

Capillary and Packed Gas Chromatograph

GC-2014C



The Versatile Packed and Capillary GC

GC-2014C

Capillary and Packed Gas Chromatograph



High Performance

Fully digital flow controllers for both the injector and the detector. Accurate flow rate control ensures high repeatability of retention time and peak area, while the automatic detector gas control (e.g. ignition and re-ignition functions) ensures a safe laboratory operation.

Versatility in All Types of Analysis

Use any column types for any analysis. Packed or capillary columns give you the freedom to choose the best technique for your measurement. Productivity tools such as liquid autosamplers and accessories (e.g. headspace) are also available.

Simple Operation

Large LCD, all digital gases control, and auto-diagnostics minimise learning curve and instrument downtime. Fully integrated multiple valve systems are made simple for optimum performance for custom System GC products.

High Performance

Precision and accuracy with fully digital flow controllers

Digital carrier gas control Single or Dual AFC

Higher-level repeatability of carrier gas is indispensable to high data reliability. More accurate electronic flow controllers set and maintain flow rates in multiple modes automatically eliminating human error.

The GC-2014 Series is equipped with the advanced flow controller (AFC) technology inherited from the GC-17A Series and GC-2010 Series.



This digital control is standard for not only capillary columns, but packed columns as well.

Accurate flow rate control via AFC has higher-level repeatability of retention time and peak area, enabling a higher level of analyses.

Dodecane				Tetradecane				Hexadecane			
	RT	Area	Height		RT	Area	Height		RT	Area	Height
1	5.243	55397	34356	1	6.731	55379	33635	1	8.06	55898	33437
2	5.243	55418	34431	2	6.731	55529	34446	2	8.06	56170	33499
3	5.243	55762	34571	3	6.731	55880	34042	3	8.059	56486	33610
4	5.243	55632	34497	4	6.731	55717	34551	4	8.06	56347	32899
5	5.244	55861	34865	5	6.732	56021	34611	5	8.061	56572	33931
6	5.243	55957	35396	6	6.731	56060	34677	6	8.06	56780	33086
7	5.243	56026	35066	7	6.731	56120	34426	7	8.061	56714	34300
8	5.242	56083	35439	8	6.73	56164	34638	8	8.059	56694	33358
9	5.243	55770	34739	9	6.73	55937	33984	9	8.059	56509	34382
10	5.243	55857	34614	10	6.731	55762	34062	10	8.06	56510	33427
Average (Avg.)	5.243	55776.3	34797.4	Average (Avg.)	6.7309	55856.9	34307.2	Average (Avg.)	8.0599	56468	33592.9
Standard Deviation	0.000471	234.7737	387.9167	Standard Deviation	0.000568	258.8747	352.4608	Standard Deviation	0.000738	269.1274	482.072
C.V.%	0.008991	0.42092	1.114786	C.V.%	0.008433	0.463461	1.027367	C.V.%	0.009155	0.476602	1.435041



Digital detector gas control APC



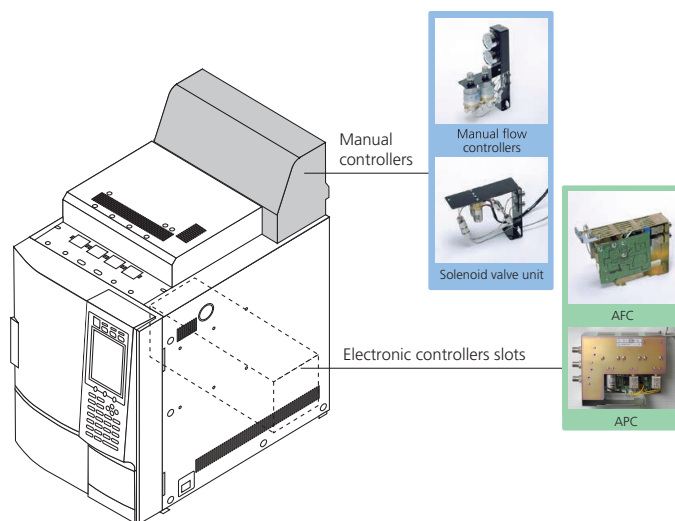
All parameters for GC analysis are controlled digitally when APC's are used to control detector gases. This facilitates the setting of analytical conditions and log management by a data station. This also facilitates lab safety, for example in the use of FID, where the hydrogen and air flow stops automatically if the flame is extinguished from any cause.

Five electronic controller slots (AFC/APC) are available in the back bottom of the main unit.

Gases are supplied or cut off in conjunction with switching ON/OFF power to the main unit or detector, even if the low-cost manual controllers are used.

Up to six additional manual flow controllers can be mounted in the clear case atop the main unit.

An optional solenoid valve can be added to manual flow controller to stop the hydrogen and air flow automatically if the FID flame is extinguished or when the GC is turned off.



Unsurpassed accuracy Injection Units

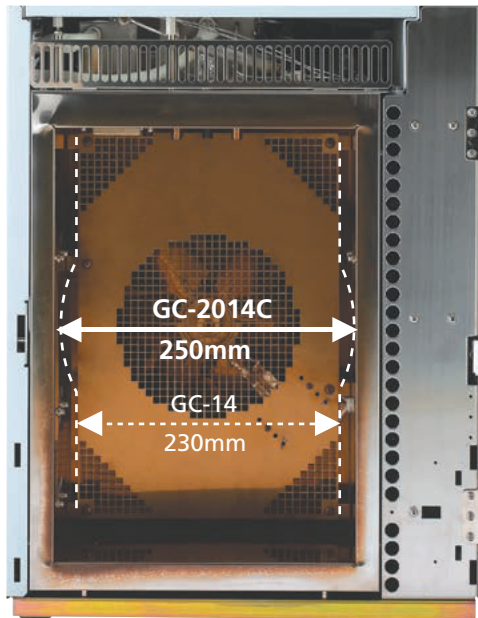
The design of the SPL-2014 capillary column sample injection unit is based on the GC-2010 technology. This accuracy was unattainable with previous models. The packed column sample injection unit employs the proven design of the GC-14 injection unit.

Analytical capacity is increased while maintaining small footprint Column Oven

By using the GC-2010 control electronics and cooling mechanisms, column oven performance has been greatly improved over that of the GC-14 Series. Oven capacity is increased while keeping the same width as the GC-14, with enough capacity to accommodate both capillary and packed columns together.

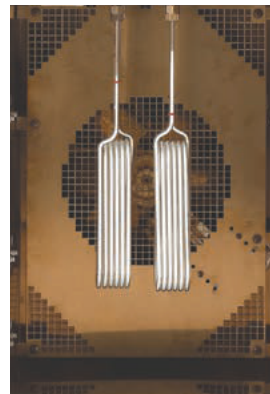
Versatility in All Types of Analysis

Port over any 40 mm glass columns used in previous Shimadzu GCs (i.e. Shimadzu GC-7, 9, 12, 14, 15 and 16 Series)

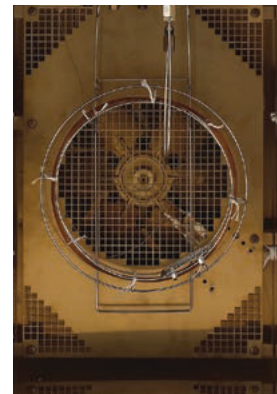


Large Column Oven Facilitates Column Operations

Column replacement is easier by increasing the oven capacity while keeping its width the same.



Packed Column



Capillary Column

Accommodates both packed and capillary columns.

The following is the basic procedure for selecting the capillary column

(1) Check the structure of the target components.

Investigate the structure (functional group), boiling point, nature, stability, and other properties of the target component.

(2) Select the stationary phase.

Selecting a stationary phase of chemical properties close to those of the target component helps increase retention force and prevent drops in separation caused by defective peak shape.

(3) Determine the column size.

Determine the column size according to the sample amount to inject while referring to the following table:

0.10mm ID 0.18mm ID	<p>Has extremely high resolution but its sample load is small.</p> <ul style="list-style-type: none"> • Samples having a complex mixed system • Suited to split injection
0.25mm ID 0.32mm ID	<p>Has high resolution and a moderate sample load</p> <ul style="list-style-type: none"> • Supports samples having a complex mixed system • Suited to split/splitless injection
0.53mm ID	<p>Has satisfactory resolution and a large sample load</p> <ul style="list-style-type: none"> • Suited to purity measurement and analysis of trace components • Used in direct injection, on-column injection, and large-volume injection • Can be easily replaced from packed column

TIP

When twice as long (for fixed-temperature analysis)

- 2× the analysis time
- 1.4× the degree of separation
- 2× the price

TIP

Membrane Thickness and Separation

Thick-membrane column

- Good separation of high-concentration components
- Suited to purity analysis

Thin-membrane column

- Fast elution of high boiling point compounds
- Suited to the analysis of medium to high boiling point compounds

A Full Line of Injection Units

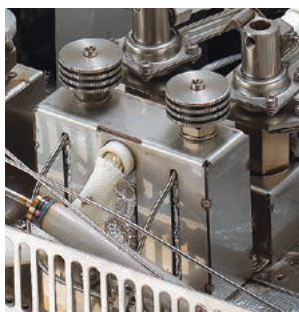
Obtaining better data requires that the appropriate column and sample introduction method be selected according to analytical objectives and samples to be

analyzed. With the GC-2014C, the optimum injection mode can be selected from four types of injection units.

Dual Packed Injection Unit

DINJ-2014

Designed for Dual FID and TCD analyses. Because two flow paths are handled using one temperature control port, these count as one heated zone.



Split/Splitless Injection Unit

SPL-2014

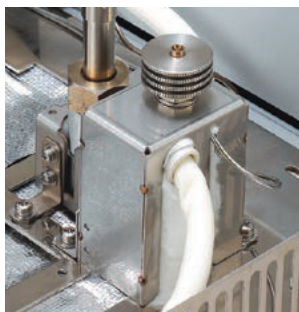
Standard unit for high-speed analysis with a narrow bore column. The gas saver function restricts the total gas used. High-pressure injection standard



Single Packed Injection Unit

SINJ-2014

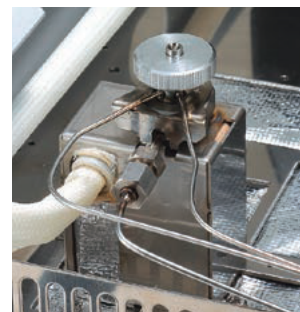
This is a specialized sample injection unit for use with ECD or other high sensitivity detectors.



Direct Injection Unit

WBI-2014

Incorporates a septum purge flow path to restrict solvent tailing. Sharing glass inserts with splitless analysis simplifies parts requirements (patented).



Simultaneously Mount up to Two Injection Units and Three Detectors

Select from four types of injection units and seven types of detectors according to the target compounds and analysis objective. Modular injection units, detectors and auto-injectors can be easily added after installing the unit in your lab.

Unit Addition

4 types of injection units

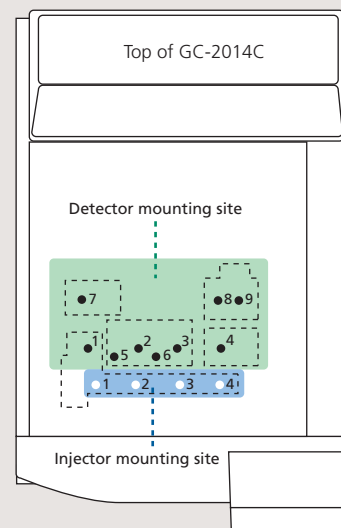
7 types of detectors

Flexibility

Options after Installation

Injection units / Detectors
Auto-injectors
Various options can be added

OPTION



Compact, High-Sensitivity Detectors

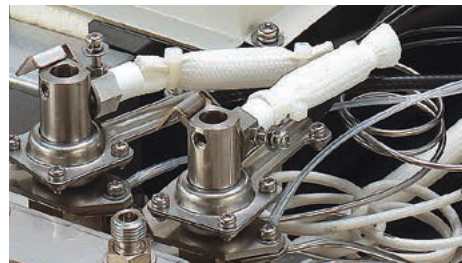
Depending on your application, we have the detectors which are suitable for your requirement.

Flame Ionization Detector

FID-2014

DFID-2014

Automatic ignition and re-ignition functions are standard. By mounting an APC or solenoid valve unit, a feedback function cuts off gas supply when the hydrogen flame is extinguished. Generally used for detection of organic compounds with a hydrogen carbon bond. An optional flame monitor is available.



Thermal Conductivity Detector

TCD-2014

The TCD-2014 is a semi-diffusion type cell reducing contamination and increasing cell lifetimes. Incorporates an automatic filament protection circuit. The TCD-2014 is used for analysis of inorganic gases and concentrated organic compounds.



Electron Capture Detector

ECD-2014

This cell is very similar to the ECD-14; so spare radiation sources can be shared. This detector is used for analysis of electrophilic compounds. Improved cell insulation and reduces contamination achieving higher sensitivity.

CAUTION

The ECD uses a radioactive Ni-63 source. Special governmental registration is required to use or purchase it. Please check with your local Shimadzu representative for relevant regulations in your area.



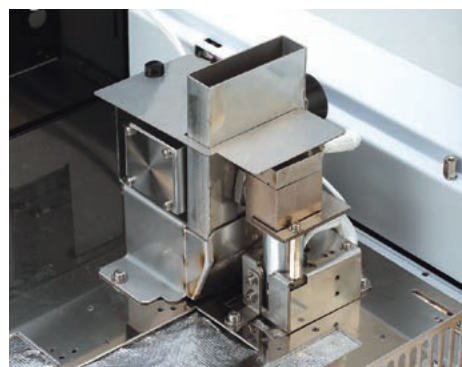
Flame Photometric Detector

FPD-2014

The FPD-2010, the nozzle system was updated to provide support for packed column analysis while maintaining its high sensitivity. The ability to exchange nozzles optimizes both packed column and capillary column analyses. The FPD-2014 is compact with a high maximum temperature (350°C). This detector is used for analysis of organic sulphur compounds and organic phosphorus compounds such as residual pesticides and malodorous components.



*Filter replacement requires no tools.



Flame Thermionic Detector

FTD-2014C

FTD-2014

This specialized detector is used for analysis of organic nitrogen compounds and organic phosphorus compounds such as residual pesticides. The new collector design in the capillary-type FTD-2014C) allows replacement without tools. An optional alkali source regeneration kit recoats the bead reducing running costs.



*Collector replacement requires no tools.

Optional Units

A variety of options support various types of analyses

AOC-20 Series

The AOC-20i auto injector and AOC-20s auto sampler is used with the GC-2014. Varying the parameters of sample injection sets the optimal injection mode. This high level of precision and repeatability is not possible with manual injection.



SystemGC

A sub-door is included for SystemGC products. The column oven door is separated into the column and sub door. The sub-door can accommodate three temperature-controlled valves, and the left-side panel three valves that are not temperature-controlled. The PRG-2010 is used to control these valves.



Headspace Autosampler

Shimadzu HS-10 and HS-20 LT allow high reproducibility ensure reliable quantitation for volatile component analysis. Application example includes measurement of VOCs in water and Blood Alcohol Concentration (BAC).



HS Switcher

Use only a single AFC for both headspace and liquid injectors in GC-2014C. A switching valve can be used to save cost while ensuring great repeatability when switching between AOC-20i and HS-10 injections.



Simple Operation

Easy to understand. Minimise instrument downtime.

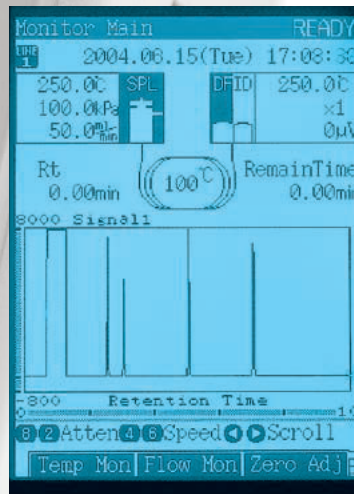
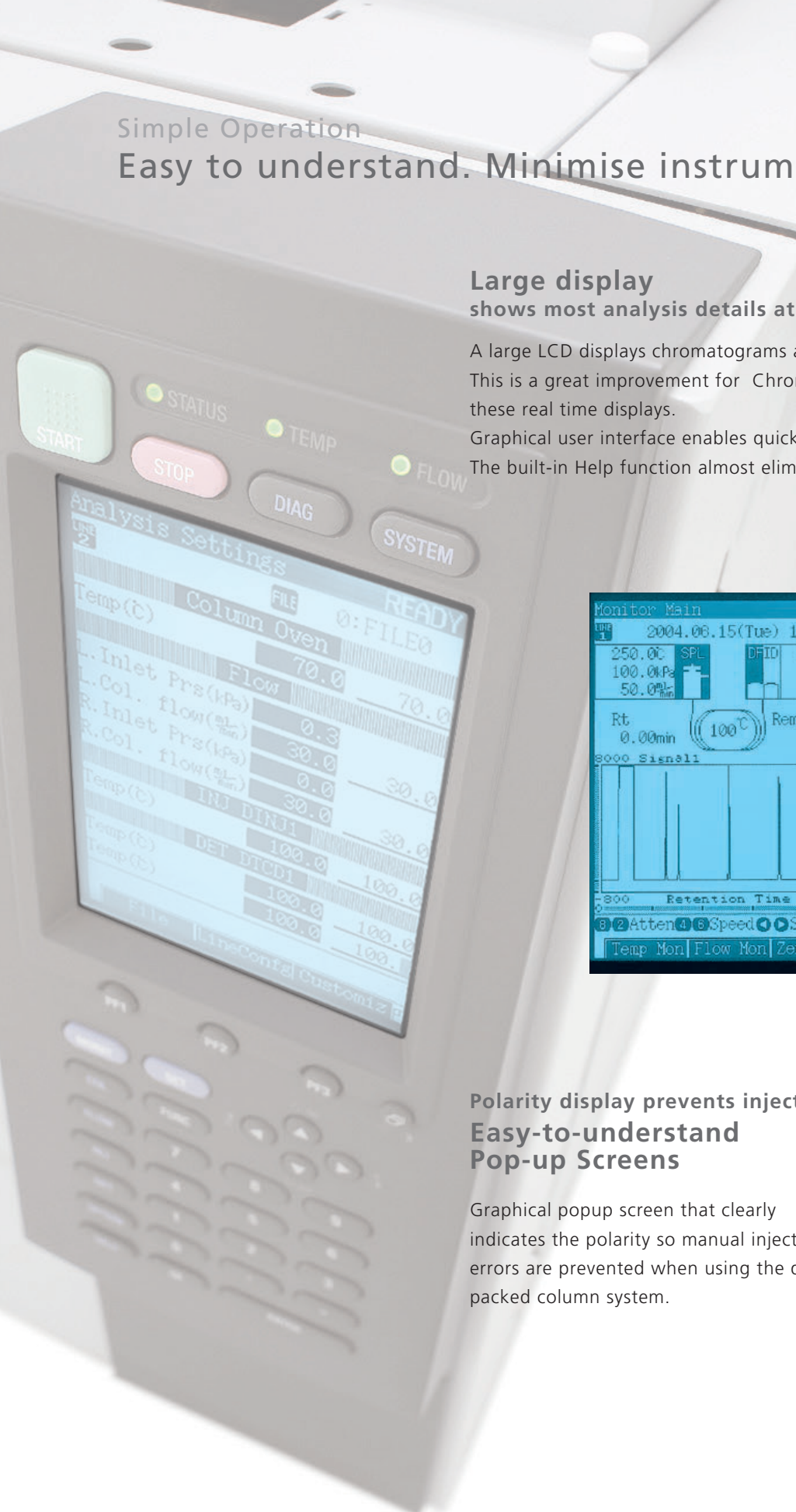
Large display shows most analysis details at a glance

A large LCD displays chromatograms and method parameters.

This is a great improvement for Chromatopacs systems that do not have these real time displays.

Graphical user interface enables quick setting of all analytical conditions.

The built-in Help function almost eliminates need for familiarization training.



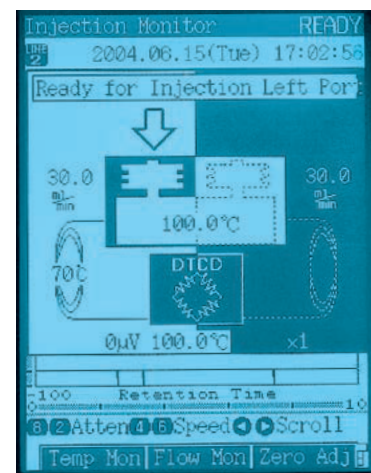
Large Display

- Chromatogram display
- Graphical UI
- Built-in Help Function

Polarity display prevents injection errors

Easy-to-understand Pop-up Screens

Graphical popup screen that clearly indicates the polarity so manual injection errors are prevented when using the dual packed column system.



Reduces unexpected downtime Intelligent Self-diagnostics

Self-diagnostics validate that the instrument before injection. This function conducts a detailed diagnosis of the septum and glass insert operating lifetime, temperature sensor errors, supplied gas pressure, control status for each gas, ignition operation, DC voltage and AD converter. Regular diagnosis prevents unexpected downtime.

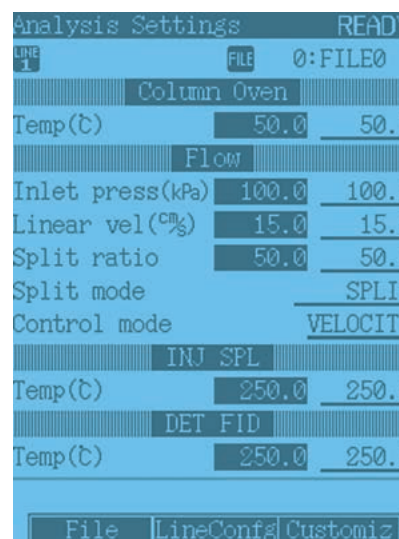


Self-diagnostics

- Unit control check
- Hardware diagnosis
- Save and check diagnosis log

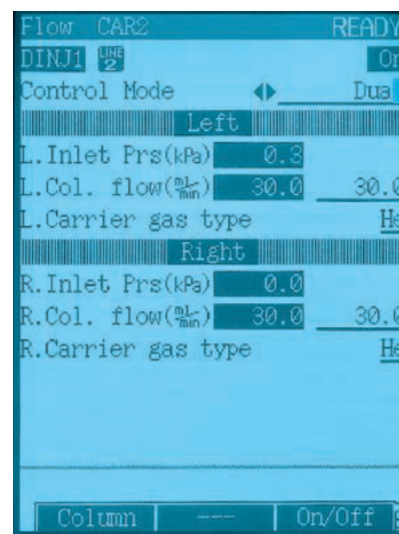
Digital Control of Column Flow Rate and Split Ratio AFC (Advanced Flow Controller)

Using the electronic flow controller, the column inlet pressure, column flow rate, linear velocity and split ratio are easily digitally set. Flow meters have now become obsolete. It is no longer necessary to set flows with soap-film flow meters. No longer required to adjust complicated split ratio settings by measuring the split or column flows manually.



Digital Control also for Packed Column Analysis Dual AFC

Easy setting of carrier gases flow by the electronic flow controllers (AFC) for both capillary and packed column analyses. For control of detector gas, select between Advanced Pressure Controller (APC) and low cost manual flow controllers. When manual flow controllers are used, a solenoid valve automatically turns ON/OFF the detector gas when the main unit power or detector is turned ON/OFF.



System GC

Applicable Fields



Refinery/Petrochemicals

- Hydrocarbons analysis
- Source gas impurity analysis
- Simulated distillation gas chromatography (SIMDIS)
- PONA analysis

Fuel Gases

- LNG (liquid natural gas)
- LPG (liquid petroleum gas)
- SNG (synthetic natural gas) and coal gas

High-Purity Gases

- Impurity analysis (H₂, O₂, Ar, N₂, CH₄, CO₂, Ne, Xe, N₂O, NH₃)
- Semiconductor and noble gases
- Analysis of hydrocarbons in oxygen

Environmental Monitoring

- Greenhouse gases (CO₂, N₂O, CH₄) analysis
- Organic solvents
- Automobile emissions

Research and Development

- Catalyst evaluation
- Reactor evaluation
- New materials development

Other Fields

- EOG (ethylene oxide gas)
- Town gas heat capacity measurement

System GCs are custom-order products dedicated to each application mentioned above (not an exhaustive list). With configurations pre-fixed, operation is more straightforward than ever. For more details, please contact your Shimadzu representative.

Software

LabSolutions Suite

LabSolutions Lite (dedicated software for GC-2014C)

This software comes by default for all GC-2014C. Users have full access over real time control and post-run processing through a PC:

- Set analytical parameters
- View chromatogram
- Peak integration and calibration
- Report with template customization
- Auto storage of data onto a computer



LabSolutions Lite supports a single instrument* (or a single user ID) in each computer.

*Upgrade kit to LC/GC workstation is available

LabSolutions LC/GC Workstation (applicable to all Shimadzu GC and HPLC)

This chromatography workstation integrates control of GC (Nexis GC-2030 Series, GC-2010 Series, GC-2014 Series, and GC-2025) and HPLC on a unified software platform, ensuring users an easier learning curve.

LabSolutions Workstation can control a maximum of four LC/GC units in a computer.

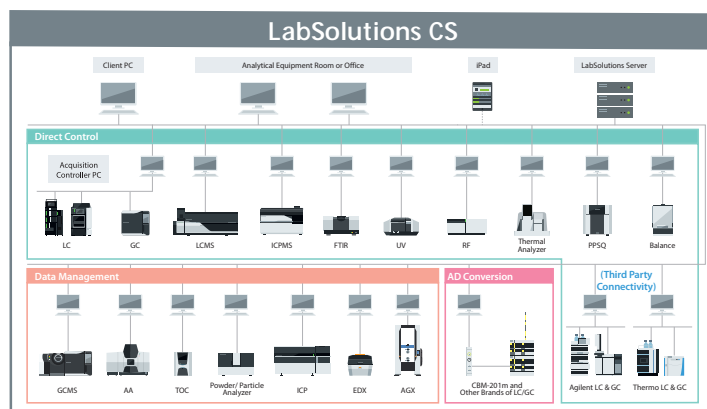
LabSolutions CS Network (applicable to full range of Shimadzu products**)

The analytical data system provides a centralised control and data storage, FDA 21 CFR Part 11 support, as well as customised calculation templates necessary for the highest form of data security.

LabSolutions CS comes by default with one Server license. Unlimited additional Instrument and User licenses can be added.

It can also be integrated seamlessly to LIMS.

** Some non-Shimadzu instruments are applicable too

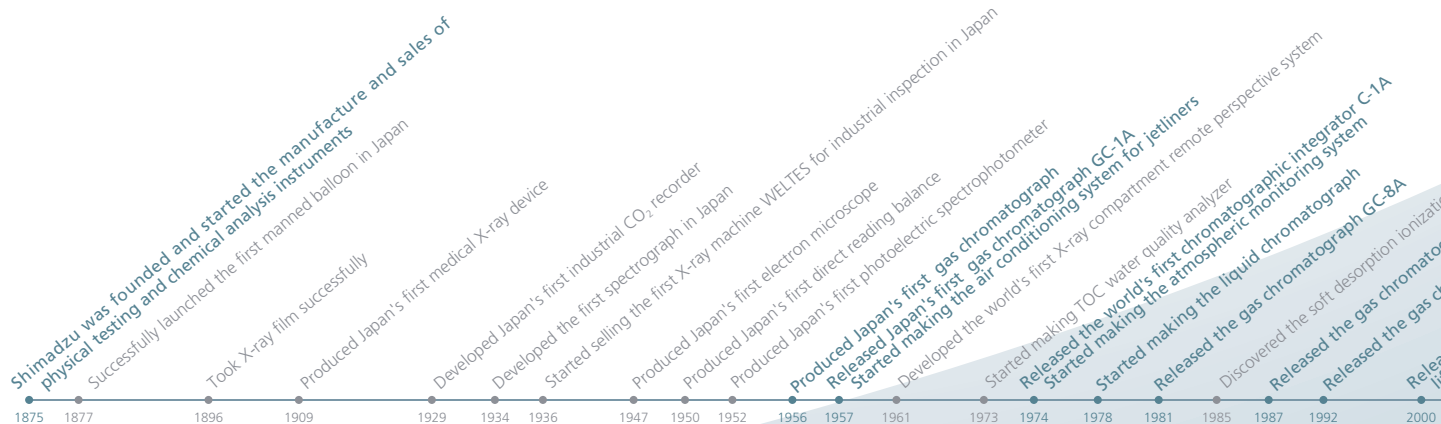




Shimadzu Corporation, the professional manufacturer of gas chromatograph for more than **60** years

Shimadzu has been developing and manufacturing gas chromatograph products for more than half a century in its development over 140 years. Excellent tradition and outstanding quality has been continued to today, so that Shimadzu has continuously launched a variety of GC application systems to meet the needs of customers.

It is because Shimadzu has always been adhering to the "spirit of craftsmanship", and the combination of solid technical capabilities that "Japanese ingenuity" is more well known.





2004

GC-2014



2009

GC-2010 Plus



2010

GC-2025



2013

Tracera



2017

Nexis GC-20



2019

GC-2010 Pro



2020

GC-2014C

on method
 graph GC-14A
 chromatograph GC-17A
 Released the gas chromatograph GC-2010 and turned the attention to
 the sciences, semiconductor /FPD and environmental solutions business
 Released MALDI mass spectrometer AXIMA series
 Koichi Tanaka won the Nobel Prize in chemistry
 Released the gas chromatograph GC-2014
 Started making the world's first X-ray diagnostic system equipped
 with a direct conversion flat panel detector (FPD)
 Released the gas chromatograph GC-2010Plus
 Released the gas chromatograph GC-2025
 Released the gas chromatograph Tracera
 Released the gas chromatograph GC-2030
 Released the gas chromatograph GC-2010 Pro
 Released the gas chromatograph GC-2014C

2001 2002 2004 2006 2009 2010 2013 2017 2017 2019 2019



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