GC

YL6500
Gas Chromatograph

See the Performance
Feel the Difference

The iDEA makes iDEAL !

YL's 5th-generation GC is starting to be a new powerful leader in a GC market. With strongly enhanced APCs (Advanced Pneumatic Control), installation of three units of inlet and detector for each enables to extend the various GC configurations to perform complex analyses.
YL6500 GC provides substantially reliable and precise data by every single part from the stable inlets to the extremely sensitive detectors as well as the innovative haptic touch pad strengthening user interface with a finger-tip. Moreover, an intuitive chromatography data system with user-friendly interface improves the ease of instrument control and a network (LAN) communication speeds up a data process.

Key Features

View

- **Enlarged haptic color LCD (5.7")** showing all factors at a glance
- Classic and lab-suitable design
- Intuitive and user-friendly view by YL chromatography data system

Verification

- High speed data process by network (**LAN**) communication
- **Enhanced APCs for all modules**
  - Increased precision in gas pressure and flow rate for more reliable results
  - Automatic compensation for temperature & pressure in installation condition
  - Pressure setpoint increment : **0.01 psi** / Pressure stability : **± 0.001 psi** (in constant pressure)
  - 4 column flow control modes: Constant pressure/ Constant flow,
    Programmed pressure (5 steps)/ Programmed flow (5 steps)
  - Shockproof design and stable structure against oven temperature changes
  - Up to six APCs can be installed and up to **18 channels** of APC
- Upgraded column oven
  - Programming ramp/plateaus : **25/26**
  - Thermal stability : ± 0.01°C

Variety

- Maximum no. of inlet / detector installation : **3**
- Various inlets available
  - Capillary Inlet (Split/Splitless Inlet)
  - Packed Inlet
  - On-Column Inlet (Temperature programming up to 5 steps)
- Various detectors with high sensitivity available
  - Flame Ionization Detector (FID)
  - Thermal Conductivity Detector (TCD)
  - Micro-Thermal Conductivity Detector (μTCD)
  - Nitrogen Phosphorus Detector (NPD)
  - Flame Photometric Detector (FPD)
  - Electron Capture Detector (ECD)
  - Pulsed Discharge Detector (PDD)
  - Pulsed Flame Photometric Detector (PFPD)

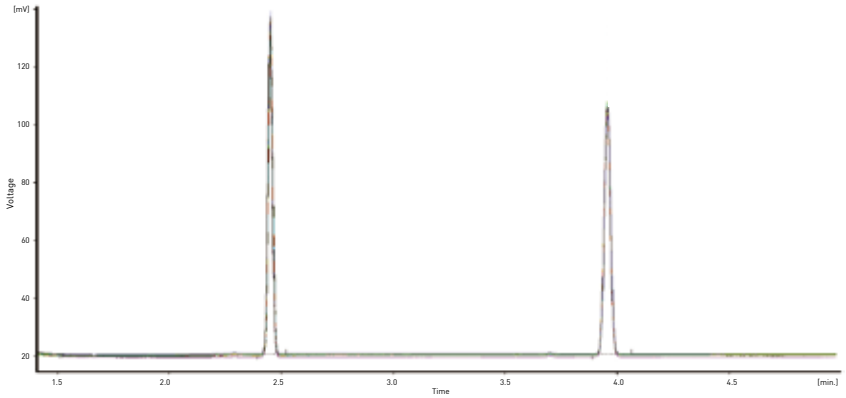
Value

- Saving user's valuable time with a high throughput autosampler
- Improved column conditioning function:
  Automatic set of split flow up to 5ml/min on column conditioning
- Sensitive leak detection (H_2)
- Prevention of oven malfunction (Over heating)
- Automatic stop when an oven door gets opened during operation.

Exceptional Reproducibility

The strongly enhanced APC with increased precision of gas pressure and flow rate assures an accurate result, especially in the reproducibility. The following chromatograms overlaid 11 times of injections verify the superior reproducibility in retention time.

Number of Injection	1	2	3	4	5	6	7	8	9	10	11
RT(min) of Peak 1	2.4541	2.4538	2.4519	2.4531	2.4526	2.4544	2.4531	2.4525	2.4542	2.4531	2.4525
RSD(%)	0.0334										
RT(min) of Peak 2	3.9576	3.9569	3.9565	3.9579	3.9559	3.957	3.9572	3.9555	3.9582	3.9571	3.9576
RSD(%)	0.0207										

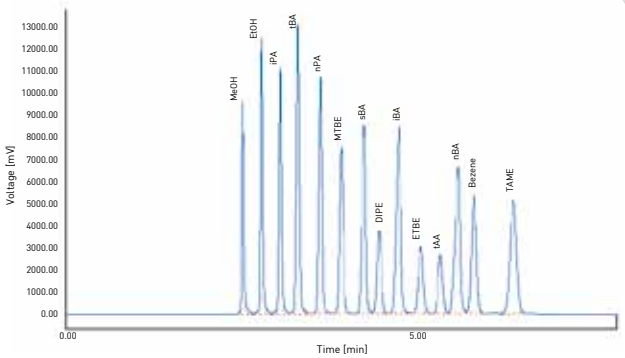


Flow Stability

Pressure Stability

The Ultimate in Gas Chromatography

The powerful programming function of oven temperature, pressure and flow rate enables to shorten retention time and reduce decomposition and loss of samples. Moreover, the swift and accurate control of valve switching time in settable point up to 0.01 min allows analyzing complex samples containing various components that can not be separated by one column or detected by one detector reversing column flow precisely (Backflush) with no loss of peak area values.



〈 Analysis of oxygenates in diesel 〉

Analysis condition

- Column: HP-1, 30 m x 0.53 mm
  TCEP μ-packed column, 56 cm x 1/16"
- Injector : 230°C
- Column flow : 3.5ml/min, Split ratio : 20:1
- Oven : 60°C (6.8min)→8°C/min→120°C(10min)
- FID : 250°C
- 1st column switching time(backflush) : 0.23min
- 2nd column switching time : 6.65min
- Valve Temp : 100°C

Dedicated Applications

YL's accumulated experience in gas chromatography and devotion for customers' satisfactions led to supply one stop solution for various dedicated applications. You only need to let us know what to analyze, and then every single component that is required to analyze your sample will be configured right away at an economical price.

Why is it called "dedicated applications" ?

We provide all you need

- Properly configured GC (Inlets, Detectors, Valves, Methanizers, etc.)
- Suitable sample preparation system/accessories
- Standard solutions
- Chromatography data system with saved methods
- Analytical columns
- Accessories (Traps, Syringes, etc.)
- Related application notes

Residual Solvent Analysis

Organic residual solvents used in the manufacture of pharmaceuticals and found in the inks used for the printing of packaging materials for food and drug products are known to be hazardous to human health if ingested. The YL Residual Solvent Analyzer can accurately and efficiently detect and quantify residual solvents.

VOC Analysis

The YL VOC Analyzer accurately tests the presence of VOCs and measures their concentration. The analyzer contains all necessary reagents and equipment for conducting the analyses including detailed procedures and protocols for conducting the tests. These protocols are in full compliance with approved U.S. EPA methods.

Pyrolysis GC Analysis

The YL Pyrolysis-GC system is a state of the art system for obtaining information on the ingredients found in various non-volatile and low-soluble polymers such as nylon, wax, paint, film, wood and plastic products. The targeted material or sample is heated to be fragmented into its individual constituents, which are then separated and identified by the GC System.

Natural Gas Analysis

Analysis of natural gas requires a very complicating configuration because it contains low level of oxygen (< 3%), isomers and compounds more than C4 which are not needed for analysis results. YL Natural Gas Analyzer can be configured in ideal with accurate valve switching venting unnecessary components and collecting significant things in time to the appropriate columns and detectors.

TOGA (Transformer Oil Gas Analysis)

Oil based transformer insulating fluids are known to release combustible gases, which can decrease the efficiency of the insulating fluid while creating a dangerous situation. The YL TOGA System is a state of the art system for efficiently and accurately monitoring the buildup of combustible gases in the insulating oils of transformer. Such monitoring can prevent an accident from occurring, as well as ensure that the insulating oil is functioning under optimal conditions.

Blood Alcohol Concentration Analysis

The amount of alcohol in the bloodstream is referred to as the Blood Alcohol Level (BAL). It is recorded in milligrams of alcohol per 100 milliliters of blood, or milligrams percent.
The YL Blood Alcohol Level Analyzer using Headspace and GC system is appropriate system for obtaining the concentration of alcohol in driver's blood or a suspect's blood related to a drinking crime. When someone dies unnaturally caused by alcohol such as methyl alcohol, an inspector identifies alcohols and quantifies the level of methyl alcohol or other side products extracted from blood or urine.

Refinery Gas Analysis

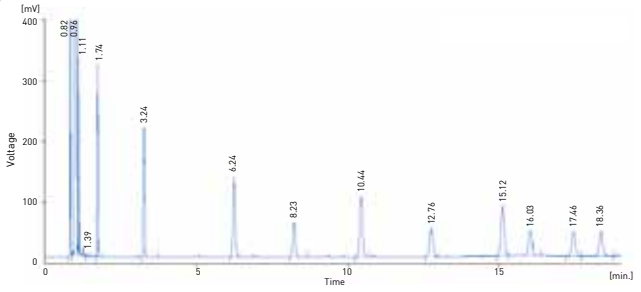
Refinery gas is a mixture of gases generated during refinery processes which are used to process crude oil into various petroleum products. Analyzing refinery gas has been getting very important in environmental fields because there are several components or chemicals in it that can potentially harm the environment if released unchecked. Due to the fact of installation detectors and inlets up to 3, YL Refinery Gas Analyzer can configure several columns, switching and sampling valves as well as the appropriate detectors to analyze the complex and difficult refinery gas samples.

See the Performance

Newly designed and highly sophisticated electronic board for each detector reduces a noise level 2~5 times lower than traditional YL's detectors. In addition, powerfully enhanced electronic circuit enables to detect weak signals for improvement of data process of samples in trace level.

Flame Ionization Detector (FID)

A Flame Ionization Detector measures the quantity of ions which are produced when a sample coming out from a column is flamed by hydrogen and air. So, this is to be used to detect any organic compounds which can be ionized by hydrogen/air flame. With linear dynamic range of seven orders, the function of auto ignition can start an ignition automatically at a setting temperature. In addition, a unified interconnector with high conductivity delivers very stable signals to electronic parts to maximize the sensitivity.

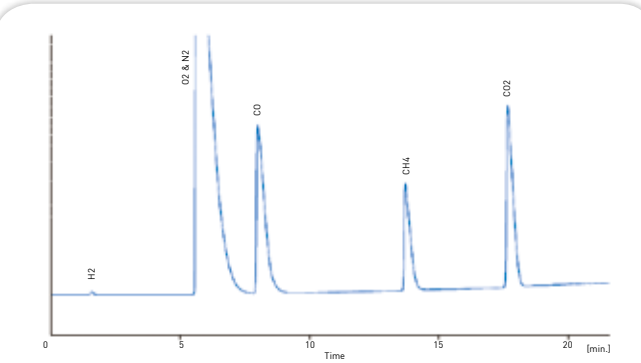


〈 Analysis of Fatty Acid Methyl Esters 〉

Analysis condition
- Column : Innowax, 30m x 0.32mm x 0.5μm
- Oven : 100°C(5min) → 4°C/min → 240°C (10min)
- Injector : 250°C
- Detector : 280°C

Thermal Conductivity Detector (TCD)

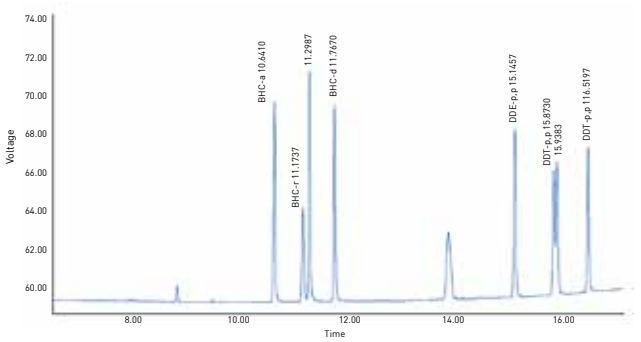
A Thermal Conductivity Detector is introduced as a universal detector because it can detect every compound which has different thermal conductivity from that of carrier gas. It is recommended to use carrier gas such as hydrogen (H_2) or helium (He) that has a big difference of thermal conductivity from that of sample components. The especially stabilized design of TCD against shock with superior thermal conductivity creates extremely stable baseline as well as minimized noise level. Also, YL's unique filament protection reduces its maintenance substantially.



Analysis Condition
- Column : Carboxen1000, 1/8", 15ft, 60/80 mesh
- Oven : 35°C(5min) → 10°C/min → 225°C(5min)
- Carrier gas : He, 25ml/min
- Injector : 120°C
- Detector : TCD(120°C), Sens 6
- Injection Volume : 1ml

Electron Capture Detector (ECD)

An Electron Capture Detector is used for detecting electron-absorbing components such as halogenated compounds. Our remarkably advanced ECD structure maximizes electron capture efficiency and the micro-volume cell increased detecting performance as well as sensitivity.

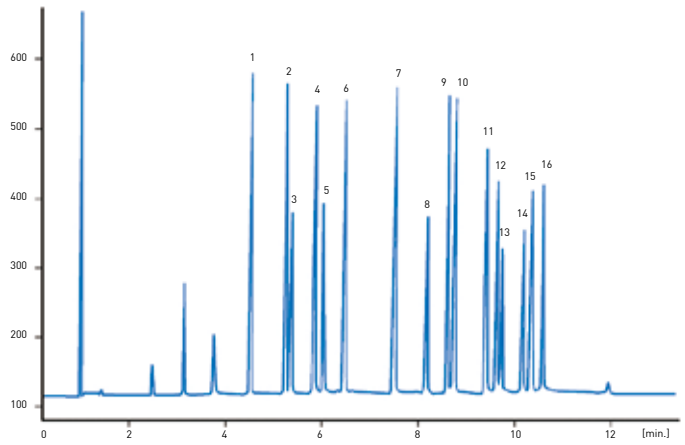


〈 Analysis of Residual pesticides 〉

Analysis Condition
- Column : HP-5, 30m x 0.32mm x 0.25μm
- Oven : 80°C (2min) → 10°C/min → 280°C (8min)
- Injector : 280°C
- Detector : 300°C
- Make up gas : 40ml/min

Pulsed Discharge Detector (PDD)

PDD is to analyze trace level of halogenated compounds. PDD has two different modes, one is PDECD and the other is PDHID. The PDECD is a selective detector for monitoring high electron affinity compounds such as freons, chlorinated pesticides, and other halogen compounds. For this type of compound, the minimum detectable quantity (MDQ) is at the femtogram (10^{-15}) or picogram (10^{-12}) level. The PDD is similar in sensitivity and response characteristics to a conventional radioactive ECD, and can be operated at temperatures up to 400°C. For operation in this mode, He and CH_4 are introduced just upstream from the column exit. The other mode, the PDHID is an universal, non-destructive, high sensitivity detector. The response to both inorganic and organic compounds is linear over a wide range. Response to fixed gases is positive (increase in standing current), with an MDQ in the low ppb range.



1. α - BHC
2. γ - BHC
3. β - BHC
4. Heptachior
5. δ - BHC
6. Aldrin
7. Heptachior epoxide
8. Endosulfan I
9. 4, 42 - DDE
10. Dieldrin
11. Endrin
12. 4, 42 - DDD
13. Endosulfan II
14. 4, 42 - DDT
15. Endrin aldehyde
16. Endosulfan sulfate

Analysis condition
- Column : HP- 608, 30 mm x 0.53 mm x 0.5μm
- Oven temp : 100°C (2 min) → 12°C/min → 280°C
- Detector : PDECD, D-2, 300°C
- Carrier : Helium, 8ml/min
- Injector : 1μl, split 15:1, 280°C

Nitrogen Phosphorous Detector (NPD)

A Nitrogen Phosphorous Detector is a specific detector which gives a strong response to organic compounds containing Nitrogen or Phosphorus. The detector is based on the principle of ionization of the analyte in presence of a heated alkali source.

Flame Photometric Detector (FPD)

A Flame Photometric Detector is similar to the FID in that the sample exits the analytical column into a hydrogen diffusion flame. But FPD analyzes the spectrum of light emitted by the compounds as they luminescence in the flame and detects selectively substances containing Sulfur or Phosphorous.

Pulsed Flame Photometric Detector (PFPD)

A Pulsed Flame Photometric Detector is to selectively analyze compounds containing Sulfur or Phosphorous but provides more than 10 times higher sensitivity and selectivity compared to a traditional FPD. It also requires low gas consumption ensuring detector stability for minimized maintenance.

Micro-Thermal Conductivity Detector (μ-TCD)

A Micro-Thermal Conductivity Detector is operated in a same principle as TCD but a smaller cell to improve sensitivity. The detector cell includes two separate nickel/iron filaments, capable of independent or referenced (differential) operation. Cell volume and geometry are optimized for capillary chromatography and enhanced sensitivity at low flow rates. (Recommended total flow rate: 2-10 ml/min.) Thermal stability is maintained to ±0.02°C, resulting in a stable and noise-free signal.

Save your time, Upgrade your life in laboratories

YL's 6000 series autosampler improves laboratory productivity with unattended and automated analysis up to 110 samples removing tedious and time-consuming manual injection. It is rugged, easy to install and highly reliable.

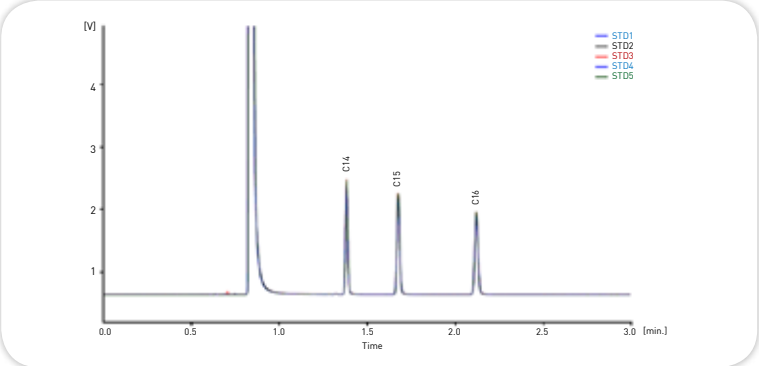
6000 Series Autosampler

6000 series Autosampler delivers improved productivity and enhanced analytical capacity with high precision and easy operation at low cost. The control of injection speed depending on samples increases data reproducibility by decreasing sample decomposition in fast injection and entire sampling of sample with high viscosity in slow injection. It can store up to 10 methods and be easily controlled by a keyboard or YL-Clarity chromatography data system.

6000 Series Autosampler

• Features

- Handles internal standard sampling
- Variable fill speed and bubble elimination allow wide range of sample viscosities
- Small footprint and easy to use: controlled by keypad or PC
- Extraordinary performance with a linearity (Area/Quantity) typically of 0.99999
- Requires low maintenance



Reproducibility in Retention Time (< 0.05%) with 6000 series autosampler

	Retention Time (Min.)		
	C14	C15	C16
STD1	1.382	1.677	2.121
STD2	1.383	1.677	2.120
STD3	1.382	1.674	2.118
STD4	1.383	1.675	2.118
STD5	1.383	1.676	2.119

Economical Solution Autoinjector, HT310A

HT310A is a liquid GC autosampler derived from 6000 series autosampler. This special version has a fixed tray that holds up to 10 sample vials and that gives the autosampler a very small footprint.

Autoinjector, HT310A

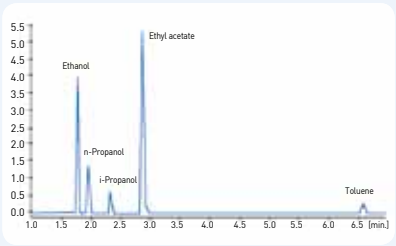
Sample Preparation System

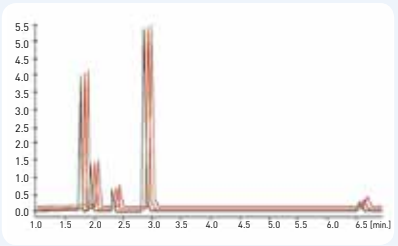
Static Headspace Autosampler, HT200H

HT200H, available in GC or GC/MS, is useful to analyze drinking water, waste water, soil (EPA 5021), industrial waste, etc. The HT200H eliminates tubing, dead volume and sample absorption.
The injection tower transports vials to the 6 position incubator for orbital agitation at the programmed temperature. The heated syringe then samples the headspace vial and injects directly into the GC.

Static Headspace Autosampler, HT200H

Measuring value (mg)	Ethanol	n-Propanol	i-Propanol	Ethyl acetate	Toluene
Measuring value 1	0.2485	0.0836	0.0413	0.4725	0.0091
Measuring value 2	0.2443	0.0821	0.0405	0.4637	0.0089
Measuring value 3	0.2470	0.0830	0.0410	0.4691	0.0090
Measuring value 4	0.2486	0.0835	0.0413	0.4712	0.0091
Mean value	**0.2471**	**0.0831**	**0.0410**	**0.4691**	**0.0090**
RSD (%)	0.81	0.83	0.92	0.83	1.06





Headspace, Liquid and SPME Autosampler, HT280T

The HT280T is a single unit combining static headspace analysis, liquid sample injection and SPME (Solid Phase Microextraction). It can save your time and money, increase analysis flexibility.

Headspace, Liquid and SPME Autosampler, HT280T

Pyrolyzer, Pyroprobe 5000 series

Pyrolysis coupled with YL6500 GC allows you to analyze the samples which were previously unsuitable for analysis without extractions or derivatizations. By using pyrolysis, samples such as paint, adhesives, tapes, caulk, food packaging, rubber, plastic, papers, ink, coating and a full range of household products can be analyzed for qualitative and quantitative information.

Rapid Oven Cooler (ROC)

Rapid Oven Cooler is the simple, affordable and easy to be installed on most GC and GC-MS available on the market. It considerably reduces dead time between sequential runs and ensures highly stable GC oven temperatures, down to 20°C, very rapidly to increase lab productivity. Analyzing very volatile compounds, it's strongly recommended to improve highly significant resolution.

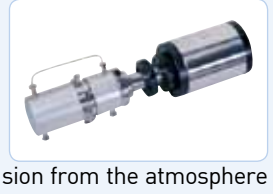
Gas Sampling Valve

In order to obtain accurate results in gas analysis, it is necessary to equip with a gas sampling valve in the front of column. The gas sampling valve enables manual or automatic gas sample injection and flow switching. Our gas sampling valve is operated by an air actuator which opens and closes it. The air actuator is useful in situations where any spark could be dangerous or where there is no electricity available. They are small, relatively inexpensive, very rugged, dependable, and field-serviceable.

• Valve Rotors

Rotor Type	Material	Max temp	Max pressure
Valcon E	Polyaryletherketone/ PTFE composite	225	400
Valcon T	Polyimide/PTFE/ carbon composite	330	300

Purge Housing



When you analyze samples of O_2, N_2, etc with low concentration of a few ppms, the purge housing is very useful for this analysis. Purge housings eliminate any possible diffusion from the atmosphere into the valve, or safely vent fugitive emissions from the valve.

YL-Clarity

The sophisticated YL-Clarity chromatography data system is easy to use and offers extensive data management plus full control of the entire YL Chromatographs. The software is designed for 21 CFR Part 11 Compliance and fully compatible with all Windows OS.

21 CFR Part 11 Compliance

- **User accounts**
  YL-Clarity sets up access rights and passwords (including their parameters e.g., minimum length, validity, etc.). Each user can define the appearance of own station.
- **Audit trail**
  It records selected events and operations into a special file and selected operations directly into a chromatogram.
- **Electronic signature**
  Each chromatogram can be signed electronically. Signature selection is based on the username or the signature certificate.

Data Acquisition

- **Overlay**
  YL-Clarity simultaneously displays a virtually unlimited number of chromatograms and their mathematical modification; for example, mutual deductions or derivations of any order.
- **Measuring**
  Simultaneous data acquisition from up to four independent chromatographs, each chromatograph can acquire data from up to 12 detectors.

Data Management

- **Integration**
  There are extensive possibilities to optimize integration. The integration parameters can be changed by entering global parameters or interactively, through direct graphic modification of the baseline.
- **Calibration**
  Internal and external standard calculation methods, calibration of groups of peaks and reference peaks method for better identification.
- **Postrun**
  YL-Clarity automatically displays, prints, exports and starts other programs after the completion of a measurement.
- **User calculations**
  Users can define custom calculations in the Result and Summary tables. Using the integrated editor you can create your own columns from original columns and individual mathematical functions.
- **Optional**
  SST (System Suitability Test)
  Validation Kit
  NGA (Natural Gas Analysis)

Technical Specifications

Column Oven

YL6500 GC Oven System Module	- Usable volume : 14L - Temperature operating range : 4°C above ambient to 450°C or more - Cooling down option : - 80°C ~ 450°C (with LN_2 cryogenic cooling) - 55°C ~ 450°C (with LCO_2 cryogenic cooling) - Temperature set-point : 1°C - Temperature programming : 25 ramps/26 plateaus - Maximum heating rate : 100°C/min - Maximum run time : 9,999min - Temperature program method : Maximum up to 20 - Temperature stability : ±0.01°C (Isothermal), ±0.1°C (Gradient)

Inlet

Packed Inlet	- Maximum Temperature : 450°C - Total flow setting range : 0.1~ 100ml/min	- Pressure setting range : 0.01 ~ 100psi - Pressure stability < ± 0.05psi - Temperature stability < ±0.1°C - Flow stability < ±0.05ml/min - Temperature setpoint : 1°C
Capillary Inlet (Split/Splitless Inlet)	- Maximum Temperature : 400°C - Total flow setting range : 0.1 ~ 400ml/min N_2 0 ~ 1000ml/min He - Splitless time setpoint : 0.01min	
On-Column Inlet	- Maximum Temperature : 450°C - Temperature programming up to 5 steps	

Detector (Data Acquisition Rate : 200 Hz)

	Maximum Temp.	MDL	Others
Flame Ionization Detector	450°C	2.0 pg carbon/sec	Linearity : 10^7
Thermal Conductivity Detector	400°C	2.5 ng/ml (Standard) 400 pg/ml (uTCD)	- Flow through cell : 4 Rhenium-Tungsten filaments - Filament protection
Electron Capture Detector	400°C	10 fg/sec	Linearity : > 10^4
Nitrogen Phosphorous Detector	400°C	< 0.4 pg N/sec (Azobenzene) < 0.2 pg P/sec (Malathion)	Linearity for N : > 10^4 Linearity for P : > 10^4
Flame Photometric Detector	300°C	< 20 pg S/sec < 0.5 pg P/sec	Linearity for S : Calibration curve is compulsory Linearity for P: >10^5
Pulsed Discharge Detector	400°C	(PDHID) : - Organic compound : low ppb - Permanent gas : low ppm (PDECD) : 10^{-15}	(PDHID) : Linearity 10^5 (PDECD) : Linearity 10^5

Autosampler

6000 Series Autosampler

- Tray Capacity : 110 vials of 2 or 2.5ml
- Pre and Post- Washing Sovent Position
- Air bubble removal up to 15 strokes
- Viscosity time from 1 to 15 secs
- Internal standard technique
- Sequence maximum 15 steps
- Progiammable sampling and injection speed
- Injection depth programmable

HT310A Autoinjector

- Tray Capacity
  - Sampling : 10 vials, 2 or 2.5ml
  - Sample Volume : Steps of 0.1µl
  - Needle Washing : Up to 15 strokes
- Injection
  - Injection Speed : 0.1 ~ 100 µl/sec
  - Waiting Time(before and after inject) : 0 ~ 99 secs

HT200H Static Headspace Autosampler

- Incubation Oven : 6 positions
- Syringe Sizes : 2.5, 5ml
- Tray Capacity : 40 vials, 10 or 20ml
- Sampling
  - Syringe Temperature : 40 ~ 170°C
  - Pre-fill Volume : Steps of 0.01ml
  - Pull Up Strokes : Up to 15 strokes
  - Equilibrium Delay : Up to 60 secs
  - Sampling Volume : Steps of 0.01ml
  - Filling Speed : 0.1 ~ 100ml/min
- Injection
  - Sampling Repeats : Up to 15
  - Injection Speed : 0.1 ~ 100ml/min

HT280T Headspace, Liquid, SPME

- Liquid Operation : Same as 6000 series autosampelr
- Headspace Operation : Same as HT200H
- SPME Operation
  - Tray Capacity : 40 vials, 10 or 20ml
  - Oven Temperature : 40 ~ 150°C
  - Shaker Speed : 320 ~ 720rpm

YL6500 Gas Chromatograph

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These Products are manufactured by Young Lin ISO 9001-certified facility that is periodically audited by the registering body to ensure compliance