

## Various Application

5 kinds of sample injectors and all conventional detectors can be attachable depending on samples for analysis. In particular, for analysis of environmental samples (water quality, air, soil and wastes) satisfactory outcome can be achieved by connecting a sample preparation system such as the Purge & Trap.



## Features of the GC650

- Automatic flow control and ignition of the FID-flame
- Auto-start of chromatogram when sample is injected
- Gas save function (Capillary Injector)
- TCD maximum current control based on the type of gas
- Optional valves (solenoid, 2-position) control function
- Automatic notification of power-off

## Intelligent Pneumatic Control (IPC)

- Full automatic flow control of IPC
- Pressure range: 0–100psi (resolution: 0.01psi)
- Flow range: 0–500mL/min (resolution: 0.01mL/min)
- Split ratio up to 5000:1

## Inlet System

: Excellent accuracy, reproducibility

### Packed Inlet

- 1/4" ,1/8" Glass-lined Metal Liner are available
- On-Column injection method (direct injection of sample into column) is available using 1/4" Glass Column
- 0.53mm ID Capillary Column can be used

### Capillary Inlet

- High resolution, prompt analysis time and most typical inlet system
- Split and Splitless mode can be selectable



## Auto Injector/Sampler

- Dual inlet injection capability
- Variable injection/syringe fill rates
- Methods linking
- Multiple solvent/waste bottles
- Syringe range 5 $\mu$ L–250 $\mu$ L
- Air gapping capability
- Multiple tray options: 120 vials, 1.8mL; 220 vials, 0.8mL; 60 vials, 10mL

## Gas Sampling Valve

- Two Valves can be controlled by Air Actuation
- Full automation system is built along with the automatic Run/Stop function



## Detectors

: High selectivity and sensitivity

### FID (Flame Ionization Detector)

- Improved sensitivity into 19mCoulomb/g Carbon
- Easy to disassemble and assemble detector
- Minimization of sample degeneration as well as jet pollution by means of inert quartz jet
- Auto ignition of hydrogen flame
- Use as TID by replacing a collector and bead



### TCD (Thermal Conductivity Detector)

- High detection reproducibility by excellent temperature stability
- Supplying static current to 4 Rhenium–Tungsten filaments and selecting the optimal reactivity by changing the filament current by 2mA according to detector temperature.



## TID (Thermionic Ionization Detector); NPD

Selective reaction to phosphorous or nitrogen compounds like organic phosphorous pesticides

TID Bead Current Auto Optimization: Automatic ignition as the optimal current supplied by sensing the bead condition of alkali Rb Salt.

The induction of nitrogen/phosphorous is more 10<sup>4</sup> times than that of carbon



## PDD (Pulsed Discharge Detector)

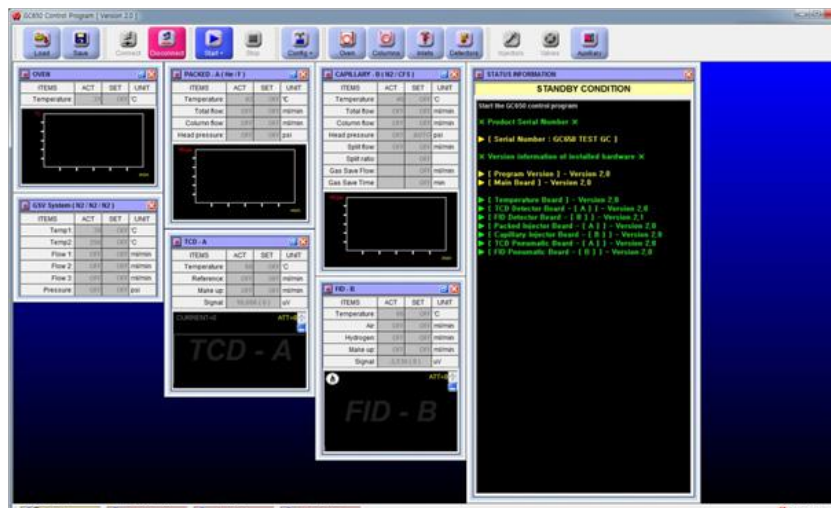
ECD Mode: Analysis of organic chloric pesticides; MDQ-Pico (10<sup>-12</sup> g) of Femto (10<sup>-15</sup> g)

HID Mode: Non-destructive Detector; Noble gas analysis/ FID substitute

PDPID Mode



## GC650 Control Program



## Easy and Excellent Control

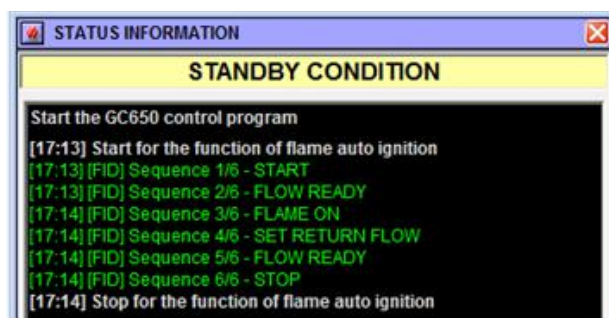
- Exact flow/pressure control by IPC (Intelligent Pneumatic Control)
- Auto ignition of FID flame
- Auto control of TCD current
- Auto start function as sample injection (Better reproducibility)
- Check for GC operation by STATUS INFORMATION window
- Auto repeat analysis function
- Can Control 2–Position Valves (2ea) and Solenoid Valves (6ea)
- Gas save function

## Safety Function

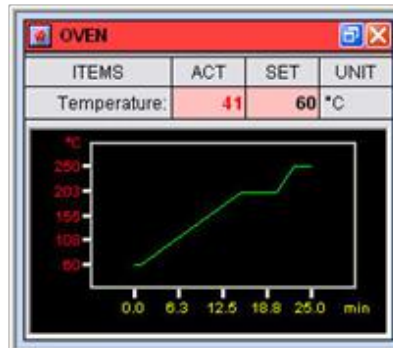
- In case of FID flame off, auto off for Air/H<sub>2</sub>/ Make–up gas flow (available from next version)
- TCD Filament protect function: Current off when the Carrier/Reference Gas does not flow (available from next version)
- Automatic notification of power–off: It informs turning off the GC safely by one clicking of the disconnect button
- Auto shutdown function when some problem happen by each device

## Status Information Window

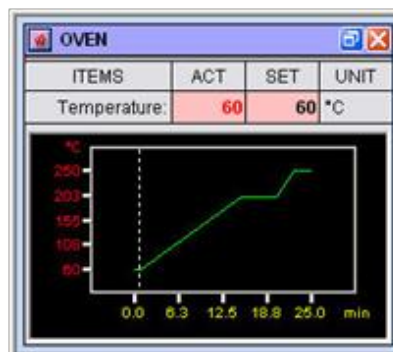
- Checking Analysis Progress
- Confirming Serial Number and Hardware Version
- Confirming Error Message



## Temperature Status



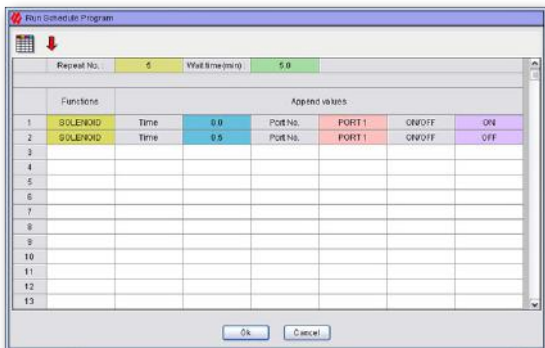
Not Ready : Red



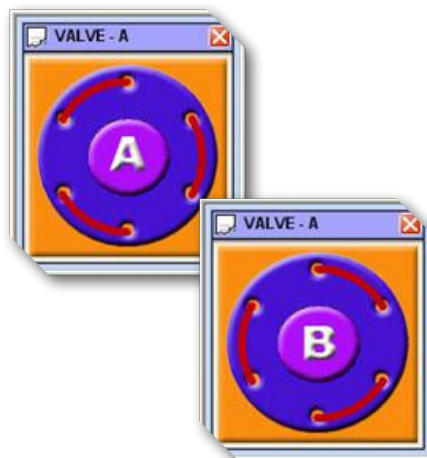
Ready : Blue

## Schedule Program

Control Solenoid Valves and 2-Position Valves  
Auto Repeat Analysis



Repeat No.	5	Wait time (min)	9.0	Applied valves			
Function	Time	Ports	ON/OFF	ON	OFF		
1	SOLENOID	Time	0.0	PORT1	ON/OFF	ON	
2	SOLENOID	Time	0.5	PORT1	ON/OFF	OFF	
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							



## Corbra Liquid Auto Sampler

### Features

- Direct Syringe Injection
- Variable Injection Rates
- Variable Syringe Fill Rates
- Dual Inlet Injection Capability
- Syringe Range 5uL–250uL
- Multiple Tray Option: 120 vials, 1.8mL; 220 vials, 0.8mL; 60 vials, 10mL
- Uses Off-the Shelf Syringes



### EST Cobra Auto Sampler

The Cobra liquid auto sampler, an entirely new sampling system designed and built to automate any GC. If you are looking for a sampling system to replace an older, less reliable auto sampler, the Cobra L/S is the logical choice. The flexibility of the Cobra L/S also allows customization for special applications. State-of-the-art component technology with easy-to-use operating features make the Cobra L/S suitable for routine as well as research level sampling requirements.

# Headspace Auto Sampler



## Markelov HS9000

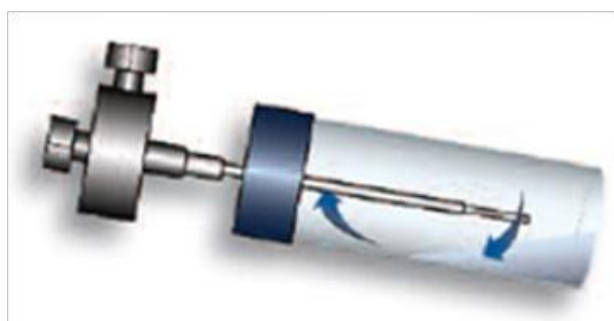
The HS9000 utilizes a closed sample introduction system. Unlike syringe injection systems, the loss of headspace vapor during the injection process due to vapor pressure changes is never a concern. In addition to the sensitivity benefits of the Dynamic Headspace technology, the HS9000 delivers the added flexibility of performing traditional fixed loop injections and time-based injections incorporated within a single system. Whether your preference is to make a highly reproducible timed injection to minimize the number of sample pathway components, a known/fixed volume loop injection or a concentrated injection for improved sensitivity, the HS9000 is the right instrument for you.

## Productivity

Horizontal rotary evaporation cuts equilibration times by 80%

High-capacity 90-position sample carousel

Automatic leak and integrity check



Patented Dual Needle Dynamic Headspace

## Features

**Static Loop Injection**—A fixed volume loop available in various sizes is filled with the headspace vapor to inject a known volume of sample into the GC.

**Static Time-Based Injection (Pressure Balanced)**

The headspace vapor is directed to the GC for a programmed period of time.

**Dynamic Headspace Trap Injection** —The headspace vapor is continually displaced from the sample vial and collected on an adsorbent trap for a concentrated injection.

## GC650 Specifications

Column Oven	
Inner volume	16.25 liter (250mm W* 260mm D*250mm H)
Temperature Range	Ambient to 400°C
Linear Programming Rate	Max: 120°C/min up to 400°C (0.1°C increment)
Heating Rate	About 2.3 minutes 50°C to 300°C
Cooling Rate	About 6 minutes 300°C to 50°C
Run Time	Automatically computed to 999.9 minutes by 0.1 minute increments
Temp. Programming	30 Step
Pneumatics (IPC Module)	
IPC pressure range	0 to 100psi
IPC flow range	0 to 450mL/min
Pressure resolution	0.01psi
Flow resolution	0.01mL/min
Support IPC Channels	Up to 20, for inlets, detectors or auxiliary gases (including pressure channel)
Pressure/flow programming steps	up to 5 steps
EPC control	Inlets and detectors (carrier, split vent, make-up and combustion gases)
Split ratio	up to 5000:1
Detector Modules Flow set range	
FID/NPD make-up	0–100 mL/min
FID air	0–450 mL/min
FID hydrogen	0–100 mL/min
TCD make-up	0–130 mL/min
TCD reference	0–100 mL/min
FPD make-up	0–130 mL/min
FPD air	0–250 mL/min
FPD hydrogen	0–300 mL/min



Inlet Modules Pressure sensor	
Accuracy	± 2% full scale
Repeatability	± 0.05psi
Temp. coefficient	± 0.01psi/°C
Inlet Modules Flow sensor	
Accuracy	± 5% depending on carrier gas
Repeatability	± 0.35% of set point
Temp. coefficient	± 0.20mL/min normalized temp. and pressure
Data Acquisition System	
Dynamic range	>2*10 <sup>6</sup>
Sampling Rate	User selectable 10–60Hz per channel
Analog signal voltage ranges	± 10,5,2.5,1.25V
Analog to digital conversion resolution	21 bits at all sampling rates
External event I/O ports	8
Remote	Start, stop control independent
Data Visualization	Up to chromatograms in real time, zoom/unzoom at any time; Scrutinize focused peaks, display baseline; Chromatograms overlap, background subtraction.
Data Management	Data export results as Text files; Dynamic data exchange to Microsoft windows applications; Various data management techniques support the time event programming (17items).
Custom reports	Peak number, retention time, peak name, peak area, peak height, area%, height%, peak start time, theoretical plates, capacity factor, peak resolution, peak asymmetry, regression coefficient value, correlation coefficient value, standard deviation, weight function, relative retention time, calibration equations.
Dimensions, weight and power	
Dimensions	425mm(W)*555mm(D)*450mm(H)
Weight	30Kg
Power	220V, 50/60Hz,2.7kW

Inlet System (Injector)	
Maximum installed Qty.	2
Type	Packed column inlet, Septum purge Packed column Inlet, Capillary Column Inlet, GSV, Auto Gas Sampling System and etc.
Temp. Range	Ambient to 400°C
Packed Inlet	1/4", 1/8" Glass-lined Metal Liner are available.
	On-Column injection method is available using 1/4" Glass Column
	0.53mm ID Capillary Column can be used
Capillary Inlet	High resolution, prompt analysis time and most typical inlet system
	Split and Splitless mode can be selectable
Gas Sampling Valve	4 Valves can be controlled by Air Actuation
	Controlling Multi Position Valve
	Full automation system is built along with the automatic Run/Stop function
Detector	
Thermal Conductivity Detector (TCD)	
Cell	Flow through cell design, 4 Rhenium/tungsten filaments (32/each)
Temp. Range	Ambient to 400°C
Bridge Power Supply	Constant current system (1-400mA)
Filament Protection circuit	Automatically protect from over load and over current
Micro-cell TCD	
Cell	4 coaxial, hot wire cell
Response Time	150milliseconds
Internal Volume	20uL
Column	Ideal for use with capillary columns
Flame Ionization Detector (FID)	
Electrode Voltage	-230V
MDQ	0.700pgC/s for dodecane
Linearity	10 <sup>7</sup>
Sensitivity	>9 mCoulomb/g Carbon (for C <sub>3</sub> H <sub>8</sub> )

Jet Tip	Made by Quartz and supplied with -230V for excellent ion collection
Temp. Range	Ambient to 400°C
Variability	Can be used TID by exchanging the bead and collector
Thermionic Ionization Detector (TID)	
Features	Electrically heated, alkali-impregnated thermionic surface in chemically reactive H <sub>2</sub> -Air environment
Response	N, P specific
Bead Current	Auto Optimization
Thermionic Source	Rigid Rb/Cs/Sr-ceramic surface on Ni-ceramic sublayer
Specificity	at H <sub>2</sub> =3mL/min
	N/C 10 <sup>5</sup> (azobenzene/C) 10gN/gC
	N/P 0.4 (azobenzene/malathion) gN/gP
	P/C 10 <sup>5</sup> (malathion/C <sub>17</sub> ) 10gP/gC
MDQ	10 <sup>-13</sup> gN/sec(azobenzene)
Linearity	10 <sup>5</sup> (nicotine)
Variability	Can be used for FID by exchanging the bead and the collector
Pulsed Discharge Detector(PDD)	
Source	Pulsed DC discharge in He
Sensitivity	10X range: 1.0V/nA
	1X range: 1.0V/nA ± 1%(HID only)
Range	10X: 10nA full-scale
	1X: 100nA full-scale(HID only)
Risetime	10msec
MDQ	Organic compound(Low ppb)
	Permanent gas(Low ppm)
Linearity	10 <sup>5</sup>



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