

autosorb 6iSA[®]

surface area & pore size analyzer



Features & Specifications



The **autosorb[®] 6iSA** Automatic Surface Area and Pore Size Analyzer is a fully automated, vacuum volumetric, gas sorption system. This is a high-throughput cost-effective system that tests up to six samples simultaneously.

The **autosorb[®] 6iSA** has several significant features and enhancements over the **Autosorb[®] 6B**:

- CFR 21 Part 11 Software that supports pharmaceutical industry regulatory compliance (see below).
- Improved communications and functional capabilities.
- Windows[®] 64 bit compatible software with superior data reduction options.
- Flexibility to be either bench mounted or cart mounted.
- Access to state-of-the-art statistical mechanics methods of pore size analysis (DFT, GCMC).

QUOTE TEXT
autosorb 6iSA

SECURE SYSTEM FOR PHARMACEUTICAL INDUSTRY SUPPORT CFR 21 PART 11

The software for the **autosorb[®] 6iSA** supports requirements for 21 CFR Part 11 compliance in the pharmaceutical industry. It is designed to meet the regulatory requirements for electronic records as set forth by the US Food Drug Administration (FDA). New compliant supportive software (ASWin-CFR) allows for secure operation of the instrument, data acquisition and report generation.

Included amongst the new functionalities are:

- Tamper resistant data files.
 - Fully detailed audit trail integrated into data files.
 - Required login with unique user name/password combination.
 - Accessibility level programmable by system administrator.
 - Automatic user account expiration.
 - Programmable session time-out (auto log off).
 - Three user levels and privilege levels.
 - Unique report identification, and a host of other features to support full compliance.
 - Tamper resistant binary encoded files.
- In addition, the ASWin software is fully 64 bit compatible to work with most recent Windows[®] versions.



Data Analysis

Adsorption / Desorption Isotherms

User-selectable number of data points at any desired target pressures. Adsorption data points may be selected independently of desorption data points.

Surface Area Methods

BET Surface Area

Single point, multi-point, slope, intercept, "C" constant, correlation coefficient, tabular and graphic format.

Langmuir Area

Multi-point, slope, intercept, correlation coefficient, tabular and graphic format.

DR (Dubinin-Radushkevich) Micro Pore Area

Slope, Intercept, correlation coefficient, average pore size, micropore volume, average adsorption energy, tabular and graphic format.

Statistical Thickness (t-plot)

de Boer, Halsey and Carbon Black models.

t-Method

Micropore area, mesopore area, micropore volume, correlation coefficient, tabular and graphic format.

Pore Volume Methods

Total Pore Volume: By the Gurvitsch rule, at user-selectable P/P_0 .

Average Pore Size

Using cylindrical pore geometry – Radius, diameter.

Surface Roughness Methods

FHH (Frenkel-Halsey-Hill) and NK (Neimark-Kiselev): Fractal dimension evaluated at user-selectable self similarity ranges, excluding or including adsorbate surface tension effects (FHH method), in tabular and graphical format.

Classical Methods for Pore Size Distribution Analysis

Mesopore Size Distribution Methods

BJH (Barrett-Joyner-Halenda) and DH (Dollimore-Heal): By volume and area, from adsorption and desorption isotherm branches, cumulative and differential, linear and logarithmic, interpolated, in tabular and graphical format.

Micropore Size Distribution Methods

HK (Horvath-Kawazoe), SF (Saito-Foley), DA (Dubinin-Astakhov), MP (Modelless Pore): Differential pore volume distributions from adsorption isotherm branches and model-specific parameters, in tabular and graphical format.

Statistical Mechanics-Based Methods for Pore Size Analysis

DFT (Density Functional Theory) via Non-Local Approximation (NLDFT) and Quenched-Solid Method (QSDFT), and molecular dynamics-based GCMC (Grand-Canonical Monte Carlo simulation), including the largest library of statistical mechanics-based models available (see List of Available Statistical Mechanics-Based Methods).



Data Reporting Capabilities

Database Functionality

Build and maintain database of all analysis files, searchable by sample i.d., description, operator (user), "comment" or date range.

Isotherms

User-selectable number of data points at any desired target pressures adsorption data points may be selected independently of desorption data points.

BET Surface Area

Single point, multi-point, slope, intercept, "C" constant, correlation coefficient, tabular and graphic format.

Langmuir Surface Area

Multi-point, slope, intercept, correlation coefficient, tabular, and graphic format.

BJH Pore Size Distribution

Volume, area, adsorption, desorption, cumulative, derivative (linear and logarithmic), interpolated, tabular and graphic format.

Dollimore-Heal Pore Size Distribution

Mesopore volume, area, adsorption, desorption, cumulative, derivative (linear and logarithmic), tabular and graphic format.

Dubinin-Radushkevich Micro Pore Area

Slope, intercept, correlation coefficient, average pore size, micropore volume, average adsorption energy, tabular and graphic format.

Total Pore Volume

At user-selectable P/P₀.

Average Pore Size

Radius, diameter.

Statistical Thickness (t-plot)

de Boer, Halsey or Carbon Black models.

t-Method

Micropore area, mesopore area, micropore volume, correlation coefficient, tabular and graphic format.

Micropore Size Distribution

DFT (Density Functional Theory), GCMC (Grand Canonical Monte Carlo), HK (Horvath-Kawazoe), SF (Saito-Foley), DA (Dubinin-Astakhov), MP method; tabular and graphic format.

NLDFT-Methods

N₂ at 77K on carbon (slit pore, equilibrium model).

N₂ at 77K on carbon (cylindrical pore, equilibrium model).

N₂ at 77K on carbon (slit & cylindrical pores, equilibrium model).

Ar at 77K on carbon (slit pore, equilibrium model).

Ar at 87K on carbon (slit pore, equilibrium model).

Ar at 87K on carbon (cylindrical pore, equilibrium model).

CO₂ at 273K on carbon (slit pore, equilibrium model).

N₂ at 77K on silica (cylindrical pore, equilibrium model).

N₂ at 77K on silica (cylindrical pore, adsorption branch model).

N₂ at 77K on silica (cylindrical and spherical pores, adsorption branch model).

Ar at 87K on zeolites/silica (spherical/cylindrical pore, equilibrium model).

Ar at 87K on zeolites/silica (spherical/cylindrical pore, adsorption branch model).

Ar at 87K on zeolites/silica (cylindrical pore, equilibrium model).

Ar at 87K on zeolites/silica (cylindrical pore, adsorption branch model).

GCMC-method

CO₂, 273K / carbon (slit-pore model).

Fractal Dimension

Neimark-Kiselev (NK), Frenkel-Halsey-Hill (FHH).

QUOTE TEXT
autosorb 6iSA



Data Reporting Capabilities / Tech Notes

QSDFT- method

N₂, carbon adsorption branch kernel at 77K based on a cylindrical pore model.

N₂, carbon equilibrium branch kernel at 77K based on a cylindrical pore model.

N₂, carbon equilibrium transition kernel at 77K based on a slit-pore model .

N₂, carbon equilibrium transition kernel at 77K based on a slit-pore model (pore diameter <2nm) and a cylindrical pore model (pore diameter > 2 nm).

N₂, carbon adsorption branch kernel at 77K based on a slit-pore model (pore diameter < 2 nm) and cylindrical pore model (pore diameter > 2 nm).

N₂, carbon adsorption branch kernel at 77K based on a cylindrical pore model (pore diameter < 5 nm) and spherical pore model (pore diameter > 5 nm).

N₂, carbon adsorption branch kernel at 77K based on a slit-pore model (pore diameter <2 nm) and a cylindrical pore model (pore diameter 2-5 nm) and spherical pore model (pore diameter > 5 nm).

Ar, carbon equilibrium transition kernel at 87K based on a slit-pore model.

Ar, carbon adsorption branch kernel at 87K based on a cylindrical pore model.

Ar, carbon equilibrium transition kernel at 87K based on a cylindrical pore model.

Ar, carbon adsorption branch kernel at 87K based on a cylindrical pore model (pore diameter < 5 nm) and spherical pore model (pore diameter > 5 nm).

QUOTE TEXT
autosorb 6iSA

Tech Notes

#32 Practical Methods to Prevent Sample Elutriation in Vacuum Volumetric Gas Sorption Analyzers.

#35 Micropore Size Analysis of Porous Carbons Using CO₂ Adsorption at 273.15K (0°C).

#36 Comments on the Proper Selection of Adsorption or Desorption Branches for Mesopore Size Analysis (Gas Sorption).

#52 Adsorptives for Physisorption Experiments: Selection and Their Physical Properties.

#54 Automated Software Assistant for the Proper Calculation of BET Area of Micro-Porous Materials.



Specifications / Physical

Analysis Specifications

Six analysis stations, each consisting of sample cell, P_o cell, sample pressure transducer and coolant level sensor.

Transducer Accuracy:

0.11% full scale (1000 torr transducer).

A/D Converter:

22-bit (1 part in 4,190,000).

Sensitivity:

< 2 x 10⁻⁸ moles adsorbed/ desorbed gas.

Ultimate Vacuum:

3x10⁻³ torr achieved by dedicated 2-stage rotary, direct drive pump.

Adsorbates:

Nitrogen and any other non-corrosive gas with appropriate coolant.

Surface Area Range:

0.01m²/g to no known upper limit.

Pore Volume (liquid):

≥1 x10⁻⁶ ml/g.

Pore Volume (STP):

≥5 x10⁻⁵ cc/g.

Pore Volume:

Detectable limit less than 0.0001 cc/g.

Pore Size Range:

3.5 to 5000 Å / 0.35 to 500 nm.

Coolant Level:

Controlled to ± 0.5 mm with sensor.

Physical & Utilities

Electrical

100 - 240 VAC, 50/60 Hz.

Environmental

10 - 38°C operating range at 90% maximum relative humidity.

Gases (not supplied)

All gases, adsorbate(s) and helium (if classical He void volume method used), shall be 99.995% purity or higher, and regulated to 8-10 psig (55 – 70k Pa).

Cryogen (not supplied)

Typically liquid nitrogen (though may vary according to specific applications). Initial requirement ~2 liters per station.

Dimensions (WxDxH)

64.8 cm x 73.7 cm x 101.6 cm
(inches: 29.5 x 37.1 x 37.1)

Weight

172.7 kg (380 lb).

Electrical

100 - 240 V, 50 /60 Hz - single phase, regular AC power socket.

Environmental

- Ambient Temperature between 100° C and 45° C.
- Relative Humidity from 10% to 95%.

QUOTE TEXT
autosorb 6iSA



Accessories / Spare Parts

Optional Accessories

Description	P/N
Reference Materials: 0.5, 2, 10, 30, 100, 165, 275 m ² /g (nominal)	Request Details
6mm Small Bulb Cell, Long	74027
6mm Large Bulb Cell, Long, Quartz	74028-1
Sample Cell Rack	96061
Long Stem Glass Funnel for 9mm or 12mm Sample Cell	74146
Foreline Trap Assembly 25KF	75232
Rolling Cart for Autosorb	02070
Uninterruptible Power Supply, 110V, 390WATT, 650VA	30054
Storage Dewar, 5 liter	75121-05
Storage Dewar, 10 liter	75121-10
Storage Dewar, 30 liter	75121-30
Transfer Device for 30L Dewar	75122-30
Trolley for 30 liter Dewar	75123-30
Heating Mantle Assembly, NOVAtouch 350°C	24020-L-JJ-CE-NT
High Temp. Heating Mantle Assembly Ntouch (400°C)	24021-L-JJ-CE-NT

QUOTE TEXT
autosorb 6iSA



Accessories / Spare Parts

Included Accessories

The autosorb 6iSA is supplied with standard accessories at no additional charge (dewars, sample cells, filler rods, o-rings, user manual and other necessary and useful items). For quantities and details click the part number below to view a pertinent list or contact your sales agent for a copy.

PN# [03020](#) or PN# [03020-2](#) (220V)

Required Accessories (not included with the autosorb 6iSA)

Description	P/N:
<p>Gas Regulator - N₂, He, Ar, Kr (0-25 psi) Complete with CGA fitting and isolation valve. To control 8-10 psig output. Suitable for use with N₂, Ar, He, etc.</p> <p>Note: Additional regulator assembly required for classical H_e void volume mode.</p>	01207
<p>Windows[®] PC PC control module/Computer Minimum specifications: 1.6GHz processor, 4GB RAM 500GB hard drive, DVR-drive Microsoft Windows[®] (requires Windows[®] 7 or higher) 20" Monitor, keyboard, mouse, USB ports</p>	38051-15

QUOTE TEXT
autosorb 6iSA



Accessories / Spare Parts

Recommended Accessories (not included with the **autosorb 6iSA**). Choose one:

If desired for extended analysis throughput, external sample preparation units are available. If you do not own a Quantachrome degasser unit, please talk to your sales representative to help choose a preparation unit to best suit your needs.

Description	PN#:
<p>MasterPrep™ Degasser*</p> <p>Six Station System for Flow or Vacuum Degassing. Temperature control and logging via PC software (included).</p> <p>Temperature: Programmable Digital Control, Ambient to 425°C. Individually adjustable for each station.</p> <p>Evacuation Rates: User-selectable. Back-fill Gas: User-selectable. Vacuum Display: Digital display. Flow Rate: 0 to 100 cc/minute, individually adjustable for each station.</p>	<p>02132-110-1 (100-120V operation) or 02132-220-1 (220-240V operation)</p>
<p>FloVac™ Degasser*</p> <p>Six Station System for Flow or Vacuum Degassing. PC Temperature Control Software included.</p> <p>Temperature: Digital Control, Ambient to 400°C in 1°C steps. Evacuation Rates: User-selectable. Back-fill Gas: Any dry, non-corrosive gas. Vacuum Display: Digital display. Flow Rate: 0 to 100 cc/minute.</p>	<p>02128-110-1 (100-120V operation) or 02128-220-1 (220-240V operation)</p>
<p>XeriPrep™ Degasser</p> <p>Six vacuum degassing stations, each consisting of sample cell port, heating mantle, independent temperature control, and isolation valve. PC control of all heating zones with individual heating ramps and times (software is included but PC is not).</p> <p>Temperature: 350°C standard, 450°C optional. Evacuation Rates: Fine, Medium & Coarse. Back-fill Gas: User preference-typically nitrogen. Cold Trap: Long duration 2L dewar (included).</p>	<p>02092-1</p>
<p>XeriPrep™-Turbo</p> <p>Includes all standard XeriPrep components, plus a turbomolecular pump to provide the enhanced vacuum capabilities required to address the most challenging micropore analyses.</p>	<p>02092-TP-1</p>

* vacuum pump not included.

QUOTE TEXT
autosorb 6iSA