



Integral nitrogen reservoir cryostat, sample in exchange gas

The OptistatDN is an integral nitrogen reservoir cryostat providing a controlled low temperature exchange gas environment for samples, designed to operate as an integral part of an optical measurement system. This cryostat is ideal for experiments requiring high sample throughput and for samples which are difficult to cool by conduction.

Components

A typical Optistat DN system consists of:

- Optistat DN cryostat
- Sample Rod
- Sample Holder
- Windows
- ITC temperature controller
- High vacuum pumping system

Optional items:

- Wiring and electrical connections to the sample
- Simple height adjust/rotate sample rod
- Precision height adjust/rotate sample rod
- Liquid cuvette

Features and benefits:

- 77K to 300K temperature range. 500 K option available
- Sample in exchange gas allows quick sample change for high sample throughput
- Superb optical access (f/1) for measurements requiring light collection
- Optimised clear beam throughput (15mm) allows a large illumination area for measurements involving the detection of low intensity light
- Optimised thermal design provides excellent control and stability of the sample temperature
- A wide range of samples holders and rods is available increasing the cryostat flexibility
- A liquid cuvette can be fitted to allow the study of liquid samples
- 15 hours cryogen hold time, before refill is required providing the convenience of a full working day operation
- An extensive range of demountable windows for spectroscopy from near ultraviolet to extreme infrared provides flexibility for current and future applications
- The compact design of the OptistatDN makes it straightforward to integrate with a wide range of spectrometers



An example of application of the OptistatDN

Dr. Ken Haenen and Prof. Jean Manca (Limburg University, Diepenbeek – Belgium) use the Optistat DN in combination with a FTIR spectrometer to perform Fourier Transform Photoconductive Spectroscopy FTSP. FTSP is a highly sensitive photocurrent method for materials with low optical absorption such as conjugated polymer- and CVD-diamond films, which are developed for novel electronic, optoelectronic, and bioelectronic applications.

Mode of operation

The OptistatDN is a top loading, static exchange gas cryostat. The sample is located in a central space surrounded by an exchange gas (typically nitrogen) providing extremely uniform cooling.

Sample cooling is achieved as follows. A liquid nitrogen reservoir surrounds the upper part of the central sample tube and supplies liquid nitrogen via a capillary tube to a heat-exchanger. During operation, the gravity fed flow of liquid is controlled by a valve, in the exhaust line, on the cryostat top plate. In static exchange gas cryostats the circulating cryogen does not come into contact with the sample, a separate exchange gas being present in the sample region. This gas is in good thermal contact with the heat exchanger, thus cooling the sample by conduction through the exchange gas.

A vacuum case surrounds the nitrogen reservoir and heat exchanger. It needs to be pumped to high vacuum (lower than 10^{-4} mbar). An activated charcoal sorb is fitted to the nitrogen reservoir. This continuously pumps the residual gases from the OVC to maintain good thermal isolation.

Changing the sample simply involves removing the sample rod maintaining overpressure of exchange gas, replacing the sample and inserting the rod back into the cryostat. There is no need to break the insulating vacuum and warm the cryostat up. The resulting sample change times are very short, typically few minutes.

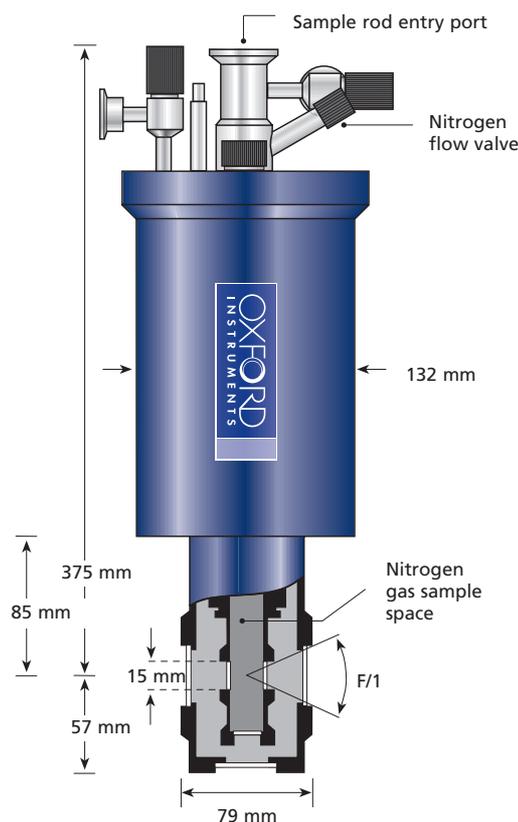
High temperature option

A 500 K option is available, however in that case the inner window must be sapphire sealed with a copper gasket. This must be specified at time of order.

Optical access:

The Optistat DN has an excellent optical access (f/1). The large acceptance angle makes it ideal for light collection measurements (for example in luminescence and Raman studies). The large clear access (15mm diameter in transmission) is important for small signal measurements that benefit from a large illumination area (for example in FTIR and UV/ visible absorption spectroscopy).

Up to five sets of windows can be provided (four radial; one axial). Each set includes two windows (radiation shield and outer case windows). 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 ultra violet to extreme infrared. We can also provide 'wedge' (non-parallel faces) windows and anti-reflection coatings, to limit the reflection of windows.



Optistat DN cryostat

Automated operation

Oxford Instruments Object Bench software included with the ITC temperature controller provides the opportunity to automate data acquisition. The PC based software takes measurements from any independent instrument (with computer interface) at different user defined temperatures. This is an ideal configuration for routine measurement programmes.

Electrical access

For electrical measurements, wires may be terminated at pins above the sample holder and/or on wired coax connectors. This provides maximum flexibility for different experimental configurations. Please contact us to discuss particular requirements.



Wiring to the sample holder

Other configurations

Please contact us to discuss options to meet specific experimental configurations that may not be satisfied by our standard options. For instance, a special 49mm diameter sample space OptistatDN can be supplied on request.

Wide range of options for sample holders:

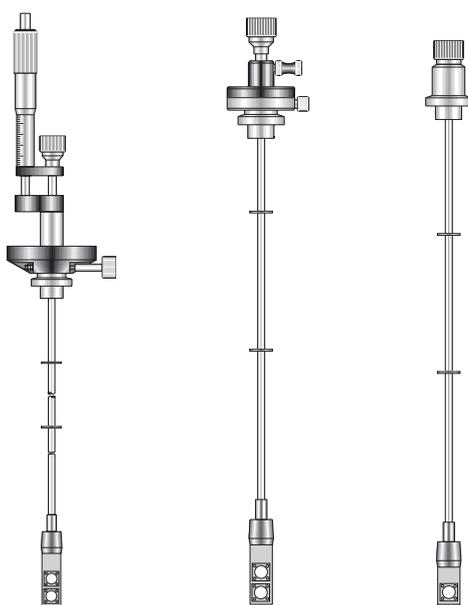
If your experiment requires a precise position of your sample, there are two sample rod options.

The *simple height adjust and rotate sample rod* provides sliding adjustment with locking screws to hold a fixed position. The range of vertical motion is 32 mm. Positioning accuracy is 0.5 mm (height) and 1 °(rotation).

The *precision height and adjust rotate sample rod* provides height adjust with a resolution of 10 µm and a goniometer for setting the rotation angle with a resolution of 12 minutes.

Both sample rods are supplied fitted with a double sample holder making it ideal for reference measurements.

The OptistatDN also enables experiments on liquid samples. In that case the sample is placed in a quartz cuvette which is in turn placed inside a cell holder, directly screwed onto the bottom of the sample rod.



Precision height adjust and rotate sample rod

Simple height adjust and rotate sample rod

Standard sample rod

System components

Cryostat basic components:

OPTIDN	OptistatDN, static, 20 mm sample space.
SR	Sample rod
SH3	Optical sample holder
or SH1	Plain sample holder

High temperature option:

OPTIDNHT	OptistatDN, static, 20mm sample space, 500 K option
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Sample holder and rod options:

SH7	Cuvette holder
CV	Quartz cuvette
OPTIHTR	Simple height adjust/rotate
OPTIHTRPS	Precision height adjust/rotate

Window options:

O(QI QO)	Spec B window set
O(WI WO)	Spec WF window set
O(ZQI ZQO)	Z-cut Quartz window set.
O(HI QO)	500K sapphire / Spec B window set
O(MI MO)	Mylar window set
O(AI AO)	Aluminised Mylar window set
O(PI PO)	Polythene window set
O(KI KO)	KRS5 window set
O(ZI ZO)	Zinc selenide window set
O(PPI PPO)	Polypropylene window set

Notes: A set comprises one radiation shield and one outer window. Windows are quoted 'per set'. Blanks will be fitted to ports which are not fitted with windows. Orientation of window sets should be specified at time of order.

Electrical connections:

LX10	Wired 10 pin seal
CX1	Wired miniature coax connector

Temperature controller options:

ITC 601PT	Temperature controller (One channel, RS232 Computer interface)
ITC 503	Temperature controller (Upgradable to 3 channels, RS232 and GPIB computer interface)
CC1	3m cryostat cable- 10 pin connector.

Pumps:

HVP	High vacuum pumping station (to pump the Outer vacuum can)
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Other options:

SKDN	Spares kit (Orings, clamps ...)
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Specifications

Maximum sample space available	20 mm diameter
Sample holder dimensions (mm)	19 mm wide x 30 mm long (Optical sample holder version has a 15 mm aperture)
Temperature range (K)	77-300 K 500 K as an option
Temperature stability (K)	+/- 0.1 K (measured over 10 min period)
Cool down from ambient to 77 K(mins)	20 ; (25min for 500 K option).
Liquid nitrogen capacity (L)	1.2
Hold time at 77 K (hours)	>= 15
Sample change time (mins)	5
Cryostat weight (kg)	5

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