220/240 V 50 Hz	**HV**
Low voltage – 110/120 V 60 Hz	**LV**

* HR only † He models only

Step 2

Add standard controller, please see page 8 for additional controller options.

Description	Order Code
MercuryiTC Controller (Base unit). Inc. 1 x sensor/heater PID control loop	**MERC-ITC-000**

Step 3 & 4

Accessories

A full range of accessories suitable for your cryostat are available on page 10.

Window Options

Each cryostat is supplied with Spectrosil WF window flanges top and bottom as standard. All flanges are user changeable and a selection of additional window materials with a variety of transmission properties are available. Please see the Windows information on page 10.

Controller Options

Upon request, our systems are supplied with a **Mercury**iTC temperature controller with one sensor/ heater PID loop as standard. Further additional options are available to order.

Features

- ✓ Supports all standard cryogenic sensors (ruthenium oxide, cernox, silicon diodes, platinum, thermocouple and RhFe)
- ✓ Heater output up to 80 W per channel
- ✓ Configurable constant voltage or constant current excitation

Expandable

Customisation is possible through the addition of plug and play expansion cards. The controller features 9 expansion slots (8 multi-function slots and a dedicated GPIB slot) which can be used to extend its capability

Expansion cards include additional temperature sensor inputs and heater outputs, pressure transducer inputs, stepper motor drive allowing gas flow regulation and efficient use of liquid helium in flow cryostats and cryogen level metering of both helium and nitrogen.

System control

The intuitive touch screen user interface facilitates easy monitoring, control and configuration of your experimental system.

- ✓ Easy connection to your **Mercury** instrument via multiple remote interfaces: Ethernet, GPIB, serial or USB
- ✓ Easy integration within your data acquisition programs and direct and remote control of the cryogenic and superconducting magnet system
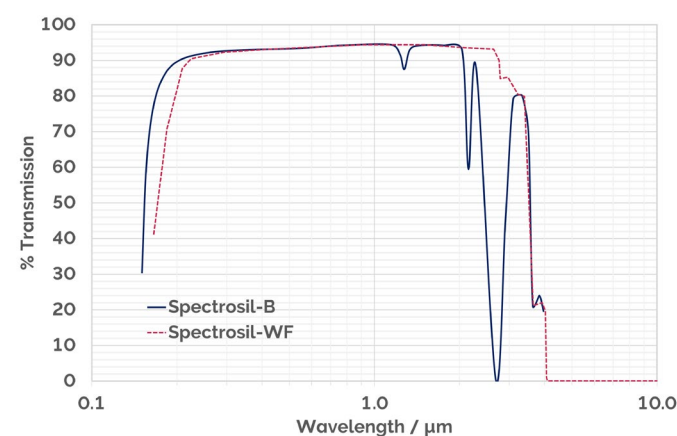- ✓ Consistent rear panel connections for easy system upgrades

Ordering

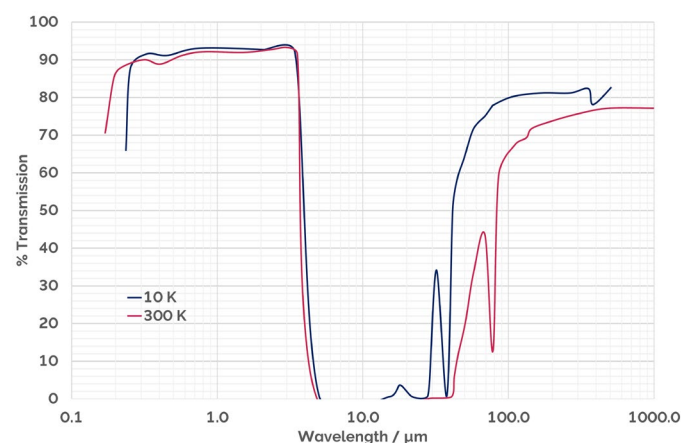| Description	Order Code
MercuryiTC Controller (Base unit). Inc. 1 x sensor/heater PID control loop	**MERC-ITC-000**
Controller + GPIB Card	**MERC-ITC-00G**
Controller + Additional Heater Card	**MERC-ITC-00H**
Controller + Additional Sensor Card	**MERC-ITC-00S**
Controller + GPIB/Sensor cards	**MERC-ITC-0GS**
Controller + Heater/GPIB cards	**MERC-ITC-0HG**
Controller + Heater/Sensor cards	**MERC-ITC-0HS**
Controller + Heater/Sensor/GPIB cards	**MERC-ITC-HGS**

Windows

Spectrosil B & WF

Spectrosil B is a synthetic vitreous silica. The material itself is not birefringent and standard strain-relieved low temperature window mounts ensure that Spectrosil B windows do not affect polarised light. It is an excellent material for filtering out the near-mid IR room temperature thermal radiation, resulting in a low thermal load on the cryostat. Spectrosil WF is a water free synthetic vitreous silica, its transmission range extends further into the IR. Data is for a 2 mm thick window.
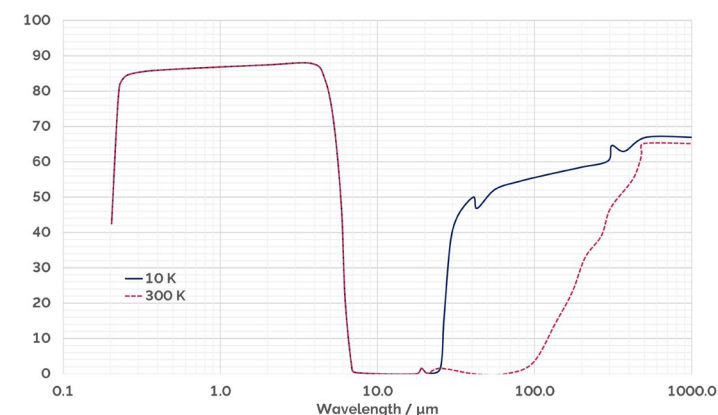

Crystalline Quartz

Crystalline quartz is a window for the visible and near IR. It exhibits a strong temperature dependence in the far IR. At temperatures below 80 K the transmission is greater than 70% for wavelengths above 80 μm. This material may be used as a cold inner window for far IR applications. Crystalline quartz is birefringent and is available cut with the z-axis normal to the window to reduce polarisation effects. The transmission data is for a 2 mm thick window.
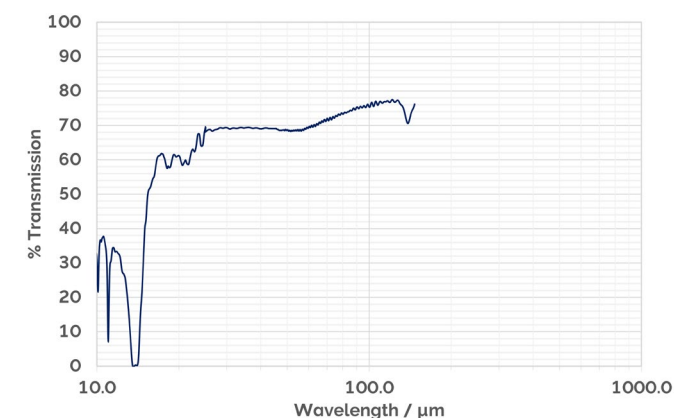

Sapphire

Sapphire is an alternative window for visible and near IR applications. It is the only window which may be used at high temperatures (up to 500 K). At temperatures below 80 K the transmission of sapphire increases in the extreme IR region. This effect allows sapphire to be used as a cold inner window for IR measurements. Sapphire is birefringent. The transmission data is for a 2 mm thick window.
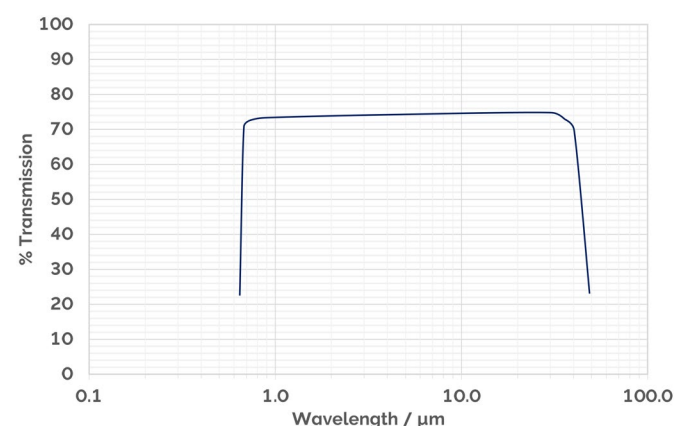

Polythene

Polythene is a polymer which may be used in the extreme IR. The material is porous to helium gas above 100 K. The transmission data is for a 1 mm thick window.
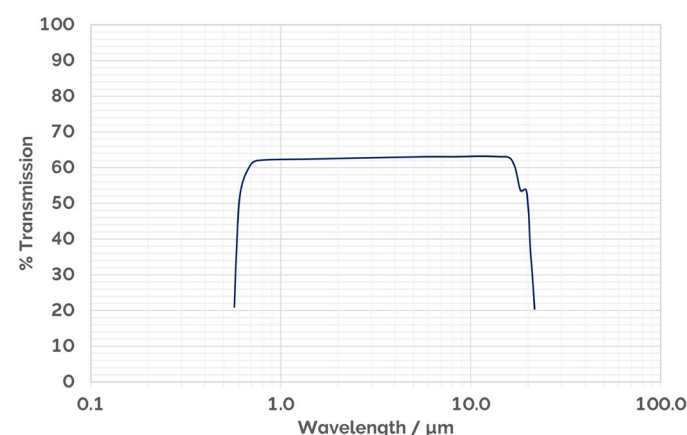

KRS-5

KRS 5 (Thallium Bromide-Thallium Iodide) is a useful window for the mid IR. The complex nature of the cold window mount and the necessity to make it vacuum tight results in the clear access diameter being reduced by 2 mm when compared with other materials. The material is toxic and should be handled with care.
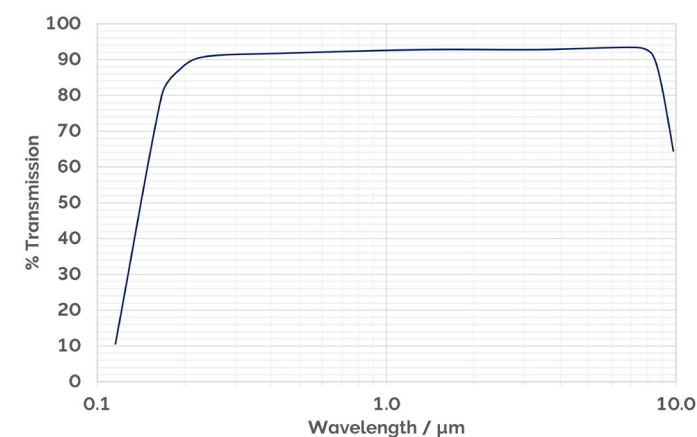

Zinc Selenide

Zinc selenide is a reliable cryogenic window for the mid IR. Care should be taken with handling as it is toxic and scratches easily. The transmission data is for a 2 mm thick window.
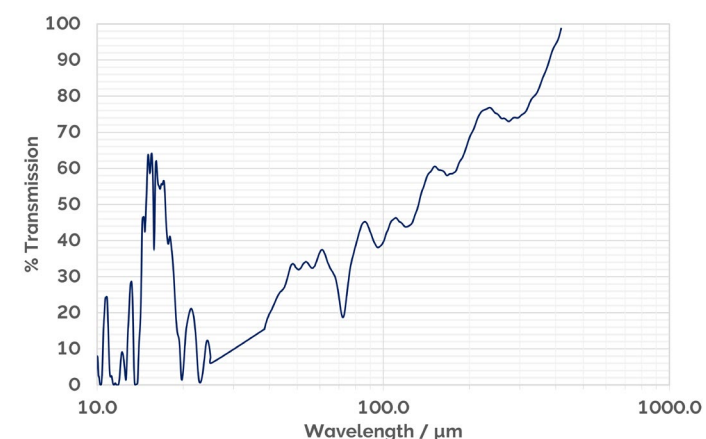

Calcium Fluoride

Calcium fluoride may be used in the near and mid IR. It cannot be used as a cold inner window due to its mechanical and thermal properties. The transmission data is for a 2 mm thick window.

Mylar™

Mylar™ is a polyester film. Standard windows are 125 μm thick and may be used as a cryogenic window in the extreme IR. Mylar is porous to helium gas above 100 K.

Windows

Description	Microstat	
	He	HiRes
Spectrosil WF	●	●
Spectrosil B	○	○
Sapphire	○	○
Calcium fluoride	⊘	○
KRS-5	○	○
Zinc selenide	○	○

●   Provided as standard,   ○   Optional order,   ⊘   Not available

Diamond, Beryllium and other windows may be available through our Customer Special Request process, Please ask your Quantum Design Oxford sales representative for information. "Film" windows, such as Mylar are not currently available for **Microstat** windows due to the adhesive process and deformation due to pressure differential.

Accessories

Description	Microstat	
	He	HiRes
Turbo station (turbo pump)	○	○
40 m³ rotary pump (all He options)	○	○
Nitrogen sidearm (nsa)	○	○
Rectangular tail	○	⊘
OptistatCF-V tail kit	○	⊘
Pillar upgrade kit (for magnet experiments)	⊘	○
Cryostat mounting plates	○	○

●   Provided as standard,   ○   Optional order,   ⊘   Not available

Power Supply Requirements:

Mercury Temperature Controller iTC power supply	
Mains supply voltage	100 to 240 VAC
Mains supply frequency	50 to 60 Hz
Maximum supply power	650 W
Maximum supply power	+/- 10% of nominal voltage
Gas Flow Pump Helium and Nitrogen Flow Cryostats:	
Mains supply voltage	120 to 240 VAC
Mains supply frequency	50 to 60 Hz
Max power consumption	370 W

Order Today

Need more information? At Quantum Design Oxford we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Quantum Design Oxford products.

For a full listing of our local sales offices, please see:

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