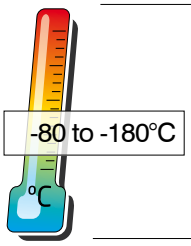

Cryostat
Model 459

- Extreme Low Temperature Calibration
- High Stability

When we considered low temperature comparison calibration, we had to take into account Health and Safety considerations, both of the liquids used in compressors to generate low temperatures and also the liquids used in the calibration volume itself. The cost of chillers increases considerably for very low temperatures. We concluded that using chillers for very low temperatures was expensive, unsafe and unreliable.

Our solution is a simple heated metal block design using a single, safe surrounding liquid, liquid nitrogen.

An apparatus immersed in liquid nitrogen will cool to approximately -195°C. Our design, using a controller and heater, permits the cryostat to be set at any temperature above liquid nitrogen temperature.

The Cryostat comprises an insulated machined copper equalizing block inside an 80mm diameter tube 480mm long, attached via a flange to a lid giving access for three thermometers, a vacuum port and a Lemo connector for the temperature sensor and heater. A cable runs to a controller which sets the temperature. An RS422 connector permits the calibration to be automated using one of our Software programs.

Evaluation

The most used range for the Isotech Cryostat is between -80°C to -180°C. This temperature range is selected because Oxygen condenses at -186°C and if this is then accidentally boiled off it can cause a health and safety issue. The performance of the Cryostat actually improves as the temperature is lowered because the temperature difference between Cryostat and it's surrounding liquid nitrogen is smaller. The measurements were made with two model 670 thermometers.

Method

The Cryostat is connected to a vacuum pump. It is pumped for five minutes and then sealed. The Cryostat is connected to the controller, switched on to check the connections. The Cryostat is then lowered into the container of liquid nitrogen, which should come between 25mm and 75mm below the flange. Three thermometer tubes exit the Cryostat and have nylon compression fittings. The standard PRT and unknown thermometers to be calibrated are lowered into the wells and the nylon fittings are hand tightened until the nylon grips the thermometer without damage. The controller is set to the required temperature and the Cryostat left to stabilize before comparison readings are made.

Optional Container for Cryostat

Model	459
Cryostat Temperature:	-80°C to -180°C
Absolute Stability (over 30 minutes)	±0.005°C at -80°C ±0.0015°C at -150°C
(as measured by one of the 670 thermometers in the bottom of one of the pockets of the cryostat)	
Homogeneity pocket to pocket	±0.005°C
Vertical Profile (over bottom 50mm)	±0.005°C at -80°C ±0.01°C at -150°C
Immersion Depth	560mm
Neck Diameter	120mm
Compatibility	Liquid Nitrogen Containers
Nitrogen Capacity	35 litres

How to Order
459 Cryostat

Accessories
459-01-01 Hand Vacuum Pump
459-01-02 Electric Vacuum Pump
459-01-03 35 Litre Cryostat Container
459-01-04 25 Litre Container for topping up