C184-E043E

SHIMADZU
Excellence in Science

Gas Chromatograph

Nexis GC-2030

Nexis GC-2030

The Next Industry Standard

In today's environment, results are needed regardless of whether the analyst is working in the laboratory, the office, or from home. With the flexibility to accommodate a variety of applications, the Nexis™ GC-2030 supports the analyst's procedures beyond the laboratory, at virtually any location.

Designed with the Analyst in Mind P4-9

Best-in-class* Sensitivity and Reproducibility P10-11

Exceptional Versatility and Productivity P12-13

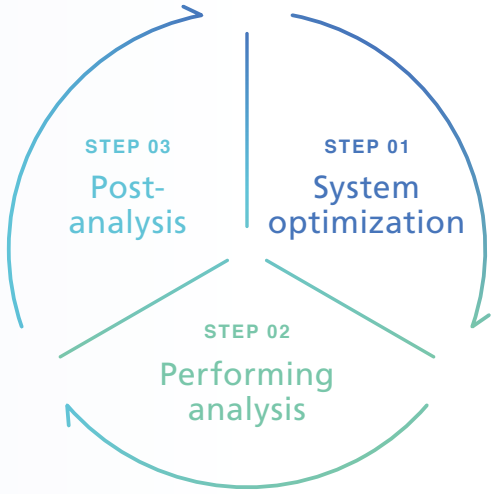
* As of July 2021, according to a Shimadzu survey


SHIMADZU
Nexis GC-2030

Designed with the Analyst in Mind

Delivers the Best Performance Regardless of Location

Laboratories today require faster and higher performance analysis. The Nexis GC-2030 features Analytical Intelligence to help achieve these goals. Clean Pilot, a system conformity test and LabSolutions™ can provide an automated workflow together with remote operation and monitoring from instrument startup to analysis completion. Automated workflows incorporate the work-style habits of experienced analysts. The result is reliable data collected over extended periods and higher productivity.

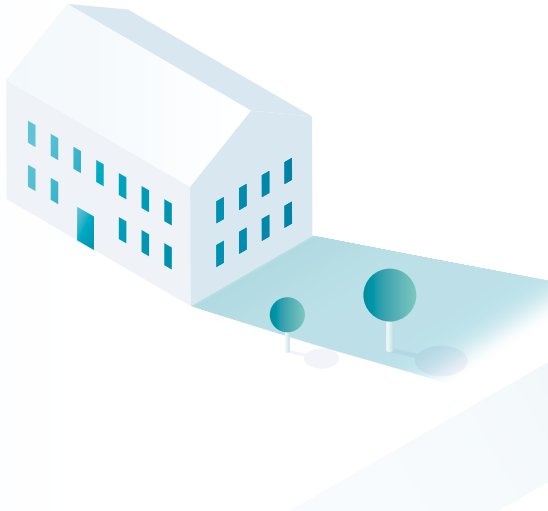


ANALYTICAL INTELLIGENCE

- Automated support functions utilizing digital technologies, such as M2M, IoT, and Artificial Intelligence (AI), that enable higher productivity and maximum reliability.
- Allows a system to monitor and diagnose itself, handle any issues during data acquisition without user input, and automatically behave as if it were operated by an expert.
- Supports the acquisition of high quality, reproducible data regardless of an operator's skill level for both routine and demanding applications.

Remote Instrument Control, Monitoring, and Postruns

Using LabSolutions, a system can be constructed with a simple network environment that enables the remote monitoring of laboratory analysis status. LabSolutions is a software to integrate GC, LC, GC-MS and LC-MS.



Freely Accessible Analytical Networks with LabSolutions CS

LabSolutions CS provides centralized management of laboratory information in a network system and centralized management of data from analytical instruments connected to the network. Data stored in the database can be browsed on a client computer at home for example.

* Note: Connections from outside the company network require networks secured via VPN for example.

Designed with the Analyst in Mind

STEP 01

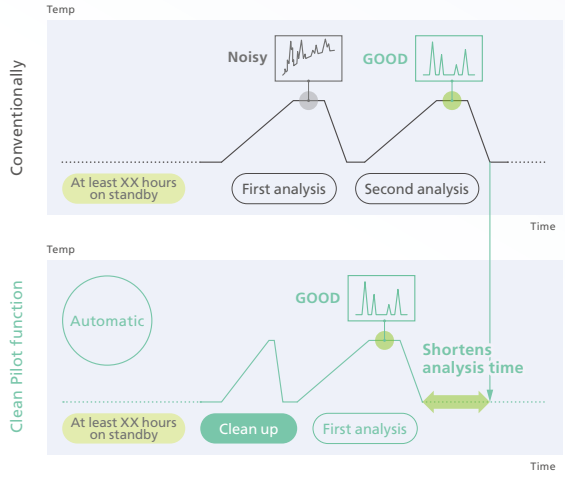
System optimization

Automating the Procedures of Experienced Analysts

– Clean Pilot Function –

ANALYTICAL INTELLIGENCE

During typical GC startup and batch analyses, in order to dispose of impurities remaining within the column, the operator has to implement conditioning by manually raising the oven temperature. Using the Clean Pilot function, conditioning is performed automatically, leading to more stable analytical results while easing the burden of lab work.



Automatic Checks of Instrument Status

– Baseline Check and System Suitability Test –

Baseline stability is determined automatically before analysis starts. Results are always obtained while maintaining consistent data quality.
The system suitability check function automatically analyzes a standard sample and determines whether to proceed to the analysis of actual samples based on peak area reproducibility and other information. A consistent quality of analysis results is therefore always obtained.

Directly access a GC unit in the laboratory from a smartphone or tablet computer

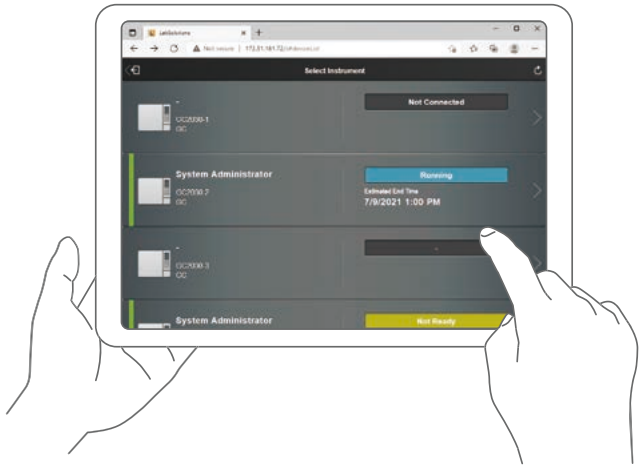
Remote Operations and Monitoring

– LabSolutions Direct Accommodates Remote Work –

LabSolutions Direct is a remote access tool used to control or monitor GC systems via a simple user interface on a commercially-available smartphone or tablet. Consequently, analyses can be performed while monitoring the status of instruments from locations away from the laboratory.

Perform these main settings via a smart device

- Starting and stopping the GC
- Starting and stopping analysis
- Monitoring chromatograms
- Checking instrument status
- Browsing analysis results in PDF format
- Checking the status of multiple instruments

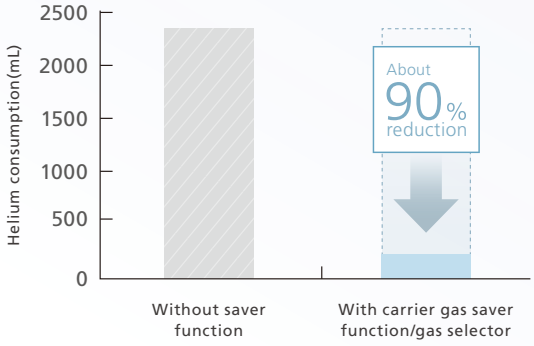


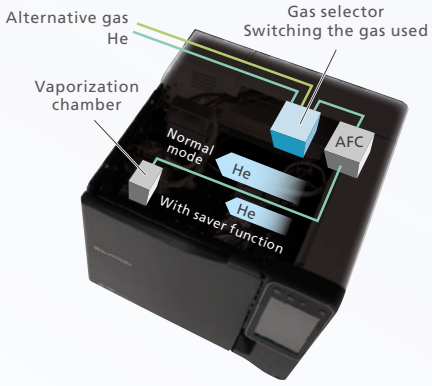
STEP 02

Performing analysis

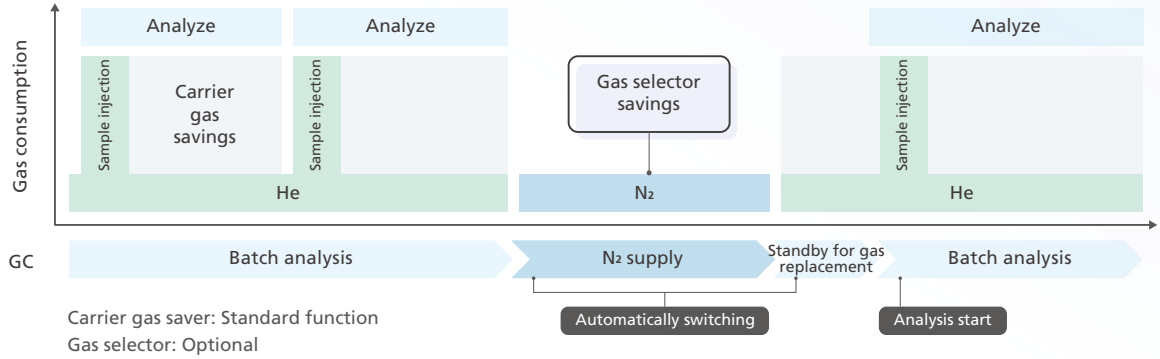
Minimizing Usage of Helium Gas – Gas Saving Function –

With the split/splitless sample injection method, the carrier gas saving function can reduce the amount of carrier gas released beyond the system from the split flow lines after transfer of the samples to the column during analysis.
Additionally, by using an optional gas selector, He can be switched to an alternative gas such as N_2 when providing gas to the units outside of analysis times. The gas can be saved when used in combination with the carrier gas saver function, or even with the total volume injection method where the carrier gas saver function cannot be used. Control is integrated with LabSolutions, enabling gas switching to be configured seamlessly.





Analysis time: 30 min. Split ratio: 100
Carrier gas saver function: Split ratio set to "10" one minute later
Total analysis time per day: 5 hours

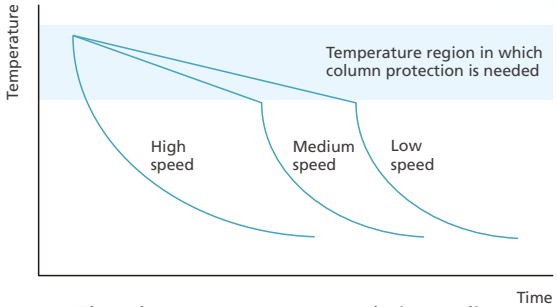


Carrier gas saver: Standard function
Gas selector: Optional

Protecting Columns

ANALYTICAL INTELLIGENCE

The column oven cooling speed can be configured separately from the oven temperature program. This protects columns, which are sensitive to abrupt temperature changes.



The column oven temperature during cooling

Designed with the Analyst in Mind

STEP 03

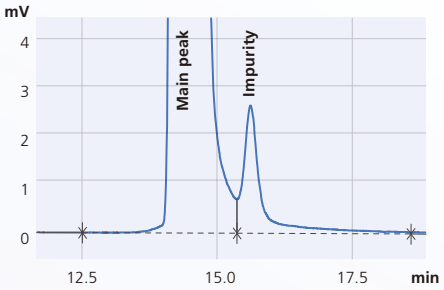
Post-analysis

Process Large Volumes of Data with High Precision in a Single Step

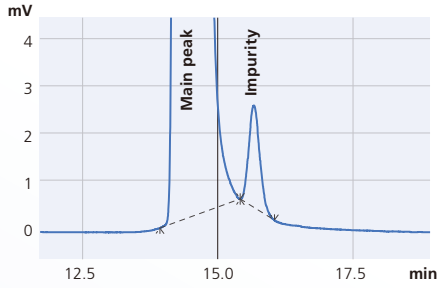
– i-PeakFinder™ Automatic Peak Integration Function –

ANALYTICAL INTELLIGENCE

The manual integration of unresolved peaks is a labor-intensive process and prone to inconsistent results depending upon the experience level of the user. Shimadzu's proprietary i-PeakFinder peak integration algorithm is perfect for such situations. i-PeakFinder processes large volumes of data with high precision in a single step, saving a lot of time and increasing the consistency of results.



Baseline processing with no parameters specified



Baseline processing with complete separation

Compliant with ER/ES Guidelines and Data Integrity

LabSolutions has a variety of functions to ensure compliance with FDA 21 CFR Part 11 and Japanese Ministry of Health, Labour and Welfare guidelines on electronic records and electronic signatures. LabSolutions also includes functions that address and support data integrity.

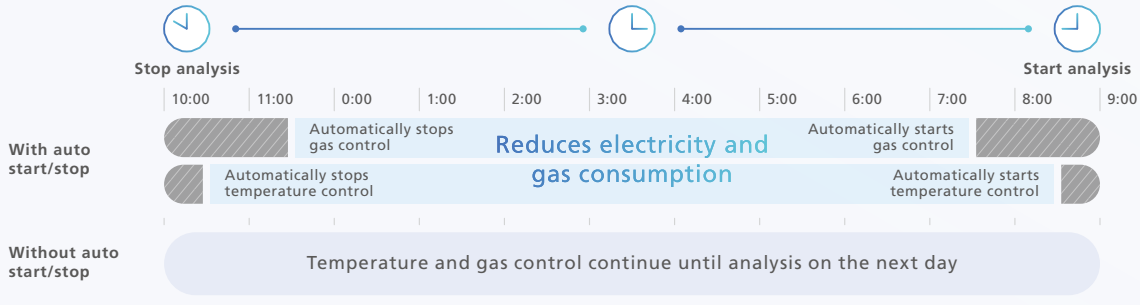
Centralized Management of Data and User Information

Data and user information are managed on a database with restrictions. Fine-grained division of operational restrictions allows optimum user management based on role, such as system administrator, analysis operator, etc.

Analysis Starts Immediately under the Optimal Conditions

– Automatic Start and Stop Functions –

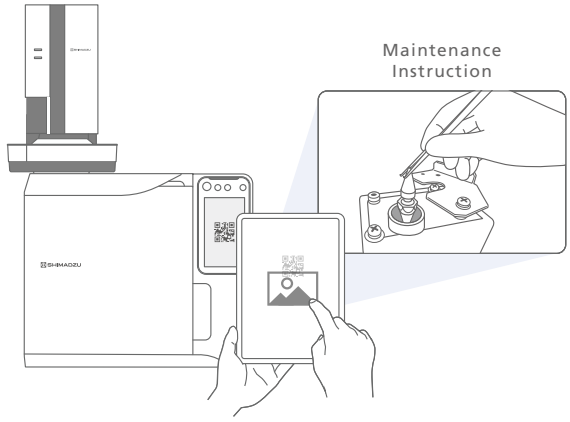
When starting and stopping a GC instrument, time is needed for the utility gas supply, oven temperature, and detectors to stabilize. When the automatic start and stop function is used, the GC automatically controls the gas and temperature, enabling the instrument to start up and shut down even when the operator is not present. In addition, continuous instrument operation is avoided, which minimizes running costs.



Making Routine Analysis More Convenient

2D Code Navigation

Reading a 2D code shown on the touch panel directs the user to a website with instructional videos on maintenance. This feature helps improve system availability and increases efficiency.



Tool-free Column Installation

ClickTek™ connectors (option) make tool-free column installation a snap. The click sensation felt when finished attaching the column provides a more reliable connection and ensures a better seal under all operating conditions. In addition, a light has been installed inside the oven to brightly illuminate the area at hand, easing the burden on the operator when attaching columns.

ClickTek™ and Oven Light

One-touch Inlet Maintenance

The injection port can be opened or closed without tools by simply sliding the ClickTek lever. Replace the insert, slide the lever and feel the click for a leak-free install every time.

ClickTek™ Nut

Preventing Problems and Improving the System Availability Factor

Automatic Notification of Replacement Periods – Monitoring Function –

The Nexis GC-2030 includes various monitoring functions, which remind users when to replace consumables and help ensure data quality.
Power consumption can also be monitored in real time.

Carrier Gas Leak Check Function

Check for leakage of gas from the sample vaporization chamber with a single tap.
Checks can be performed with the column attached as is, thereby speeding up the procedure.

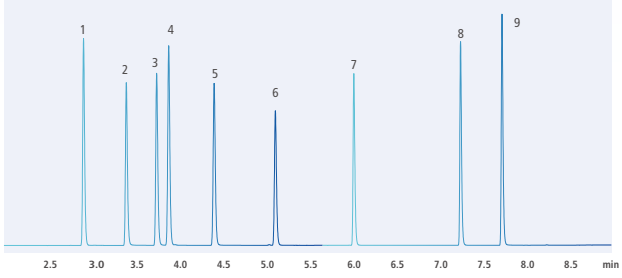
Diagnoses Instrument Operating Status – Self-Diagnostic Function –

The operational status of the instrument can be confirmed using the self-diagnostic (system check) function. Periodic diagnostics help prevent unexpected downtime.

Best-in-class* Sensitivity and Reproducibility

Achieves Exceptional Reproducibility

Nexis GC-2030 provides best-in-class analysis accuracy. Shimadzu's new AOC-30 auto injector automates the analysis, reduces an operator's workload, and enables continuous analysis with a high degree of accuracy that cannot be achieved by manual operation. In addition, an advanced flow controller (AFC) included in the CPU supports carrier gas constant linear velocity control, constant flowrate control, constant pressure control, and various other control modes and achieves exceptionally high reproducibility for ultra-high-speed and ultra-high-precision control modes.



Chromatogram Overdraw (n=10)

1	n-Decane	0.162	6	Methyl nonanoate	0.157
2	n-Octyl alcohol	0.163	7	Methyl decanoate	0.141
3	2,6-Dimethylphenol	0.160	8	Methyl dodecanoate	0.180
4	n-Undecane	0.145	9	Dicyclohexylamine	0.208
5	2,6-Dimethylaniline	0.149			

Area Reproducibility (%RSD)

AOC™-30 Series Autoinjectors

The AOC-30 can automate analyses with up to 150 samples. This not only eases the burden on operators, but also enables high-accuracy consecutive analyses that cannot be achieved manually. Pretreatment just before sample measurement and injection is overlapped, improving throughput during consecutive analyses. Shimadzu's proprietary injection method limits damage to the septum and contamination of the injection port insert, thereby achieving high reproducibility.

Inlets

Split/Splitless Injector (SPL)

- The carrier gas saver function reduces split gas consumption.
- Inactivation options

Direct Injection Unit (WBI)

- Shares and simplifies the glass inserts for splitless analysis (patented).

Programmed Temperature Vaporization Injector (PTV)

- Uses an inert heat-resistant quartz insert.

On-Column Injection Unit (OCI)

- Supports analysis of high-boiling compounds (straight-chain hydrocarbons with 100 or more carbons)

Packed Column Injection Unit (SINJ)

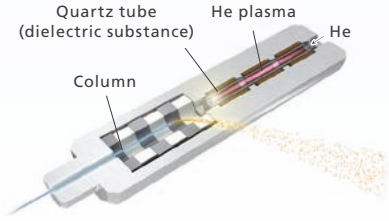
- Glass packed column and SUS packed column can be connected.

* As of July 2021, according to a Shimadzu survey

High-Sensitivity Detectors Support a Wide Variety of Analyses

Barrier Discharge Ionization Detector (BID)

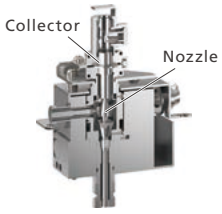
The barrier discharge ionization detector (BID-2030) is a universal detector that offers high-sensitivity analysis by using a low-frequency dielectric barrier discharge plasma for ionization. The BID generates a helium (He) plasma by applying a high voltage to a quartz glass tube. The light energy from the He plasma then ionizes the target components and the ions are collected and output as peaks using a collection electrode. A wide variety of compounds other than He and neon (Ne) are detected with high sensitivity.



Barrier Discharge Ionization Detector
(BID-2030)

Flame Ionization Detector (FID)

The jet and collector structure on the flame ionization detector (FID-2030) has been optimized to provide improved performance. Noise levels were also decreased by improving the stability of the signal processor and flow controller. This results in the world's most sensitive FID*.



Flame Ionization Detector
(FID-2030)

Sulfur Chemiluminescence Detector (SCD)

ANALYTICAL INTELLIGENCE

SCDs are the most sensitive GC detectors for measuring sulfur components. The Nexis SCD-2030 is equipped with an ultra short flow path and high efficiency redox cell, so it provides the world's highest level* of sensitivity and stability.
In addition, detector startup is automated, easing the burden on operators.

Sulfur Chemiluminescence Detector
(SCD-2030)

Other Detectors

Thermal Conductivity Detector (TCD)

- Enables more reliable analysis that is less easily affected by column oven temperature.
- Analysis for inorganic gases and high-concentration organic compounds.

Electron Capture Detector (ECD)

- High sensitivity and a wide dynamic range are achieved by adopting ECD cell structure and purge flowrate optimization, as well as highly durable materials.
- Analysis for electrophilic compounds.

Flame Photometric Detector (FPD)

- A novel optical system with a more advanced dual-focus system results in the world's highest* sensitivity.
- Analysis for organic phosphorus compounds and sulfur
- compounds.

Flame Thermionic Detector (FTD)

- An improved collector reduces the negative peaks from impurity components.
- Collectors can be replaced without tools.
- Analysis for organic nitrogen compounds and organic phosphorus compounds.

* As of July 2021, according to a Shimadzu survey

Exceptional Versatility and Productivity

Simultaneously Control Up to Three Injection Units and Four Detectors

The most optimized system can be selected depending on the purpose of analysis and target components. Four detectors can be controlled simultaneously using LabSolutions.*
In addition, both capillary and packed columns can be attached, so multiple analysis methods can be run with a single GC unit, saving on laboratory space.
* The number of detectors installed depends on the type of detector.

AOC™-30+HS-20 NX (Trap mode) + GCMS-QP2020 NX

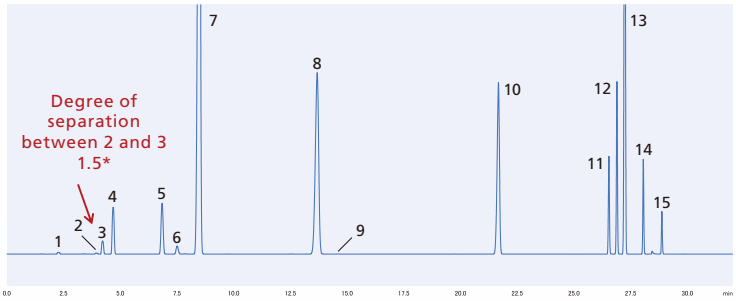
Switching Carrier Gases via a Gas Selector

ANALYTICAL INTELLIGENCE

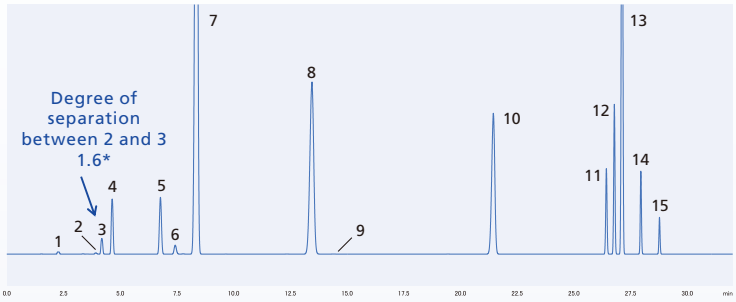
Changing the type of carrier gas involves a great deal of work, including replacement of the piping and gas filters. With the gas selector (option), the carrier gas can be switched via the software, so different analyses can be performed while easily switching the carrier gas.

UPS 467
Carrier Gas Selection in Residual Solvent Tests

The gas species used for analysis are recorded in the acquired data file, ensuring data integrity.



Helium carrier gas



Nitrogen carrier gas

1: Methanol
2: Acetonitrile
3: Methylene chloride (DCM)
4: trans-1,2-Dichloroethylene
5: cis-1,2-Dichloroethylene
6: Tetrahydrofuran
7: Cyclohexane
8: Methyl cyclohexane
9: 1,4-Dioxane
10: Toluene
11: Chlorobenzene
12: Ethylbenzene
13: m,p-Xylene
14: o-Xylene
15: Cumene

Analysis of Water Soluble Solvent Samples

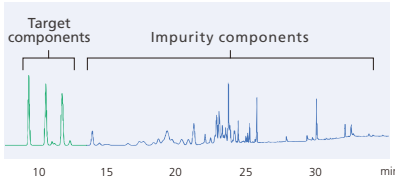
* The degree of separation is a reference value. This is not a guaranteed value.

Advanced Flow Technology

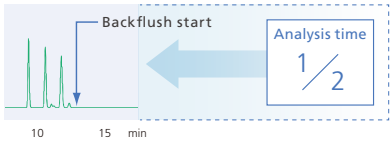
Shorter Analysis Time – Backflush System –

Once target compounds have been detected, the backflush system reverses the carrier gas flow to discharge non-eluting components in the column through the injection port. This shortens analysis times and improves productivity.

Normal Analysis



Backflush Analysis



Multiple Chromatograms Obtained from a Single Analysis – Detector Splitting/Switching System –

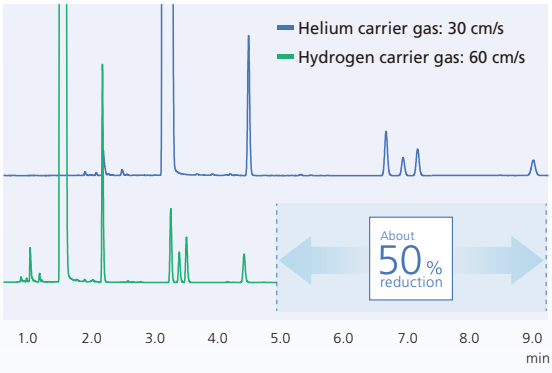
Multiple chromatograms can be obtained at the same time by using the detector splitting/switching system to split or switch the flow exiting the analytical column and send the eluted components to multiple detectors. Consequently, much more information can be obtained from each analysis, which improves productivity by saving time and reducing costs.

High-Separation Analysis – Heart-cut System –

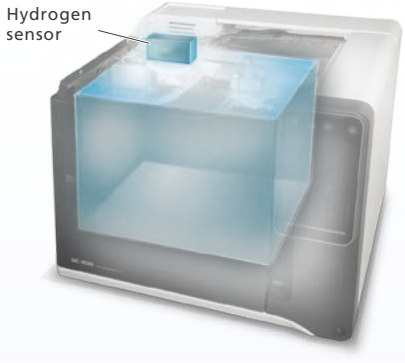
Heart-cut is a method of performing separation using two columns with different selectivity. In this system, components that could not be separated by the first column are introduced into a second column with different properties, and further separation is performed. Heart-cut systems can achieve high-resolution analysis, which is normally difficult to attain by single-column analysis. There is no retention time shift even after multiple heart-cuts.

Faster Analysis with Hydrogen Carrier Gas

Hydrogen can be a safe and highly effective carrier gas. As a highly efficient carrier gas with a flat Van Deemter curve, it maintains its separation efficiency across a wide linear velocity range. This makes it both a good substitute for Helium and also a great choice for speeding up analysis times.
We know safety is paramount, which is why the Nexis GC-2030 offers an optional built-in hydrogen sensor (option). It not only maintains a safe standby mode for early detection of any potential leaks, but also shuts off the hydrogen flow. The main unit also includes an automatic carrier gas leak check function, which is very helpful when using hydrogen as a carrier gas.



Example of Using Hydrogen Carrier Gas for High-Speed Analysis of Impurities in Benzene



Hydrogen Sensor Monitors Inside the GC Oven

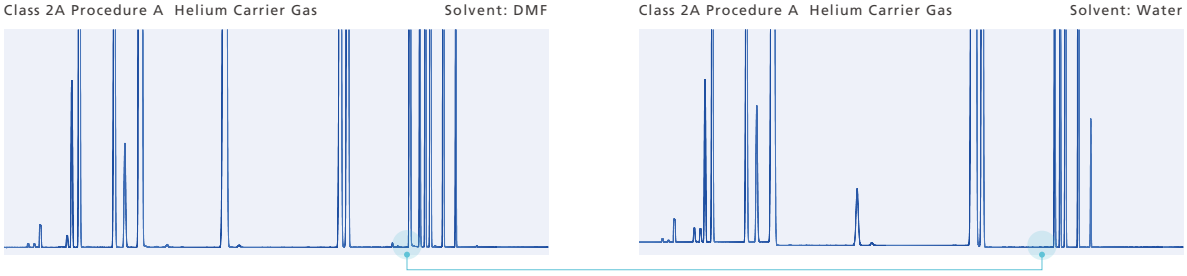
Application Systems Tailored to Your Analytical Requirements

Pharmaceuticals

UPS 467
Analysis of Residual Solvents in Pharmaceuticals

A headspace sampler maintains the sample at a constant temperature and then injects a fixed quantity of the gas phase generated into a GC unit.
It is used for qualitative and quantitative analysis of volatile components in solid or liquid samples. The further strides in performance and user-friendly design of the HS-20 series provide strong support for a wide variety of analyses, from work in research departments to quality control.

Nexis GC-2030 + HS-20 NX (Loop model)



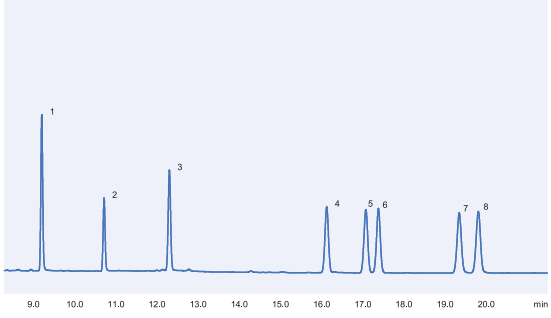
No carryover of DMF

Analysis of Trace Residual Solvents in Pharmaceuticals Using Headspace GC,
Class 2 Standard Solution

Foods

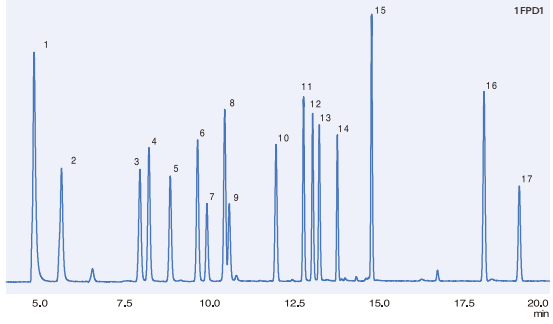
Analysis of Residual Pesticide in Foods

When analyzing residual pesticides in foods, it is advantageous to use a high-sensitivity selective detector. In contrast, an FID, which is suitable for general-purpose applications, is used to comprehensively measure many different pesticides.
Using an ECD/FPD detector configuration provides high-sensitivity analysis of phosphorus, sulfur and halogen while an FID measures a wide variety of pesticides.



Analysis of Chlorinated Pesticides in
Traditional Chinese Medicines via ECD

1 Hexachlorobenzene
2 Quintozene
3 Heptachlor
4 Oxychlordane
5 Heptachlor-2,3-exo-epoxide
6 Heptachlor endo-epoxide
7 trans-Chlordane(γ)
8 cis-Chlordane(α)



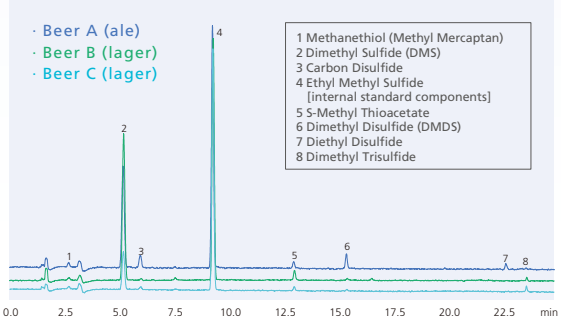
Analysis of Phosphorus Pesticides in Carrots via FPD

1 Omethoate
2 Ethoprophos
3 Phorate
4 Fonofos
5 Diazinon
6 Iprobenfos
7 Chlorpyrifos-methyl
8 Paraoxon
9 Fenitrothion
10 Bromophos
11 Crotoxyphos
12 Disulfoton sulfone
13 Bromophos-ethyl
14 Profenofos
15 Ethion
16 leptophos
17 Pyrazophos

For more Nexis GC-2030 applications, visit our web page:

Analysis of Sulfur Compounds in Beer

Sulfur compounds in beer, which affect the aroma of the beer, can be quantified in the order of ng/mL by combining the headspace injection method and an SCD.



Chromatograms of Three Kinds of Beer

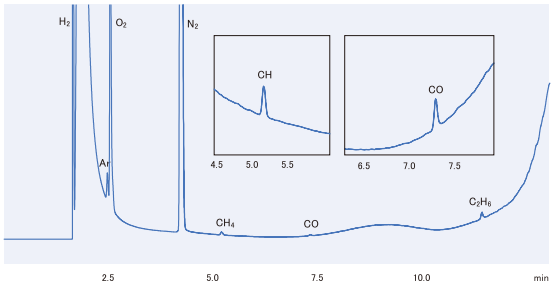
Nexis GC-2030 + SCD-2030 + HS-20 NX (Loop model)

New Energy

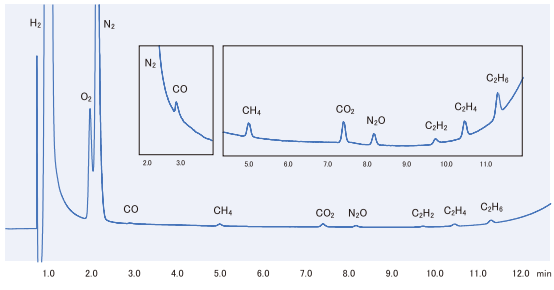
Analysis of Impurities in Hydrogen Gas

Dual BIDs

The Nexis GC-2030 can be equipped with two BIDs. More qualitative information can be obtained from the same sample by attaching columns with different separation characteristics.



O_2: approx. 100 ppm, N_2: approx. 340 ppm,
Other impurities: approx. 0.2 ppm



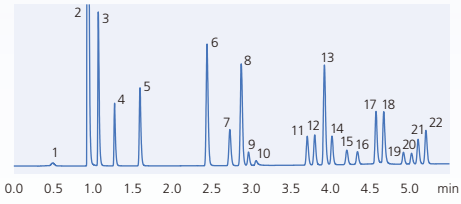
O_2: approx. 25 ppm, N_2: approx. 160 ppm, CO_2: approx. 0.4 ppm,
Other impurities: approx. 0.2 ppm

Simultaneous Analysis of Impurities in Hydrogen

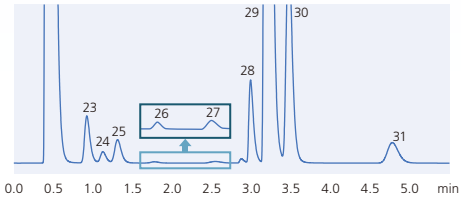
Petrochemical

Refinery Gas Analysis System

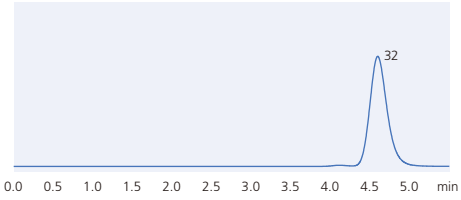
Specialized systems can be configured by installing multiple valves and columns in the standard Nexis GC-2030 installation space. Inorganic gases, hydrocarbons, hydrogen sulfides, and other components can be analyzed within five and a half minutes. Method development is not required because systems are assembled and tested in advance at the factory, prior to arriving at your lab.



Refinery Gas Analysis (FID)



Refinery Gas Analysis (TCD-1)



Refinery Gas Analysis (TCD-2)

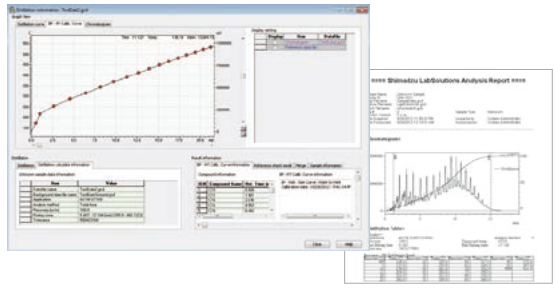
[FID]
1. C_6^+
2. Methane
3. Ethane
4. Ethylene
5. Propane
6. Propylene
7. Isobutane
8. n-Butane
9. Propadien
10. Acetylene
11. *trans*-2-Butene
12. 1-Butene
13. i-Butene
14. *cis*-2-Butene
15. Isopentane
16. n-Pentane
17. 1,3-Butadien
18. Methylacetylene
19. *trans*-2-Pentene
20. 2-Methyl-2-butene
21. 1-Pentene
22. *cis*-2-Pentene

[TCD-1]
23. Carbon dioxide
24. Ethylene
25. Ethane
26. Acetylene
27. Hydrogen sulfide
28. Oxgen
29. Nitrogen
30. Methane
31. Carbon Monoxide

[TCD-2]
32. Hydrogen

Analysis of Simulated Distillation

Simulated Distillation GC Analysis Software integrated with LabSolutions is compliant with ASTM, ISO, and various other standards that specify distillation GC. With high boiling point compounds, sample loss can be minimized by using the OCI-2030 NX injection port.

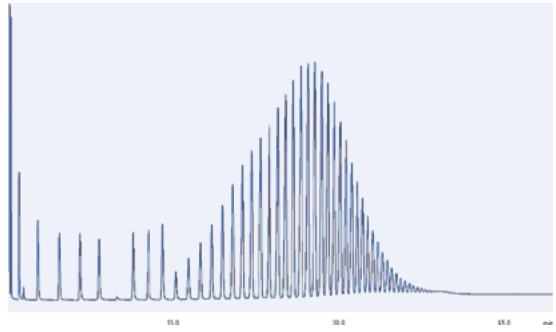


Simulated Distillation GC Analysis Software

Compatibility with Simulated Distillation GC Analysis Software

	Carbon number	Sample
ASTM D 3710,D 7096	n-C_3 to n-C_{15}	Gasoline, naphtha
JIS K 2254	–	Kerosene, diesel
ASTM D 2887 (ISO3924, IP406)	n-C_5 to n-C_{44}	Jet fuel, diesel
ASTM D 6417	n-C_8 to n-C_{60}	Lubricant oil, base oil
ASTM D 7213(Extended D2887)	n-C_7 to n-C_{60}	Lubricant oil, base oil
ASTM D 6352	n-C_{10} to n-C_{90}	Lubricant oil, base oil
ASTM D 7500	n-C_7 to n-C_{100}	Lubricant oil, base oil
EN 15199-1 (IP480, DIN 51435)	n-C_7 to n-C_{120}	Lubricant oil, base oil
ASTM D 5307	to n-C_{44}	Crude oil (internal standard method)
ASTM D 7169, EN 15199-2 (IP 507)	n-C_7 to n-C_{100}	Crude oil (external standard method, up to n-C_{120} for EN)

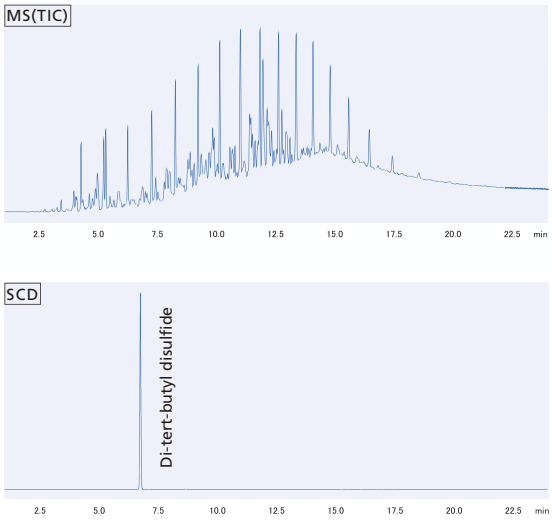
* Please contact Shimadzu representatives for more details of compatibility



Chromatogram of Polywax (ASTM D 7500)

Monitoring Sulfur in Diesel Oil Distillates

Using a detector splitting device with minimal dead volume, it is possible to analyze the components in diesel oil comprehensively with MS, while simultaneously measuring* the sulfur components selectively and with high sensitivity using an SCD.



Simultaneous Analysis of Sulfur Standard Components in Diesel Using GC-MS and SCD

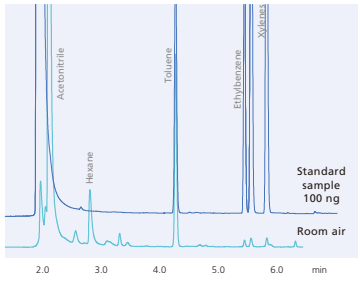
GCMS-QP2020 NX + SCD-2030 + AOC™-30i

* LabSolutions DB GCMS or LabSolutions CS is required to acquire data simultaneously from a GCMS and SCD.

Environment

Analysis of VOCs in Work Environments

Trace components in the air can be concentrated for measurement via thermal desorption. The TD-30 can accommodate up to 120 samples, and thanks to the repeated collection function, if a precious sample is analyzed incorrectly, it can be measured again.



Analysis of VOCs in Work Environments

Nexis™ GC-2030 + TD-30

Coordinating with Compatible Products

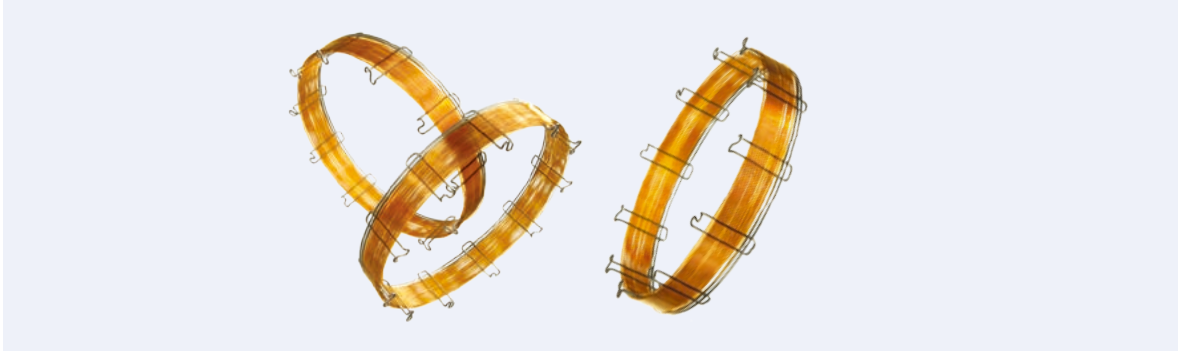
By coordinating with other brands of pretreatment systems, detectors, and analysis software, an application system can be constructed that is compatible with various standards, methods, and regulations.
Examples: MOSH/MOAH analysis; PIONA analysis; analysis of VOCs in water; analysis of gases produced by high polymer materials; and analysis of phthalate esters in flame retardants.

AOC™-6000 Plus Multifunctional Autosampler

EGA/PY-3030D Pyrolizer (Frontier Laboratories)

Consumables

Proven quality consumables are critical to getting the right analysis results and minimizing unexpected downtime. Shimadzu offers a wide range of consumables to maximize the performance of GC/GCMS systems.



SH Series Capillary Columns

An extensive lineup of more than 40 columns provides strong support for your applications.
They are highly inert and feature low bleed.

Shimadzu Super-Clean Gas Filter

This filter removes oxygen, moisture, and hydrocarbons from the utility gas. It features high visibility, and the filter replacement period is easily checked. Replacement requires no tools at all, which simplifies maintenance.

Certificated Quality (CQ) Vial

The Shimadzu CQ vial is a high-quality vial with significantly reduced septa bleed. Analysis with low-quality vials results in incorrect analysis and risks contamination of the equipment and loss of valuable samples. Delivered with quality certificates, the CQ vial ensures performance and always provides reliable results.

Inert Inserts

Both the inserts and wool have been rendered inert, reducing decomposition and adsorption of target components.

Xtra Life Inlet Septum

The unique structure achieves ten times more leak-free analysis than conventional methods and minimizes the amount of septa dust generated repeatedly during injections.

60 years of making gas chromatographs based on technical expertise represented by “Made in Japan”.
Shimadzu Corporation manufactured the first gas chromatograph released in Japan.

Since then, Shimadzu has continued to develop gas chromatography products for over a half-century of Shimadzu’s 140-year history.
This tradition of excellence and quality continues today, with various GC systems available and tailored to meet the needs of most customers.
It represents a combination of the manufacturing spirit and solid technical capabilities of Shimadzu and Japan, backed by the reliability for which “Made in Japan” has become known.

Shimadzu Corporation

www.shimadzu.com/an/