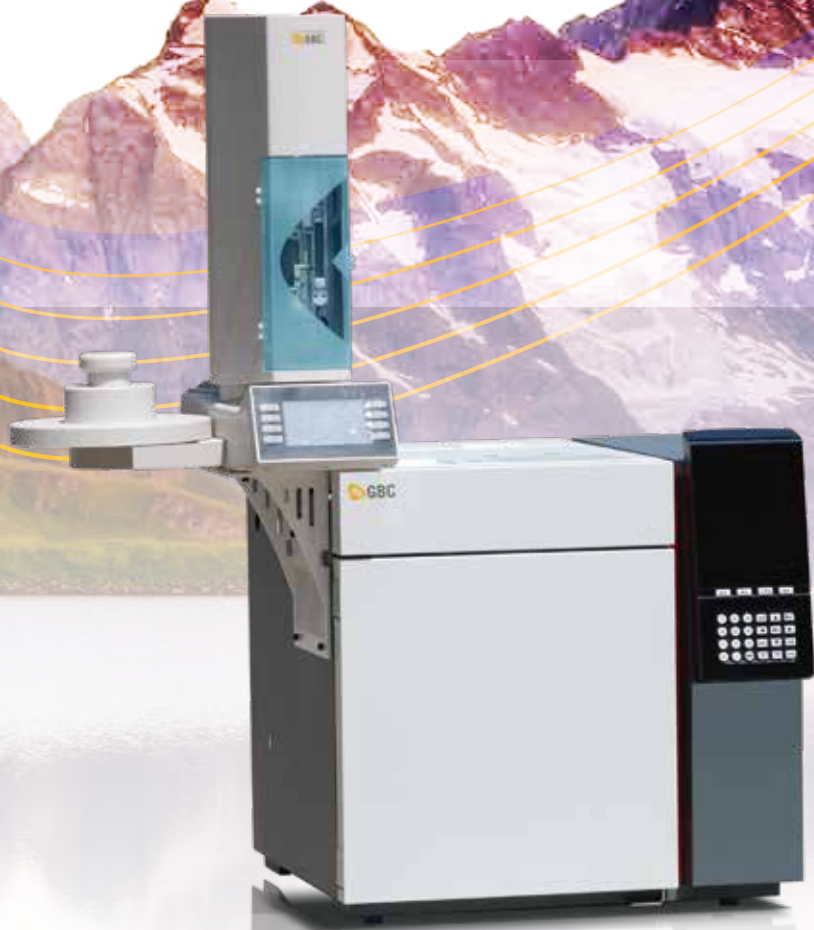


Nebula Series

Gas Chromatograph



GC





ISO 9001
Quality Accreditation

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The GBC Quality Management System has been accredited to the ISO 9001 quality standard by Lloyd's Register Quality Assurance Limited. This certification is your assurance that the procedures and processes used to produce the goods and services which GBC provides comply with the relevant International Standard, and demonstrates commitment to meeting the needs and expectations of our customers.

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GBC's Product lines



Visionary Technology

GBC Scientific Equipment will advance people's knowledge and their capacity to enhance the quality of life for all humankind.



Nebula Series

Gas Chromatograph



Introduction

The Nebula Series is the latest generation of gas chromatographs which can be fully controlled by software. It uses EPCs (electronic pressure controllers) to control six gas channels, including carrier gas, combustion gas, auxiliary combustion gas, split and makeup gas among others. The number of gas channels can be extended if needed. The temperatures of detectors and the column oven are controlled using a PID based intelligent control system.

Features

High Automation and High Efficiency

The Nebula Series functions, such as temperature control, ignition, baseline adjustment, sensitivity adjustment, polarity selection, or bridge temperature control, are automatically controlled by

computer. Gas flow and pressure are precisely controlled by EPC. The operation of the Nebula Series is simple and user friendly. Because of the significant decrease in analysis time, analysis is faster and more efficient.

The Nebula Series has numerous self diagnosis and alarm functions. The instrument diagnoses issues at startup and also during analysis. There are alarms for absence of gas supply and for over heating. The Nebula Series has self protection and is easy to trouble shoot. With options such as six way valve sampling, automatic back flushing, precutting equipment, and septum purge, the Nebula Series satisfies various analysis needs.

A 10 segment programmable temperature control along with automated control of the column oven back door allows for fast and fully automated analysis under any temperature conditions, thereby increasing productivity and efficiency.

Easy Operation

A user friendly interface for simple and convenient operation.

A large screen LCD displays temperature and operating conditions in real time in a convenient and intuitive control panel.

Analysis conditions can be set not only by the onboard control panel, but also by the flexible workstation software.

Online help system provides users with ease of operation and troubleshooting features.

High Precision

- Peak area and retention time have excellent repeatability.
- Detectors with high sensitivity, and low noise with low base line rise.
- The instrument can control the temperatures of up to eight individual instrument components such as column oven, injection chamber, TCD, FID, etc. The column oven temperature is precisely controlled to provide a constant temperature environment for efficient sample separation components.

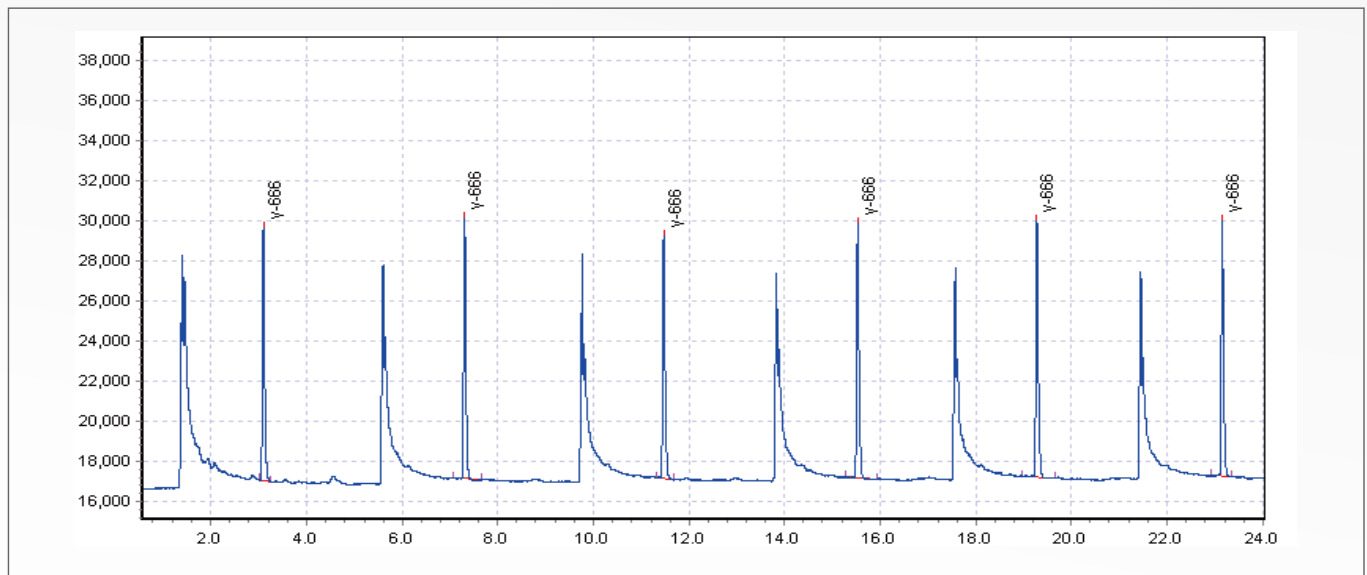
Flexibility and Extensibility

- Three detectors, three injection ports and three columns can be installed simultaneously in various configurations.
- Three gas channels along with three signal outputs can be installed together.
- The column oven has a large capacity and can hold up to three glass packed columns, stainless steel packed columns, or capillary columns at one time.

- The sampling method is flexible; methods include capillary split/splitless sampling, packed column sampling, and cold column head sampling .
- Other options include an auto sampler and six way valve injection system.
- The Nebula Series system includes automatic back flushing, automatic switching of carrier gases, septum purge and fully automated analysis in one injection.
- The Nebula Series can be equipped with accessories such as methane converters, pyrolyzers, thermal desorption equipment, or purge and trap analyzers.
- A unique trap pipe design at the split outlet protects the EPC and maintains a clean environment in the lab.
- The channel connected to the Mass Spectrometer can be reserved on the Nebula Series according to the user's requirement.
- The Nebula Series can provide an optimal analysis solution to meet the requirements of a wide range of application fields.

Excellent Repeatability

- Using a capillary column with an ECD detector and split injection, the RSD is not more than 2.60% (n=6, γ -666) for 6 continuous injections.



Improved Features

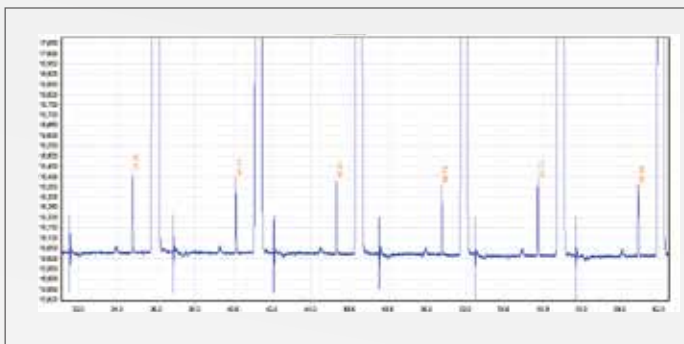
Improvement of Gas Control

- Up to six gas channels can be controlled by EPC. More gas channels can be extended to be EPC controlled according to user requirement.

EPC Specifications			
Pressure Range	0.05 - 0.3 MPa	Flow Repeatability	±0.5% F-s
Withstand Pressure	0.45 MPa	Flow Accuracy	±1% F-s
Pressure Repeatability	±0.15% F-s	Flow Linearity	±1% F-s
Pressure Accuracy	±1% F-s	Response Time	1 - 4 Sec
Pressure Linearity	±1% F-s		

TCD Improvement

- The dead volume has been reduced. The stability time has been shortened. Can now be used with capillary columns.
- Components are now antioxidant. The filament is heated by a constant average temperature bridge power supply, which increases detector sensitivity while improving lifetime.
- Using the TCD detector with a capillary column in split injection mode to analyze benzene in toluene results in a RSD of less than 2.50% for 6 continuous injections, as well as peaks with a small FWHM.



Improvement of the ECD

- The volume of the micro ECD cell has been reduced, resulting in a stable baseline. Capillary columns can now be used with the ECD.
- Sensitivity has been increased significantly. The detection limit now reaches 2×10^{-14} g/mL (γ -666).



Newly Designed Micro ECD

Wide Range of Accessories

The Nebula series can be equipped with additional accessories such as auto samplers, capillary split/splitless injectors, methane converters, thermal desorption equipment, purge and trap analyzer, etc.

Workstation Software

The workstation interface is simple yet powerful. Features include multi-channel independent sampling, and the ability to process up to 30 chromatogram files simultaneously. Parameters of collected chromatograms can be customized. Chromatogram processing tools are diverse and comprehensive. The data processing functions are intuitive, convenient and easy to use. Function features include baseline background reduction, complete control of instrument operation and customizable analysis report templates. The workstation can also be connected with various auto samplers.

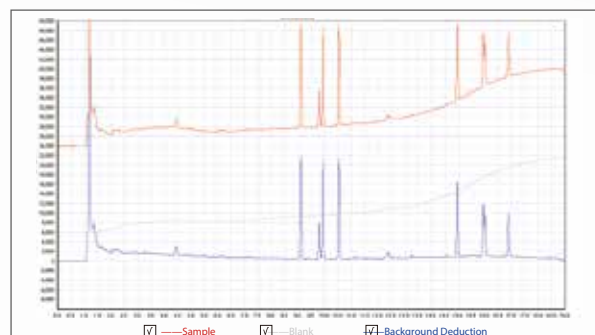
Workstation Specifications

Sampling Precision	0.1 μ V/s	Range	-1.000 - 1.000 V
Number of Detectable Peaks	2000	Maximum Chromatogram Storage	20 h
Analysis Precision (Linearity)	0.2%	Maximum Sampling Rate	100 samples per second

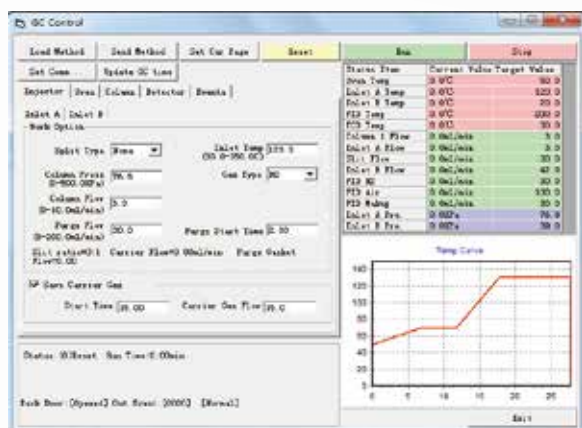
The workstation can control and operate the instrument, set and change the analysis parameters and set the chromatogram background reduction.

Baseline Background Reduction Feature

The following chromatogram demonstrates the baseline background reduction feature for a temperature program controlled analysis of an organic chlorine pesticide.

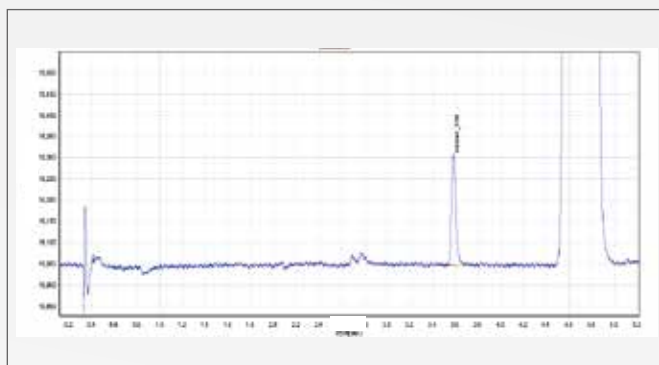


Workstation Control Interface

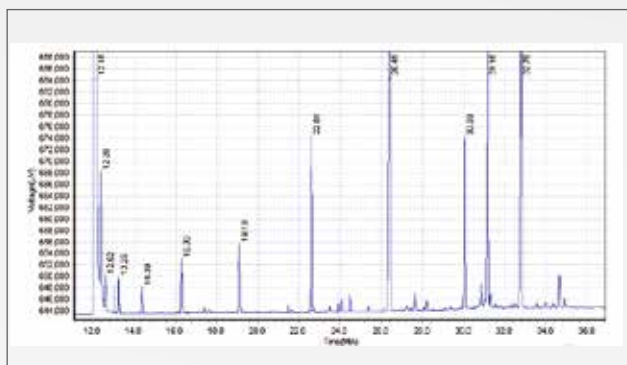


Applications

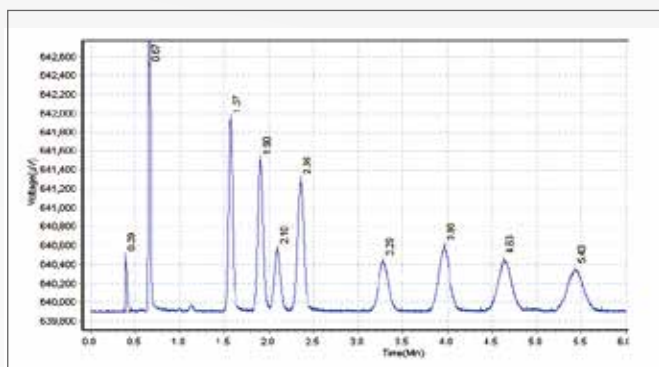
- Analysis of benzene in toluene with a capillary column using a TCD.



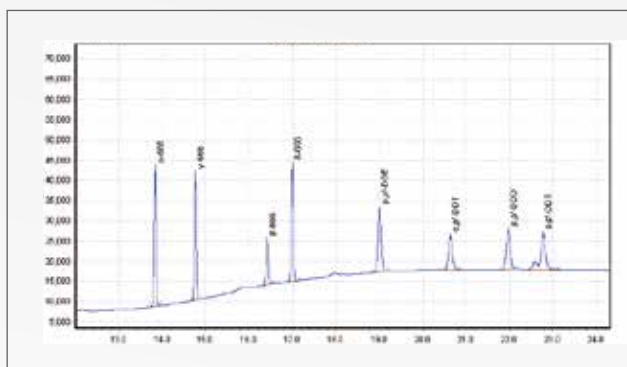
- Analysis of fatty acids in milk with a temperature program controlled capillary column using a FID.



- Analysis of an organic phosphorus pesticide with a capillary column using a FPD.



- Analysis of an organic chloride pesticide with a temperature program controlled capillary column using an ECD.



Technical Specifications

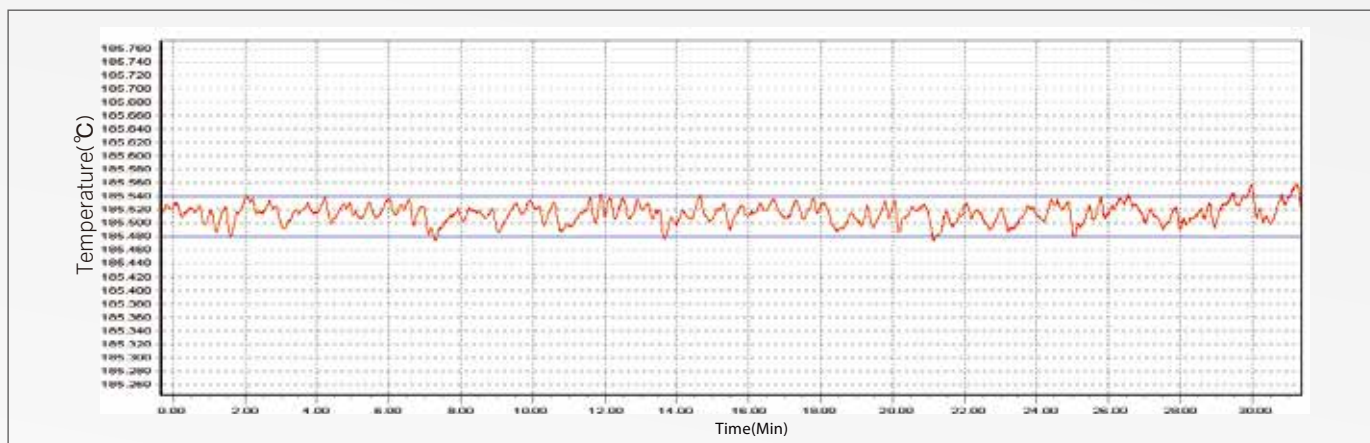
Detectors

	TCD	FID	ECD	FPD
Sensitivity	$S \geq 10000 \text{ mV} \cdot \text{mL}/\text{mg}$ (benzene)			
Detection Limit		$Dt \leq 8.0 \times 10^{-12} \text{ g/s}$ (n-hexadecane)	$Dt \leq 2.0 \times 10^{-14} \text{ g/mL}$ (γ -666)	$Dt(P) \leq 2.0 \times 10^{-12} \text{ g/s}$ $Dt(S) \leq 5.0 \times 10^{-11} \text{ g/s}$ (methyl parathion)
Noise	$\leq 0.050 \text{ mV}$	$\leq 5.0 \times 10^{-14} \text{ A}$	$\leq 5.0 \times 10^{-12} \text{ A}$	$\leq 1.0 \times 10^{-12} \text{ A}$
Drift	$\leq 0.100 \text{ mV}/30\text{min}$	$\leq 3.0 \times 10^{-13} \text{ A}/30\text{min}$	$\leq 1.0 \times 10^{-11} \text{ A}/30\text{min}$	$\leq 3.0 \times 10^{-12} \text{ A}/30\text{min}$
Range of Linearity		10^7	10^4	10^4

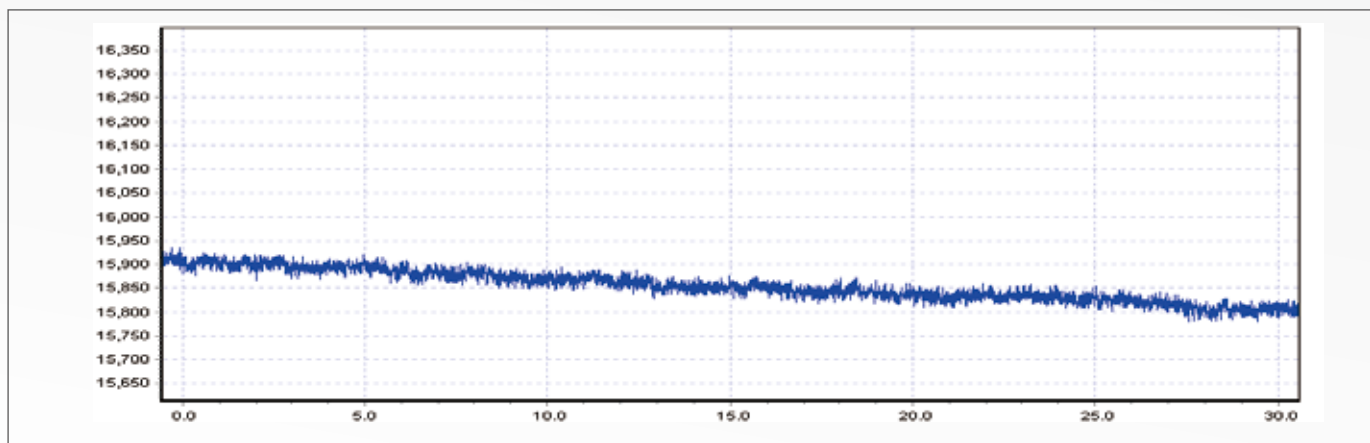
Column Oven

Dimensions	280 mm × 300 mm × 280 mm
Temperature Control Range	Room temperature +10 °C to 400 °C
Overheating Protection	Any temperature less than 400 °C can be set
Temperature Control Precision	±0.030 °C
Temperature Program	Maximum of 10 steps
Temperature Heating Rate	0-40.0 °C/min (0.100 °C/min increments)

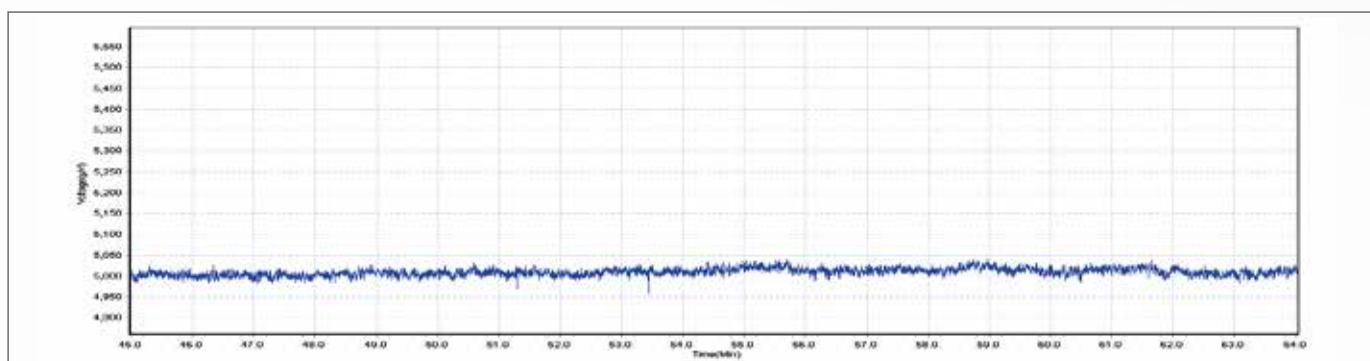
The temperature of the column oven is precisely controlled. The range of temperature fluctuation is within ±0.030 °C.



Stable temperature control ensures a good baseline.



Baseline noise using a HP-5 capillary column with ECD. Temperature of column oven is 190 °C.



Baseline noise using a OV-101 packed column with ECD. Temperature of column oven is 190 °C.

Instruments

The Nebula Series Gas Chromatograph is available in 33 different configurations.

Nebula features:

Detectors include:

flame ionization (FID), thermal conductivity (TCD), micro-electron capture (ECD), flame photometric (FPD) and nitrogen phosphorus (NPD).

Three detectors, three injection ports and three columns can be installed simultaneously.

Six gas channels (can be extended if needed).

Temperature control of up to eight individual instrument components.

Large capacity column oven.

Flexible sampling method.

Each Nebula Gas Chromatograph is supplied with a computer loaded with user-friendly software.

Accessories

Auto Sampler.

Six way valve injection system.

Methane converters.

Pyrolyzers.

Thermal desorption equipment.

Purge and trap analyzers.

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GBC Scientific Equipment
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