Low-Cost Cryogenic Temperature Controller for the Autosorb iQ

This amazingly powerful and affordable cryocooling accessory allows users of Autosorb iQ analyzers to smoothly synchronize the generation of precise sorption analyses at liquid argon temperature (87 K), while using less expensive liquid nitrogen (77 K) as the cryogen, with the newest IUPAC recommendations (Thommes et al., Pure Appl. Chem. 87(9-10), 1051-1069 (2015)).

Features:

- The CryoSync® Cryocooler uses liquid nitrogen (77 K) to generate user-programmable liquid argon temperature (87 K) with excellent precision.
- A standard cell with the sample to be analyzed is placed on a thermostatic block whose temperature is accurately controlled by warming a heat sink immersed in liquid nitrogen.
- The CryoSync® Cryocooler is capable of maintaining excellent temperature stability in the thermostatic block, with a standard deviation better than ± 0.005 K for a minimum of 50 hours.
- Although the CryoSync® Cryocooler can work without a PC, it is supplied with Windows-compatible software that allows temperature monitoring and recording in real time.
- The CryoSync® Cryocooler, developed by Quantachrome Instruments (patent pending), provides a very cost-effective and convenient way to meet the latest IUPAC recommendations for argon-87K-based micropore analyses.

Summary of Features:

- Performs analyses at liquid argon temperature (87 K) using less expensive liquid N₂ (77 K).
- Temperature stability better than ± 0.005 K (std. dev.).
- Analysis duration greater than 50 hours.
- Simple and affordable alternative to much costlier cryostatic compressor devices.
- Menu-driven, easy-to-use software allows the user to collect, display, analyze, and archive data.
- Each data point can be acquired and saved to the data file during analyses in progress.
- Multiple instruments can be controlled by a single computer.
- USB interface between instrument and PC allows remote access to all functions and data.
- Universal accessory, easily adapts to any commercial gas sorption analyzer able to accept an external temperature control option.
- Ideally suited to synchronize the need for liquid-argon-free analyses with IUPAC-recommended high resolution micropore analyses using argon gas at liquid argon temperature (87 K).
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Benefits:
- **Promotes New IUPAC Recommendations:** Argon adsorption at 87 K is now recommended by IUPAC for micropore analysis (Thommes et al., Pure Appl. Chem. 87 (9-10), 1051-1069 (2015)), because of nitrogen’s quadrupole moment and diffusional limitations at 77 K.
- **Produces Improved Results:** The CryoSync® Cryocooler technology, developed by Quantachrome Instruments (patent pending), improves data quality by ensuring a very highly precise and constant temperature and, therefore, constant Po (as opposed to having to measure Po changes continuously) throughout entire analyses.
- **Provides Universal Applicability:** An independent Control Box and a complementary CryoTemp Monitor software enable standalone operation of the CryoSync® Cryocooler accessory.
- **Represents Cost-Effective Alternative:** Much more economical than routinely using liquid argon or expensive cryostatic compressors.

Physical Specifications:
- **Dimensions:**
  - Height 12” (30 cm).
  - Width 4” (10 cm).
  - Depth 4” (10 cm).
- **Weight:**
  - 5.0 pounds (2.3 kg).
- **Electrical:**
  - 100-240 volts, 50-60 hertz, 30 W (max.), grounded connection.
- **Ambient:**
  - 15-35 °C operating range, 20-90% relative humidity.

Technical Specifications:
- **Temperature Range:**
  - 82-115 K nominal with standard liquid N₂ supply.
- **Temperature Stability:**
  - better than ± 0.005 K (std. dev.).
- **Sample Cells:**
  - One per Argon Cryocooler accessory.
- **Analysis Duration:**
  - +50 hours without Dewar refilling.

![CryoSync® system components.](image1)

![CryoSync® controller front and back.](image2)