

**GOW-MAC<sup>®</sup>**  
INSTRUMENT CO.

# Series 600 Gas Chromatograph

The GOW-MAC<sup>®</sup> Series 600 Gas Chromatograph represents a true combination of analytical instrumentation and computer technology. However, it is the design and implementation of this technology that makes the Series 600 GC a unique instrument. In addition to an enhanced computer interface and ability to utilize eight different detectors, the Series 600 GC has been engineered for efficiency — from its modest “footprint” on the researcher’s lab bench, to its utilization of GOW-MAC’s patented detector technology, to its modular functionality.

## Performance Excellence

The Series 600 Gas Chromatograph may be used in either isothermal or temperature programmable modes. In either mode, instrument operation is fast and easy with the 8 line EZ-view LCD display and touch keypad. The keypad allows for easy movement through the program menus. At the touch of a button, one can bring up the instrument’s status, history of use, create and store methods, or edit GC operating parameters. Each temperature programmable method accommodates up to 10 ramps and provides for the selection of column oven conditions: initial time and temperature, rate, and final time and temperature (450 °C max).

Temperature circuits are continuously monitored and recalibrated once every second. The history of the column oven and its use is recorded every hour and stored in battery backed up memory. A separate engineer’s record provides recalibration and service functions. The GC accommodates electronics and gas controls for two complete chromatographic channels with dual simultaneous outputs.

- ♦ Programming rate: 0.1 °C to 40 °C/min in 0.1 °C increments
- ♦ Fast oven cooling: 300 °C to 50 °C in 5 minutes
- ♦ Method Storage: 10 methods with individual security codes
- ♦ Real time chromatograms displayed on LCD



The oven has a front opening door for easy access to a maximum of three columns. Dynamic air flow eliminates temperature gradients across the oven. An overheat protection circuit prevents thermal runaways caused by spiking or surging line current.

## Single Board Computer

A multi-layered, single-board computer provides the intelligence for the Series 600 Gas Chromatograph. The functions of date, time, serial interface, display and keypad interface are controlled by the on-board computer. To enhance instrument diagnostics, each detector has its own PCB mounted into a single mother board, allowing for easy diagnostics.

## Temperature Control

The Series 600 can be operated at temperatures from ambient plus 5 °C to 450 °C. Operating temperatures are independently programmed and controlled at six locations: up to three injection ports, a maximum of two detectors, and the column oven. The software allows for additional zones to be added for interfacing with additional aftermarket accessories.

## Pneumatic Controls

Direct acting, precision, independent flow controls for carrier and detector gases are standard. All controllers are easily accessible. They are located on the front panel of the GC under a see-through door to prevent accidental changes of preset values. Gas flows are registered on corresponding gauges.

### *Electronic Pressure Programming (EPP)*

The optional Pressure Programmer enables capillary column performance to be improved with faster sample throughput, improved sensitivity and allows gentler treatment of columns.

### *Pressure Programs*

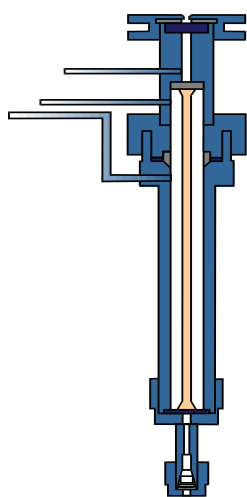
Initial isobaric with dwell time plus 5 ramps; each ramp consists of a rate, a target upper pressure, and dwell time

## Interfacing

The Series 600 Gas Chromatograph interfaces with the user through a simple keypad and a 256 x 128 element EZ-view liquid crystal display. The display is backlit for ease of viewing at virtually any angle and can be adjusted for different lighting conditions. The keypad consists of eight soft keys. Three keys are dedicated to specific functions. Five keys are programmed with varying functions and are used to request the operation or section of the program required. Control of the GC is based on a menu system consisting of a series of pages. Each page in the menu is responsible for controlling a particular aspect of the chromatograph. The simple touch of a button brings the user into immediate control of the GC — real time chromatograms, editing features, method development and setup, etc.

## Injection Methods

The Series 600 Gas Chromatograph supports up to three independently controlled injection modules to maximize efficiency, accuracy, and reproducibility. Injection methods supported include:



### **Capillary Column Injection**

#### *Direct Capillary*

- Accommodates columns with 0.32, 0.45, 0.53, or 0.75 mm i.d. and lengths of up to 100 meters

#### *Split/Splitless*

- Enhanced design with graphite ferrule seal and low flow septum purge reduces background noise and solvent peak tailing while minimizing sample contact with metal surfaces which lessens the possibility of thermal breakdown

- Built-in septum purge with needle valve control for variable split ratio setting
- Operates in either Split/Splitless, or Direct On Column injection modes
- Accommodates capillary columns from 0.02 mm to 0.75 mm inner diameter

## Packed Column Injection

- Ideal for routine analysis
- Dual or single column system, though 3 columns can be installed simultaneously
- Select either 1/8" (standard) or 1/4" metal, or 2 - 3 mm outer diameter glass columns
- Direct sample injection to widebore capillary columns

## Gas and Liquid Sample Valves

GOW-MAC's Engineering Department will design a custom flow system for the Series 600 GC using 4-, 6-, 8-, or 10-port valves. The GC accommodates virtually any configuration for optimum separation and precise quantification. Valves can be either heated or unheated, purged, made of corrosion resistant materials, or manual or pneumatic actuated.

## Satellite Sampling Devices

The Series 600 GC has been designed to accept most commercially available aftermarket autosamplers, purge & trap samplers, and cryo samplers.

## Data Handling

The Series 600 GC is compatible with the powerful Clarity® PC chromatography software package, as well as most commercially available chromatography data handling software packages interfacing with a PC. Using Clarity®, a chromatographer can create methods, design custom reports, view calibration curves, acquire and process data, and create and run batch sequences from a single window. Clarity requires either Windows® XP Pro (SP3), Vista®, or 7®. The GC provides one RS-323 serial port, one RS-422/RS-485 serial port, and one parallel port for interfacing to modems, plotters, and various other devices.



## Detectors

The Series 600 GC can handle the application — environmental, petrochemical, pharmaceutical, food & flavor, solvent, or industrial chemical. The GC will accommodate up to two independently temperature controlled detectors that can be operated either independently, in series, or in parallel modes.

### Thermal Conductivity Detector (TCD)

Types:	
Capillary	20 µl internal volume
Packed or Wide bore capillary	140 µl internal volume
Gas density	780 µl internal volume
Design:	Flow through
Filaments:	Single helix: tungsten (W), rhenium-tungsten (WX), gold-sheathed tungsten (AuW), nickel (Ni)
Operating Temperature	50 °C to 450 °C
Response Time	< 0.5 seconds
Sensitivity	2 x 10 <sup>-9</sup> g/mL for hydrocarbons
Linear Range	> 10 <sup>4</sup>

### Flame Ionization Detector (FID)

Operating Temperature	100 °C to 300 °C
Sensitivity	20 ppb of CH <sub>4</sub>
Linear Range	1 x 10 <sup>6</sup>

### Nitrogen/Phosphorus Detector (NPD)

Operating temperature	50- 400 °C
Sensitivity	N: < 0.4 pg N/sec for azobenzene P: < 0.05 pg P/sec for malathion
Linear Range	N: > 10 <sup>4</sup> P: > 10 <sup>3</sup>
Selectivity	N: 25,000 gN/gC P: 250,000 gP/gC

### Flame Photometric Detector (FPD)

Operates with double or single flame	
Filters	Sulfur (380 nm) Phosphorous (526 nm)
Temperature Range	ambient to 300 °C
Phosphorus Mode:	
Sensitivity	0.9 pg P/sec for DDVP
Linear Range	10 <sup>4</sup>
Selectivity	10 <sup>6</sup> gP/gC
Sulfur Mode:	
Sensitivity	20 pg S/sec for thiophene
Linear Range	10 <sup>3</sup>
Selectivity	10 <sup>5</sup> gS/gC

Detector	Average Detection Limit	Carrier Gas	Selective for:
TCD	30 ppm	Helium, UHP Nitrogen, UHP Hydrogen, UHP	Organic chemicals; universal response; non-destructive
FID	200 ppb	Hydrogen, UHP Nitrogen, UHP	Organic analysis
PID	1 ppb	Helium, UHP	Aromatics, Arsenic, Sulfur, Phosphorous
FPD	50 ppb	Helium, UHP Hydrogen, UHP Nitrogen, UHP	Sulfur, Phosphorous compounds
NPD	10 ppb	Helium	Sulfur, Phosphorous, Nitrogen, Arsenic
ADD	<100 ppb N <sub>2</sub>	Argon UHP	Universal response; non-radioactive; concentration dependent. Ideal for trace analysis in Argon matrix gas

Detector options subject to continuing R & D development. Ask your GOW-MAC representative for further details.

### Argon Discharge Detector (ADD)

Operating Temperature	Ambient
Carrier Gas	99.9999 argon UHP
Sensitivity	H <sub>2</sub> < 20 ppb N <sub>2</sub> < 100 ppb O <sub>2</sub> < 100 ppb CH <sub>4</sub> < 50 ppb CO < 500 ppb CO <sub>2</sub> < 1 ppm
Linear Range	> 10 <sup>3</sup>

### Photo Ionization Detector (PID)\*

Detection Limit	1 x 10 <sup>12</sup> g (benzene)
Max. Op Temp	
Xe and Kr Lamps	400 °C
H <sub>2</sub> lamps	250 °C
Sensitivity	0.3 coulombs/g (benzene)
Linear Range	> 10 <sup>5</sup> (benzene)
Background Current**	10 <sup>-11</sup> - 8 x 10 <sup>-11</sup> amps
Ionization Chamber Vol	40 µl
Polarizing Voltage	10 to 100 V

\* Carrier gas flow rate 20 mL/min., PID Temp 150 °C, Kr/MgF<sub>2</sub> lamp

\*\* Depends upon lamp type: Kr, Xe, or H<sub>2</sub>



## Specifications

### User Interface and Microprocessor

Touch Keypad	Liquid Crystal Display (LCD)
Viewing Area	132.0 mm W x 39.0 mm H
Viewing Angle	6:00
Backlight	Cold cathode Fluorescent Lamp (CFL) x 1
Microprocessor	CPU: 33 Mhz 80386SX
Processing Ability	32-bit
Serial Ports	One serial RS-232 port, one serial RS-422/RS-485 port. Ports can be configured as COM1, COM2, or disabled individually.

### Column Oven

Temperature Range	Ambient +5 °C to 450 °C
Temperature Readout	Digital, LCD
Temperature Control	
Accuracy	± 1% of rated, ± 1% of setting
Stability	< ± 0.05°C/hr after 30 minute warm-up
Temp. Variation Coefficient	± 0.01 °C/°C
Overheat Protection	Preset 30 °C above max. column setting
Column Compatibility	
Capillary	0.32 - 1.0 mm o.d. and lengths up to 100 meters
Metal	2 mm, 3 mm, 1/8" o.d., 1/4" and lengths up to 16 meters
Glass	6 mm o.d. and length up to 6 meters
Dimensions	8.625" W x 11.250" H x 12.250" D (219 x 286 x 311 mm)

### Temperature Programming

Temperature Setting	1 °C steps
Programming Rate	0.1 °C to 40 °C/min in 0.1 °C increments
Linear Temperature Profile	40 °C/min. up to 200 °C 15 °C/min. from 200 °C to 300 °C 7 °C/min. from 350 °C to 450 °C
Oven Cooling Time	300 °C to 50 °C in 5 minutes
Maximum Run Time	655 minutes
Number of Ramps	10 with initial time, programming rate and final time
Method Storage	10 methods with security PIN codes

### Injection Ports

Mainframe will accommodate up to two independently temperature controlled injection modules. An extended option is available for three.

<i>Direct Packed/Capillary</i>	Operating temperature: ambient plus 5 °C to 450 °C in 1 °C increments
	Accepts 1/8", 1/4" o.d. or capillary columns from 0.02 to 0.75 mm i.d.
	Dual carrier gas inlets with septum purge injection
<i>Split/Splitless Capillary</i>	Operating Temperature: ambient plus 5 °C to 450 °C in 1 °C increments
	Modes: Split, Splitless, direct on column
	Built in septum purge with needle valve control
	Graphite ferrule seal with low flow septum purge

### Flow Control Pneumatics

Differential Flow Controllers	
Column Inlet Pressure Range	0 - 100 psi (0 - 7 bar)
Flow Control Accuracy	0.3% of set pressure

### External Event Relays and Heated Zones

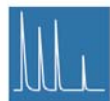
# of Events	6
# of Zones	5

### General Specifications

Power Requirements	110/220/240 V, 50/60 Hz
Weight	57 lbs (25.85 Kg)
Dimensions	22.50" W x 20.00" H x 22.00" D (57.15 x 50.80 x 55.88 cm)

### Ordering Information

Call GOW-MAC or your local representative to discuss the details of your particular application.



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