



Universal Temperature Control System for Materials Analysis

- High precision turn key temperature control system
- Dedicated sample cell for dielectric and impedance spectroscopy included
- Designed for easy, safe and fully automatic operation
- Wide temperature range: -160°C to $+400^{\circ}\text{C}$
- 0.01°C stability due to 4 channel Quattro controller featuring PID control algorithms with non-linear extensions
- Includes 4 channel controller QUATRO, stabilized power supplies, cryostat with sample cell, gas heating, liquid nitrogen cooling system, vacuum system

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Quattro Cryosystem

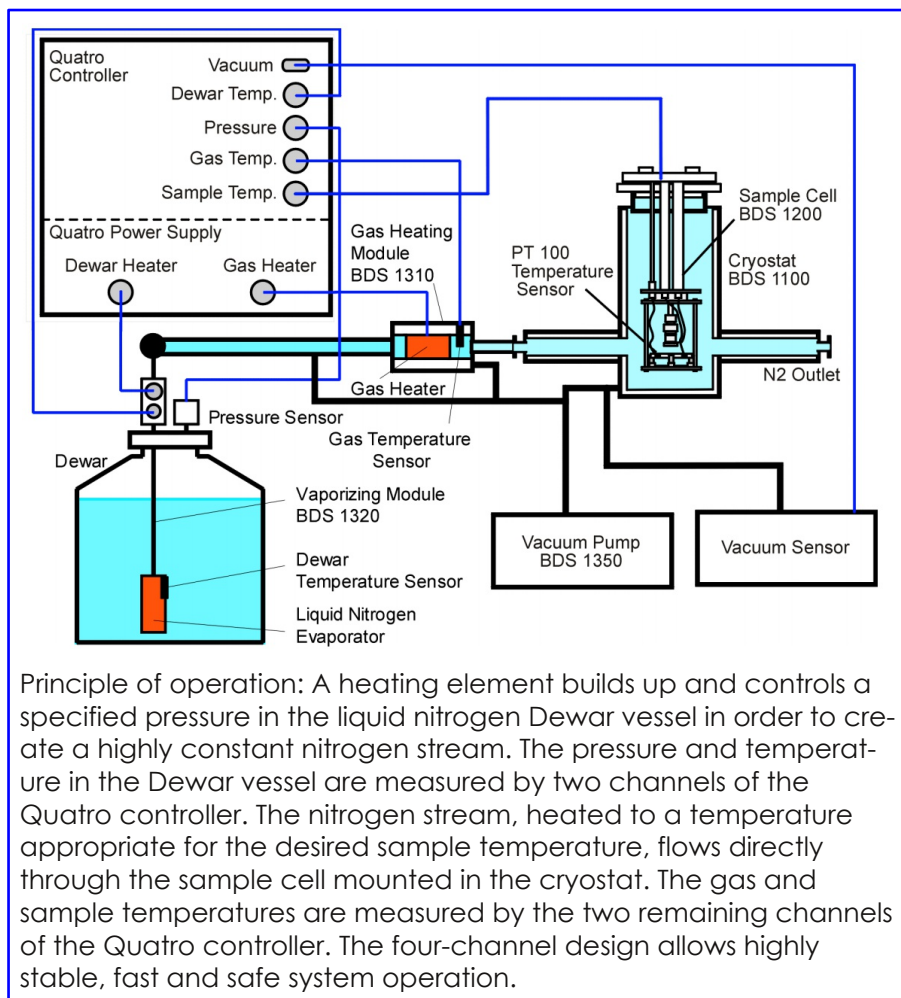
Cryosystem

The Quatro Cryosystem is a high quality turn key temperature control system for applications in materials research. A sample cell particularly suited for dielectric and impedance spectroscopy is included. The system has been developed to set or change the temperature of the sample under test with high accuracy and reproducibility. The system is modular and may be combined with any Novocontrol dielectric or impedance analyzer.

The Quatro Cryosystem is designed to provide easy, safe and fully automatic operation, enabling computer-controlled long time experiments over several days without supervision.

Applications

Temperature control extends the versatility of dielectric and impedance spectroscopy and increases the significance of the obtained results. Various key materials properties, e.g., molecular relaxations, conductivity, phase separation, phase transitions, activation energy, glass temperature, rate of blending, purity, ageing, curing, either show marked temperature dependence or are only accessible through temperature-dependent measurements.



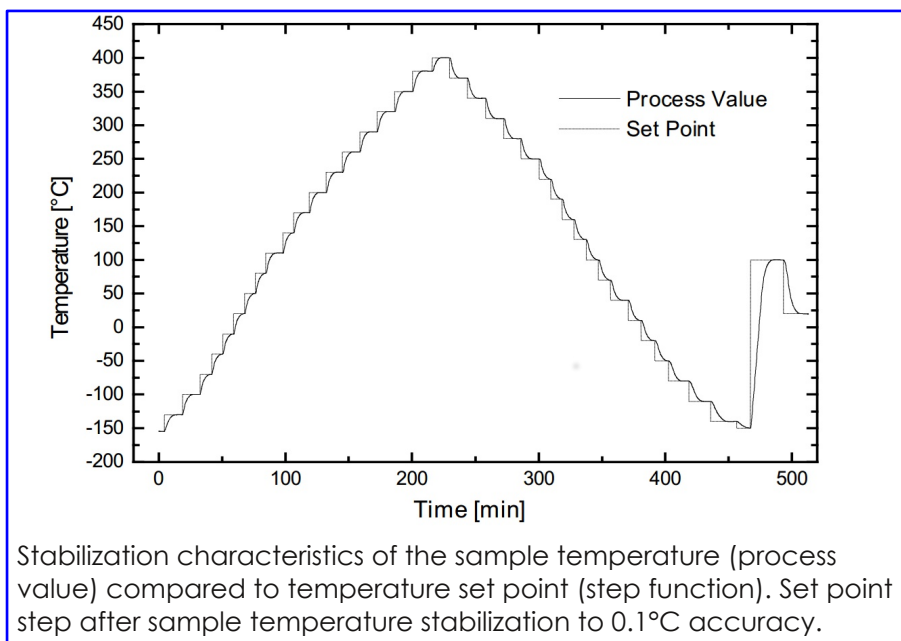
Principle of operation: A heating element builds up and controls a specified pressure in the liquid nitrogen Dewar vessel in order to create a highly constant nitrogen stream. The pressure and temperature in the Dewar vessel are measured by two channels of the Quatro controller. The nitrogen stream, heated to a temperature appropriate for the desired sample temperature, flows directly through the sample cell mounted in the cryostat. The gas and sample temperatures are measured by the two remaining channels of the Quatro controller. The four-channel design allows highly stable, fast and safe system operation.

Purge Gas Option

An economical way to operate the QUATRO system without liquid nitrogen is provided by the purge gas option. The temperature range in this mode is limited to 25 °C ... 400 °C.

Features

- high precision turn key temperature control system
- temperature range -160°C to 400°C
- temperature ramps from 0.01°C/min to 20°C/min
- 0.01°C temperature stability
- temperature overshooting after set point step typically < 0.2°C
- stabilization times typically below 8 minutes (for 0.1°C stability)
- low nitrogen consumption due to automatic pressure - temperature adaptation
- automatic adaptation of controller parameters (selftune)
- 4 channel microprocessor controller with 24 bit ADC and IEC communication port
- vacuum-isolated cryostat and nitrogen lines



Stabilization characteristics of the sample temperature (process value) compared to temperature set point (step function). Set point step after sample temperature stabilization to 0.1°C accuracy.