



## ActivelyCooled optical cryostats, sample in vacuum

Oxford Instruments offers a range of compact, closed cycle refrigerator based cryostats in a variety of configurations. These systems are capable of achieving sample temperatures as low as 2.8K, without the need for liquid cryogen maintenance using ActivelyCooled technology. This brings significant benefits in terms of integration into a wide range of measurement systems together with ease of use. The range includes cryostats with sample environment in vacuum using either a Pulse Tube(PT) or a Gifford McMahon (GM) refrigerator. These systems also feature a modular design which provides the benefit of flexibility for specific applications and convenient sample change.

### System components

A complete OptistatAC-V system consists of:

- OptistatAC-V cryostat
- Optical sample holder
- Windows(up to four radial, one axial)
- ITC Temperature controller
- Air or water cooled compressor
- Flexible metal hoses
- Provision for electrical connections to the sample holder and heat exchanger (supplied as standard)

### Features and benefits:

- Ease of use
- Easy sample change
- Low running costs
- 2.8K base temperature without the need for cryogen(PTR version only)
- Large sample space enabling studies of samples with a wide range of size and geometry
- An extensive range of demountable windows for current and future applications
- Compatibility with a wide range of optical measurement systems

## Mode of operation

The compressor system supplies compressed helium to the cold head through the flexible metal hoses. The gas expands in the cryostat unit to provide refrigeration, by expanding the high pressure helium to low pressure, and then returns to the compressor unit. The cold head heat exchanger is in good thermal contact with the sample holder.

Precise temperature control is obtained using an ITC temperature controller to drive a heater located near the sample holder, sample temperature being measured using a rhodium iron temperature sensor. The optical cube, which is the lower section of the outer vacuum case, is retained by easily removable clamps to facilitate sample change. To change the sample, the cryostat is warmed to room temperature, the vacuum released, the clamp, optical cube and radiation shield (if applicable) removed.

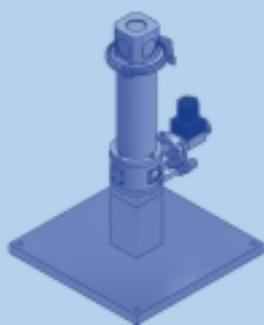
### Optical access

Up to five sets of windows can be provided (four radial and one axial) for the optical cube. All windows are demountable and may be exchanged at a later date for measurements over different regions of the optical spectrum. Oxford Instruments offers an extensive range of window materials permitting spectroscopic measurements from ultraviolet to extreme infrared (including THz applications).

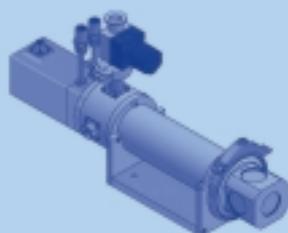
### Options for sample holders

The OptistatAC-V is supplied with an optical sample holder as standard. A plain resistivity sample holder may also be supplied on request.





GMR cryostat fitted with a vertical mount (supplied as standard)



GMR cryostat fitted with a horizontal mount (optional)

## Cryostat mount

The OptistatAC-V 01 and 04, based on GM refrigerators, are supplied with a cryostat mount. As standard, the cryostat will be supplied with a mount for vertical orientation of the cryostat. A mount for horizontal operation is also available on request. The OptistatAC-V 12 and 14, based on PTR refrigerators are supplied with a four leg support arrangement with vertical orientation as standard. The cryostat mounts permit integration with a wide range of optical measurement systems, including optical bench configured systems.

## Other configurations

Please contact us to discuss options to meet specific experimental configurations that may not be satisfied by our standard options, for example:

- electrical wiring to the sample to suit specific applications
- smaller diameter outer vacuum case and radiation shield (lower sections) to allow the sample to be located in the pole gap of electromagnets
- optical cube and radiation shield configurations to suit specialised optical access (f number) requirements
- longer flexible metal hoses
- specialised window requirements

## Cryostats using GM refrigerator technology

GM refrigerators are the most cost effective method for refrigeration at cryogenic temperatures. GM refrigerators incorporate a displacer pneumatically driven and located in the cold head. This eliminates the need for complex mechanical linkages which require more frequent servicing.

These cryostats also have the added advantage of being very compact and can operate in any orientation.

### OptistatAC-V 01

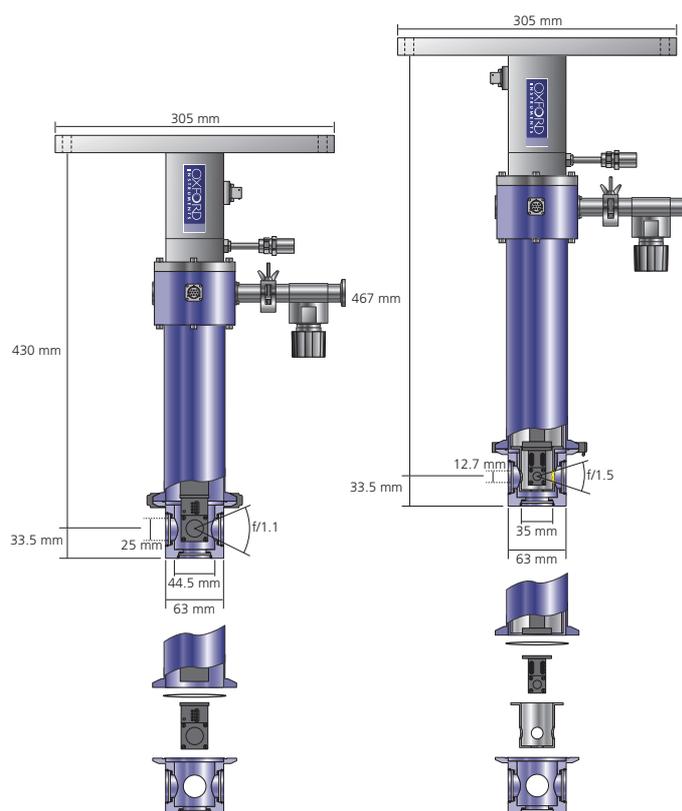
This cryostat has a temperature range of 22-325 K and uses a one stage GM cooler.

This cryostat is ideal when temperatures higher than 25 K are required. In particular, this cryostat can reach 77 K in 20 minutes and has a high cooling power (11 W) at this temperature.

### OptistatAC-V 04

This cryostat has a temperature range of 9-325 K and uses a two stage GM refrigerator.

The first stage supplies cooling from 40-80 K and the second stage cools approximately from 9 K. The first supplies the power to intercept heat at higher temperature, therefore shielding the second stage from unnecessary heat.



OptistatAC-V 01

OptistatAC-V 04

## Cryostats using PT refrigerator technology

These cryostats are ideal for experiments requiring very low level of vibrations.

The rotary valve in the cold head directs the helium gas in and out of the expansion tubes dropping the temperature to 2.8 K without the use of displacers. This results in a significant reduction in vibration of the cryostat structure compared with other types of closed cycle refrigerator based system. This also results in higher reliability and minimum maintenance.

The PT refrigerators have two stages. The 1st stage operates at 65 K and the 2nd stage at less than 4.2 K.

### Cryostat orientation

The pulse tube refrigerator must be operated with the cold end down at a vertical offset of no greater than 20 degrees.

### Vibration

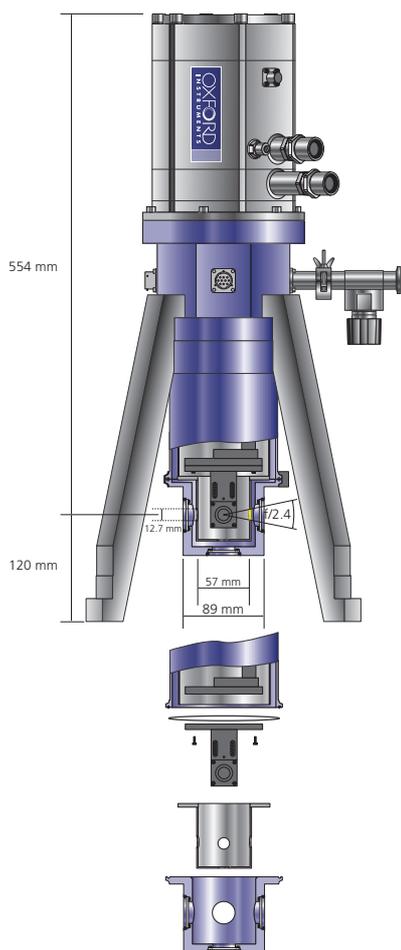
The typical displacement amplitudes on the second stage heat exchanger in the radial and axial directions are typically 7 and 12 micrometers, respectively.

### OptistatAC-V 12

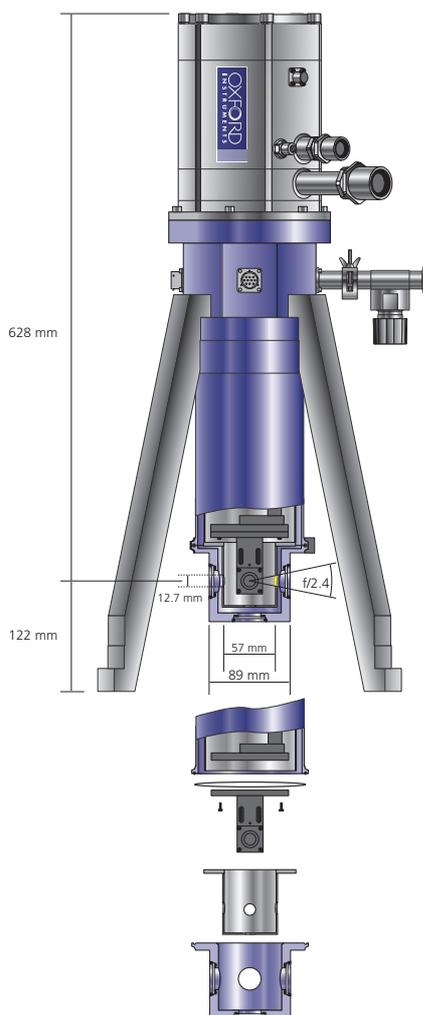
This cryostat has a temperature range of 2.8-325 K and is the most cost effective and smaller PTR cryostat.

### OptistatAC-V 14

This cryostat has the same temperature range (2.8-325 K) as the OptistatAC-V 12 but cools down faster to 4 K (60 minutes as opposed to 90 minutes). This cryostat also has a higher cooling power (0.5 W at 4.2 K).



OptistatAC-V 12



OptistatAC-V 14

## System components

### Cryostat basic components:

OptistatAC-V 01A	ActivelyCooled optical cryostat, based on 1W @ 25K GMR, air cooled compressor
OptistatAC-V 04A	ActivelyCooled optical cryostat, based on 0.5W @ 10K GMR, air cooled compressor
OptistatAC-V 12A	ActivelyCooled optical cryostat, based on 0.25W @ 4K PTR, air cooled compressor
OptistatAC-V 14A	ActivelyCooled optical cryostat, based on 0.5W @ 4K PTR, air cooled compressor
OptistatAC-V 01W	ActivelyCooled optical cryostat, based on 1W @ 25K GMR, water cooled compressor
OptistatAC-V 04W	ActivelyCooled optical cryostat, based on 0.5W @ 10K GMR, water cooled compressor
OptistatAC-V 12W	ActivelyCooled optical cryostat, based on 0.25W @ 4K PTR, water cooled compressor
OptistatAC-V 14W	ActivelyCooled optical cryostat, based on 0.5W @ 4K PTR, water cooled compressor

### Sample holders options

OSHACV	Optical sample holder
RSHACV	Resistivity sample holder

### Window options

OQO	Spec B window
OWO	Spec WF window
OZQO	Z-cut Quartz window .
OSO	Sapphire window
OMO	Mylar window
OKO	KRS5 window
OCO	Calcium fluoride window
OZO	Zinc Selenide window

Blanks will be fitted to ports which are not fitted with windows. Orientation of windows should be specified at time of order.

### Temperature controller options

ITC 503	Temperature controller (Upgradable to 3 channels, RS232 and GPIB computer interface)
CC1	3m cryostat cable- 10 pin connector.

### Options

HVP	High vacuum pumping station ( to pump the Outer vacuum can)
HMB	Horizontal mounting bracket (OptistatACV 01 and 04 models only)
VMB	Vertical mounting bracket (OptistatACV 01 and 04 models only)

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Specifications	OptistatAC-V 01	OptistatAC-V 04	OptistatAC-V 12	OptistatAC-V 14
Cooling technology	GMR	GMR	PTR	PTR
Temperature range(K)	22-325	9-325	2.8-325	2.8-325
Temperature stability(K)	+/- 0.3	+/- 0.3	+/- 0.15	+/- 0.15
Typical cool down time(min)	20 to 77K	60 to 10K	90 to 4K	60 to 4K
Typical cooling power in Watts	1W@25K 2W@30K 11W @77K	0.5W@10K 2W@20K 1W@12K 4W@50K	0.25W@4.2K 10W@65K	0.5W@4.2K 25W@65K
f number(with standard windows)	1.1	1.5	2.4	2.4
Compressor adsorber service interval (hr)	10,000	10,000	>20,000	>20,000
Power consumption(kW) Air cooled compressor	1.2	1.5	3.5	5.3
Power consumption(kW) Water cooled compressor	1.0	1.25	3.3	4.8
Mains power requirements	100*, 115 or 200*, 208/230 VAC, 1 phase, 60 Hz  100 or 200, 220/240* VAC 1 phase, 50 Hz	100*, 115 or 200*, 208/230 VAC, 1 phase, 60 Hz  100 or 200, 220/240* VAC 1 phase, 50 Hz	200*, 208/230 VAC 1 phase, 60 Hz  200, 220/240* VAC, 1 phase, 50 Hz	200*, 220/230 or 460 VAC 3 phase, 60 Hz  200/220 or 380/420 VAC 3 phase, 50 Hz
Water flow rate (litres/minute) (water cooled compressor only)	2	2	3	6

\*using a transformer (provided except for the OptistatAC-V 14)



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