C146-E367A

SHIMADZU
Excellence in Science

Gas Chromatograph Mass Spectrometer

GCMS-QP2020 NX

UFMS
ULTRA FAST MASS SPECTROMETRY

Smart Solutions Expanding the Possibilities of Laboratories to their Fullest Potential

GCMS-QP2020 NX

GC/MS is now a standard analytical technique used in a variety of fields. With each new development, requests for more cost-effective systems and improvements in the work-life balance of users grow. Dedicated to improving efficiency, the GCMS-QP2020 NX can assist any laboratory, regardless of its analysis focus, achieve its full potential.


SHIMADZU
Nexis GC-2030

Smart Performance

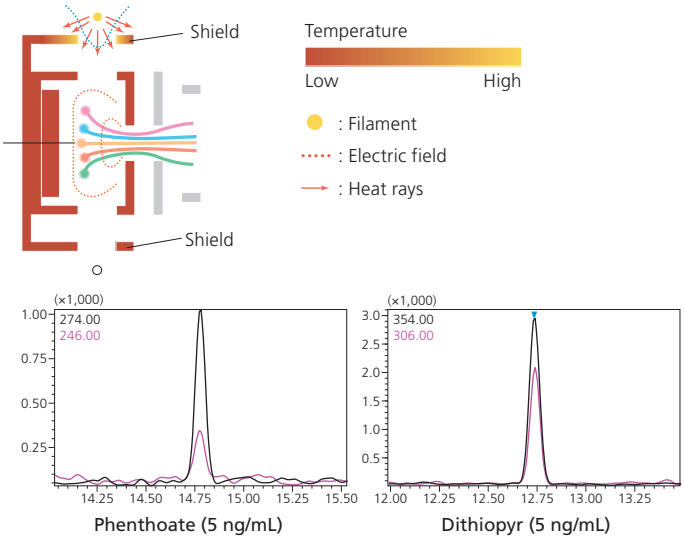
Provides Higher Sensitivity and Reduces Operational Costs

A large-capacity differential exhaust turbomolecular pump and a high-performance flow controller ensure that the utmost in sensitivity is obtained under all conditions used for GC. This sensitivity combined with high-speed analysis capabilities helps maximize laboratory efficiency by reducing analysis times. In addition, the system can be safely operated using carrier gases other than helium, such as hydrogen or nitrogen, thereby reducing operating costs.

Technology Achieves High Sensitivity

Ion Source Featuring High Sensitivity and Long-Term Stability

The filament and the ion source box have been separated, which reduces the impact of the filament potential on the interior of the ion source. In addition, a shield is provided to block radiant heat generated by the filament, achieving a uniform temperature inside the ion source box. Thus, active spots inside the ion source are not prone to occur, enabling high-sensitivity analysis with long-term stability. (Patent: US7939810)



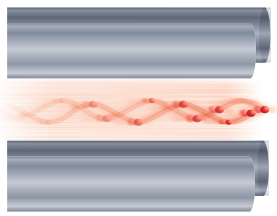
Large-Capacity Differential Exhaust System

Through adoption of a new type of turbomolecular pump with increased exhaust efficiency, the system's performance is greatly improved when using hydrogen or nitrogen, in addition to helium, as the carrier gas. Moreover, a differential exhaust method is used to create a vacuum separately for the ion source and the quadrupole. As a result, an optimal MS state can be realized regardless of the conditions imposed by the carrier gas used.

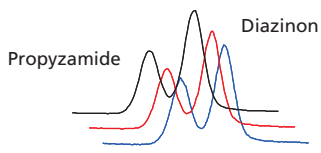
High-Speed Scan Control Technology

Advanced Scanning Speed Protocol (ASSP™)

The rod bias voltage is automatically optimized during high-speed data acquisition, which minimizes sensitivity deterioration during high-speed scans of 10,000 u/sec or faster. The sensitivity obtained is at least five times better than with conventional systems. This is effective for scan data sensitivity improvements and favorable mass spectrum acquisition, particularly in high-speed analysis with Fast-GC/MS, simultaneous Scan/SIM, FASST analysis, and applications using GC × GC-MS. (Patent: US6610979)



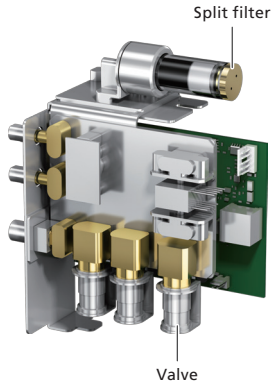
Newly Patented Technology (ASSP)



Black: 1,111 u/sec
Red : 5,000 u/sec
Blue : 10,000 u/sec

New Flow Controller Achieves Exceptional Reproducibility

A new flow controller (AFC) with a CPU uses various control methods to control carrier gas flow to a constant flow speed, flowrate, or pressure. It can also accurately trace the analytical conditions already being used. The split line filter can be replaced without any tools. Internal contamination can be confirmed visually, ensuring filters are replaced at the proper time.



Flow Controller
(AFC-2030)

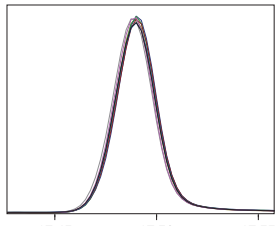
One Touch Inlet Maintenance

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

Advanced GC Oven

The improved temperature control function enables more precise temperature control of the GC oven, which improves the precision of retention time reproducibility. In addition, three oven cooling rate levels can be specified to minimize damage to column liquid phases and maximize the service life.



Mass Chromatogram of Benzo[a]pyrene
(Overlaid plotting of measurements repeated eight times)

	Area value %RSD	Retention time %RSD
Acenaphthylene	0.969	0.005
Fluorene	0.918	0.007
Phenanthrene	1.075	0.006
Anthracene	1.141	0.007
Pyrene	1.263	0.004
Benz[a]anthracene	1.405	0.005
Chrysene	1.283	0.005
Benzo[b]fluoranthene	1.940	0.003
Benzo[k]fluoranthene	1.268	0.003
Benzo[a]pyrene	0.781	0.005
Indeno[1,2,3-cd]pyrene	0.744	0.004
Dibenz[a,h]anthracene	0.836	0.004
Benzo[ghi]perylene	0.767	0.004

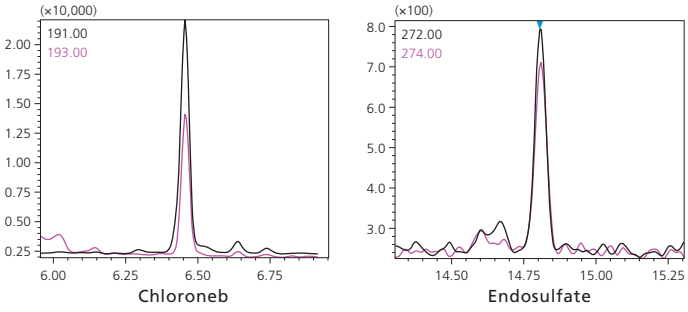
Repeatability with Polycyclic
Aromatic Hydrocarbons (PAHs)

Reduced Operating Costs Using Alternative Carrier Gases

Hydrogen and nitrogen are less expensive than helium and are readily available, so they are attracting attention as alternative carrier gases. The high-performance Advanced Flow Controller (AFC) provides accurate control even with hydrogen and nitrogen. In addition, the new large-capacity differential exhaust system enhances the vacuum performance when hydrogen or nitrogen is used as the carrier gas, so the optimal MS state is achieved under all carrier gas conditions.

Application Example Using Hydrogen as the Carrier Gas

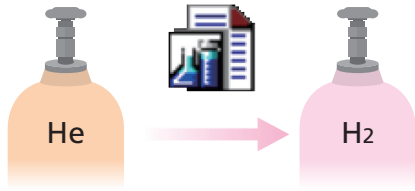
Hydrogen and nitrogen provide less sensitivity than helium. However, chromatogram patterns equivalent to when helium is used can be obtained by using a short column with a narrow internal diameter. EZGC® Method Translator*[1], a method conversion program provided by Restek, can convert the analysis conditions when helium is used to the optimal analysis conditions for the alternative carrier gas.

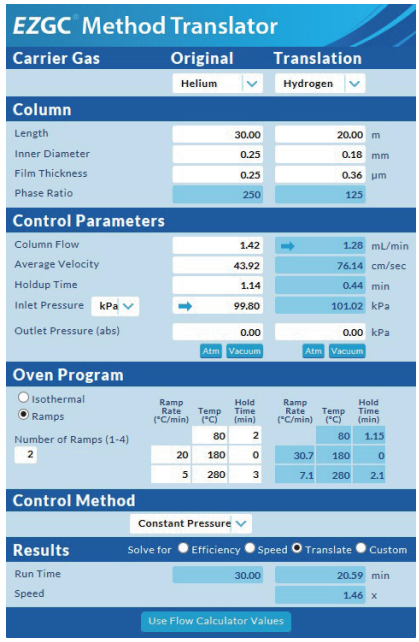


Mass Chromatograms of Pesticides (5 ng/mL, SIM)

The retention indices are essentially unchanged even when the conventionally used analysis conditions are converted for using hydrogen as the carrier gas. Mass spectral libraries containing retention indices and databases provided by Shimadzu should be used.





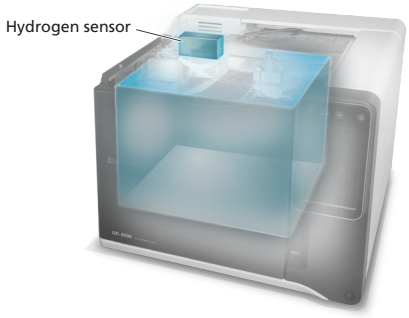


EZGC Method Translator

*1 EZGC is a trademark of Restek Corporation.
For details, refer to the Restek Corporation website.
http://www.restek.com/ezgc-mtfc

Hydrogen Sensor Assures Safety

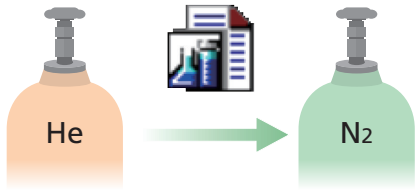
A hydrogen sensor (optional) can be installed inside the GC. By discovering potential leaks in advance, accidents can be prevented. Furthermore, the main unit is equipped with an automatic carrier gas leak checking function, which strongly supports the use of hydrogen as a carrier gas.

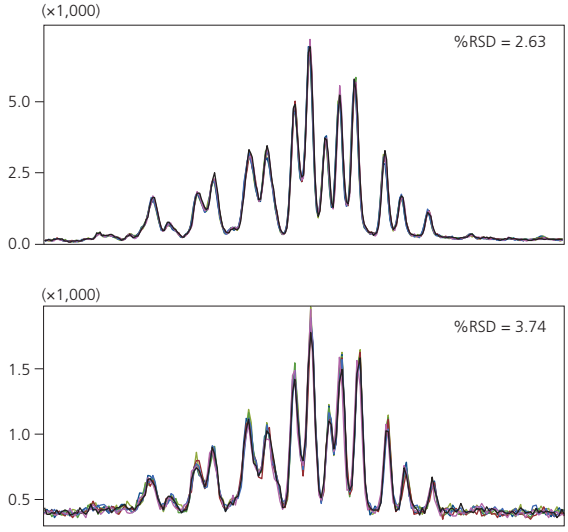


Hydrogen Sensor Monitors Inside of GC Oven

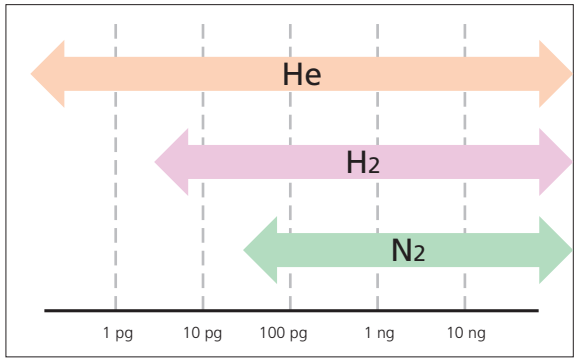
Application Example Using Nitrogen as the Carrier Gas

The use of helium as the carrier gas is a major contributor to instrument operating costs.
Nitrogen is approximately 10 times less expensive than helium, so significant reductions in operating costs can be expected by utilizing nitrogen as the carrier gas.



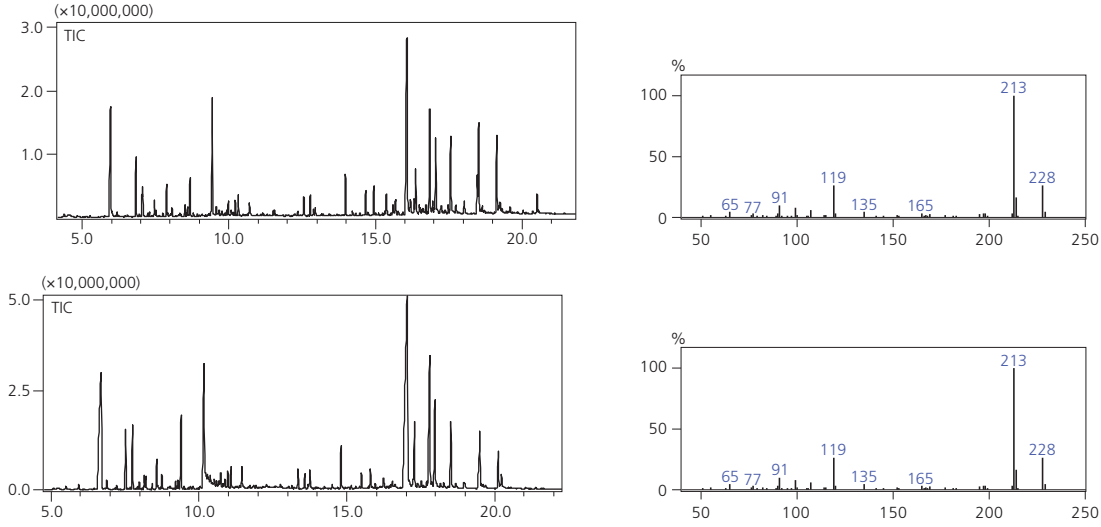


SIM Mass Chromatogram for DINP (0.5 µg/mL, overlay at 7 replicates)
Top: Helium Carrier Gas (99.99%, with gas purification filter)
Bottom: Nitrogen Carrier Gas (99.99%, with gas purification filter)



Indication of Measurement Range for Each Carrier Gas (On-Column Amount)
These measurement ranges are at best only guidelines, and may be unsuitable depending on the target compound sensitivities and the compound characteristics.

Equivalent chromatogram patterns and mass spectra were obtained even though the analysis conditions used with helium as the carrier gas were converted for using nitrogen as the carrier gas. This can be applied for purposes of qualitative analysis including the analysis of evolved gases from polymeric materials.

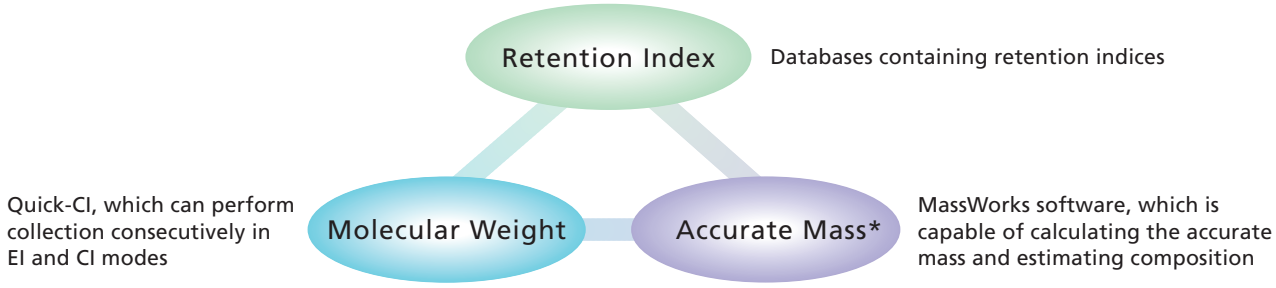


Sample Analysis of the Instantaneous Thermal Decomposition of an Electronic Board Utilizing Py-GC/MS (mass spectrum for bisphenol A)
Top: Helium Carrier Gas (99.99%, with gas purification filter)
Bottom: Nitrogen Carrier Gas (99.99%, with gas purification filter)

Smart Performance

Easily Obtains All the Information Required for Qualitative Analysis

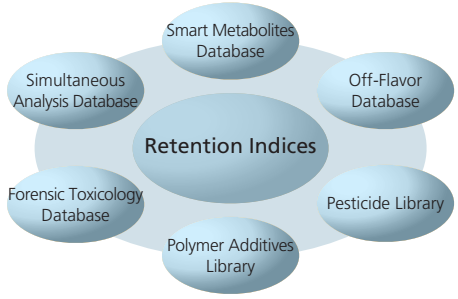
With GC/MS, which has significant qualitative capabilities, a wealth of fragment information is obtained, so it is used as a means of identifying unknown compounds. A mass spectral library is generally used as a means of compound identification. However, experience with compound identification is required if the compound is not registered in the mass spectral library, or there are a number of compounds with similar structures. With the GCMS-QP2020 NX, in addition to the mass spectrum, three kinds of value-added compound information are used in combination to support high-accuracy qualitative analysis.



* Accurate mass refers to the accurate mass calculated mathematically by MassWorks.

Databases Containing High Value-Added Retention Indices

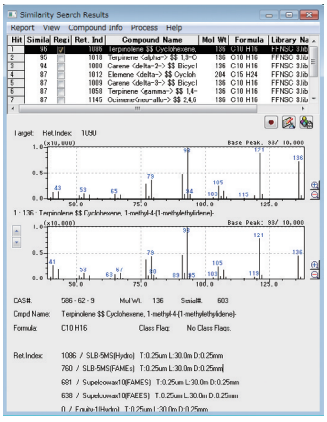
Databases are available with retention indices specific to a variety of application fields, including foods, chemistry, fragrances, forensics, and metabolite component analysis. In addition to mass spectra, searches are performed in combination with retention indices, which are very highly compound specific, so isomers and compounds with similar structures are accurately identified.

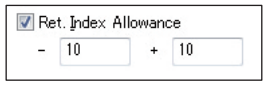


Other Mass Spectra Libraries

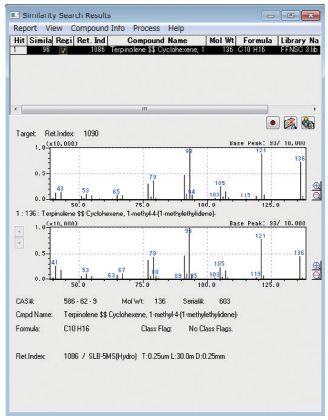
- NIST Mass Spectral Library
  Registered with approx. 306,622 spectra.
- WILEY Mass Spectral Library
  Registered with approx. 775,500 spectra.
- GC/MS MPW DRUG Library
  Drugs, toxicants, pesticides, environmental pollutants (approx. 10,430 compounds)

Up to 10 library files can be configured. In addition to the public NIST and Wiley libraries, a variety of library files can be configured. In addition, there is a function to easily create private libraries.



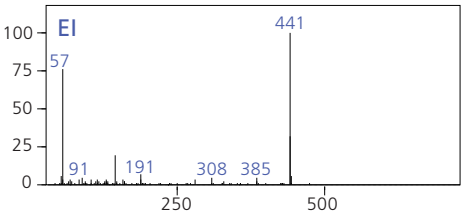


Narrowed by retention index



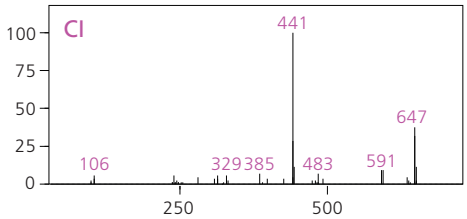
Smart EI/CI Ion Source Easily Switches Between EI and CI Methods

The Smart EI/CI ion source has been developed in order to acquire CI data without switching the ion source, and without losing the sensitivity of EI, which is most commonly used.
Even when it is difficult to perform identification with the EI mode using the mass spectral library, molecular weight information can be obtained from CI data, thus helping in the estimation of unknown compounds.

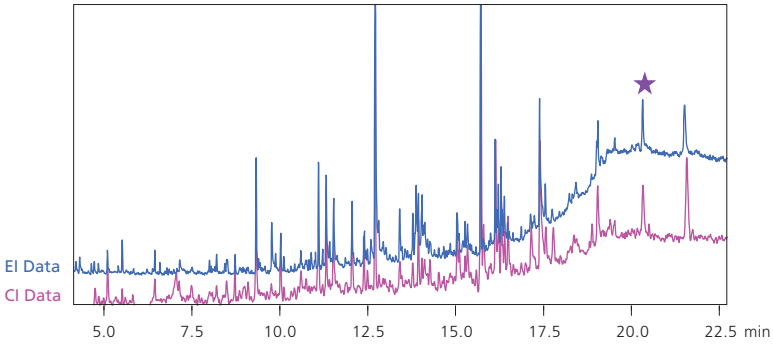


Confirmation of Mass Spectra

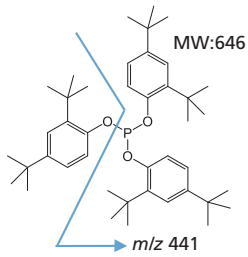
Smart EI/CI Ion Source



Confirmation of Molecular Weight Information



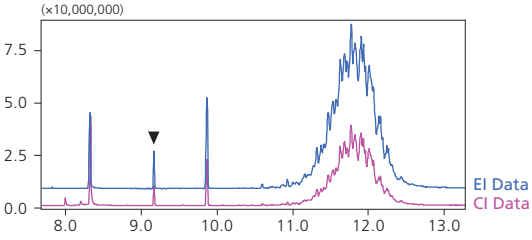
Analysis of Extracts from a Food Container (Extracted using 20% EtOH solution)



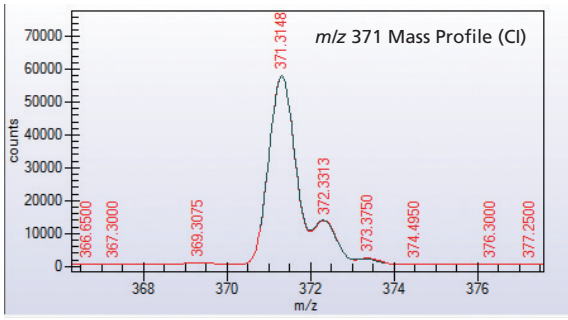
It can be estimated that the peak shown with an asterisk in the graph on the left is Tris (2,4-di-t-butylphenyl) phosphite, which is used as an antioxidant, based on the EI mass spectrum and the molecular weight information provided by CI spectra.

Estimating Composition Using Accurate Mass

The MassWorks software calculates the theoretical accurate mass from the quadrupole MS mass profile. It then outputs candidate compositional formulas based on isotopic ratios and the theoretical accurate mass. This software is useful for estimating the composition of compounds that are not registered in a mass spectral library.
The GCMSsolution™ software can simultaneously output GC/MS data and mass profile data. The majority of compounds detected with the GC/MS data can be identified from a mass spectral library. MassWorks is then used to estimate the composition of any compounds that are not identified, further increasing the quality of the qualitative analysis.



Sample Analysis of Additives in a Polymer



CLIPS Results

	Formula	Mono Isotope	Mass Error (mDa)	Mass Error (PPM)	Spectral Accuracy	RMSE	DBE
1	C22H43O4	371.3156	-0.7863	-2.1176	98.9772	256	1.5
2	C19H50P3	371.3120	2.8124	7.5743	98.7149	321	-3.5
3	C19H48O2PS	371.3107	4.0856	11.0030	97.8758	531	-3.5
4	C19H47O4S	371.3190	-4.1571	-11.1956	97.6479	588	-3.5
5	C19H49O2P2	371.3202	-5.4303	-14.6244	98.8709	282	-3.5
6	C22H44O2P	371.3073	7.4564	20.0811	98.8498	287	1.5
7	C19H49P2S	371.3025	12.3283	33.2017	98.0966	476	-3.5
8	C19H47O2S2	371.3012	13.6014	36.6305	95.1422	1,214	-3.5

It is predicted to be diethylhexyl adipate ($C_{22}H_{42}O_4$) based on the candidate compositional formula and the mass spectral pattern.

Smart Productivity

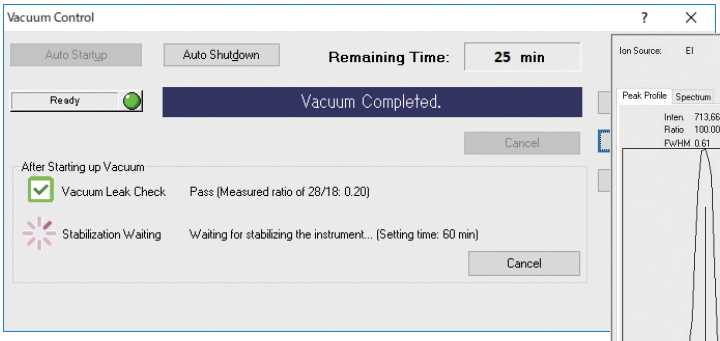
Efficient Operation of the System with Time Management Function

The GCMS is now a standard system for analysts, and a single system can be used for a wide variety of applications. The active time management feature appropriately manages times when the system requires maintenance, or when system changes are being made, or the waiting time for a user when multiple users are waiting to use the system. This ensures more efficient use of the system and greater uptime.

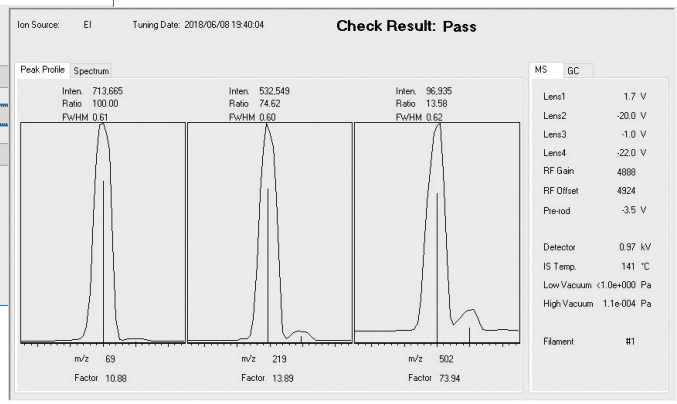
Active-Time Management™ That Accurately Determines Operation Time

Time Management during Instrument Startup/Shutdown

The mass spectrometer has to be operated in a vacuum condition, the startup and stopping of the system takes time depending on the condition. Determining this can be a challenge. Since the amount of time that the system takes when starting up or stopping is displayed in real time, it is easy to accurately determine when maintenance of the ion source or analysis is possible. Moreover, tasks that until now needed to be performed by the user, such as leak checks upon system startup and auto tuning, are now performed automatically.



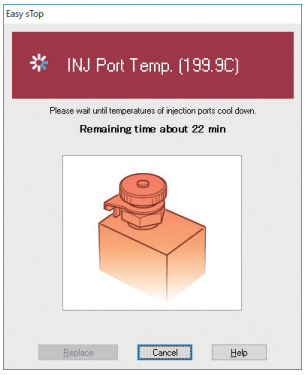
Auto Startup and Shutdown



Auto Tuning Check Result

Time Management during Sample Injection Port Maintenance

The Easy sTop function, used to safely maintain the sample injection port without releasing the vacuum, displays the remaining time (cooling-down time) when the septum or the insert can be replaced in real time. Maintenance time can be minimized by understanding the accurate remaining time.
Furthermore, by using a ClickTek nut on the top of the sample injection port, the port can be opened or closed without tools, by simply using fingers to twist a lever. That enables faster and easier insert replacement than ever before.

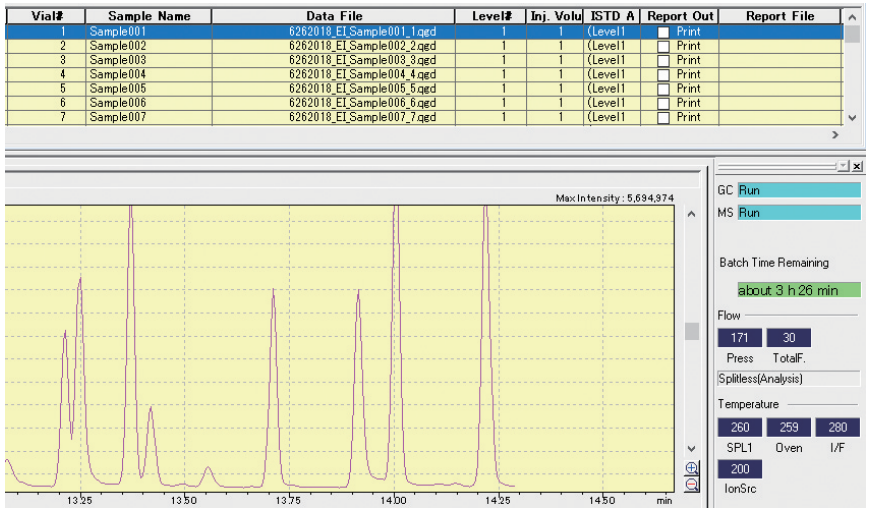


Easy sTop Function

ClickTek Nut

Time Management for Continuous Analysis

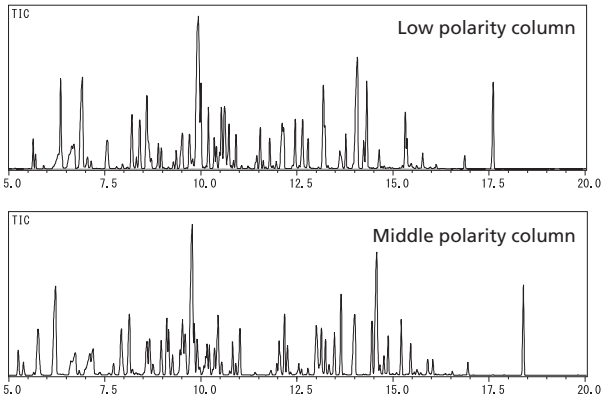
By displaying the time required for continuous analysis in real time, the time when the current continuous analysis will finish can be accurately confirmed. This increases the instrument operating time (active time) by reducing standby time required during continuous analysis or while switching between different users. In addition, because this function makes it easier to schedule the timing for analysis preparations, such as sample preparation and pretreatment, based on the finish time of the previous analysis, it enables analytical processes to be performed more efficiently, which can help improve work-life balance.



Time display for continuous analysis can be used only in liquid injection using AOC-20i.

Twin Line MS System Eliminates the Need to Swap Columns

The GCMS-QP2020 NX is capable of accepting installation of two narrow-bore capillary columns into the MS simultaneously. This allows you to switch applications without physically modifying the column installation. Simply decide which column is best for your analysis and choose the associated injection port.



Analysis of Flavor and Fragrance Components Using Complementary Column Phases

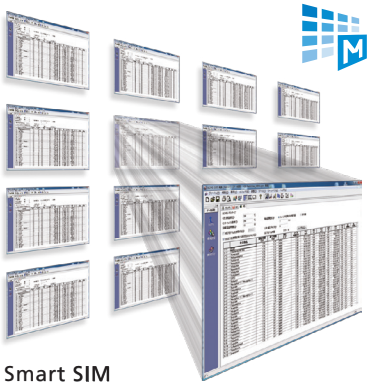
Smart Operation

Dramatic Improvement in the Efficiency of Multicomponent Simultaneous Analysis

The efficiency of multi-component simultaneous analysis is dramatically improved thanks to Smart SIM™, which simplifies and automates the method creation, and LabSolutions Insight™ software, which greatly reduces the time needed for analyzing data. In addition, databases specialized for specific fields are provided, so regardless of the field in which quantitative analysis is to be performed, highly reliable data can be obtained as the result of the optimized analytical conditions.

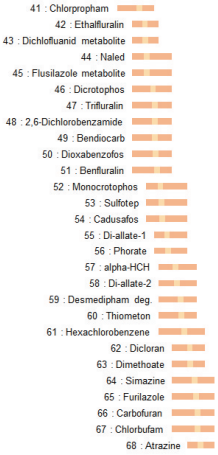
More Convenient Multicomponent Analysis Achieved by Smart SIM

The Smart SIM automatic method creation function automatically configures the SIM program to suit the retention times. Even in cases where there are a number of compounds and they are apportioned to multiple methods, the methods can be integrated while maintaining the sensitivity as is. This significantly reduces the number of analysis cycles and the measurement time, improving productivity.



Smart SIM

The optimal MS table is automatically created



All compound information contained in methods for currently used Shimadzu GC/MS systems can be stored in the database simply by selecting the files.

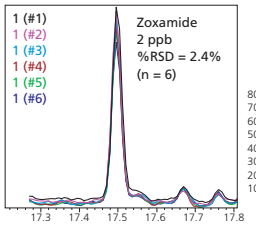
Import

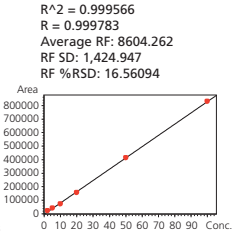
m/z for SIM or Scan

Serial#	Type	Acq. Mode	Method No.	Compound Name (J)	Ion1 Type	Ion1 m/z	Ion1 Ratio	Ion2 Type	Ion2 m/z	Ion2 Ratio	Ion3 Type	Ion3 m/z	Ion3 Ratio	Ion4 Type	Ion4 m/z	Ion4 Ratio
1	Target	SIM	1	Aldicarb deg.	T	115.0	100.00	Ref.1	100.0	98.35		68.0	137.36			
2	Target	SIM	1	DCIP	T	121.0	100.00	Ref.1	77.0	89.47		79.0	73.68			
3	Target	SIM	1	Aldoxycarb deg.	T	68.0	100.00	Ref.1	80.0	15.26		65.0	11.24			
4	Target	SIM	1	Chlofentezine deg.	T	137.0	100.00	Ref.1	139.0	33.20		102.0	38.80			
5	Target	SIM	1	Hymexazol	T	99.0	100.00	Ref.1	71.0	18.40		100.0	4.40			
6	Target	SIM	1	Methamidophos	T	141.0	100.00	Ref.1	94.0	337.84		95.0	208.11			
7	Target	SIM	1	Dichlorvos	T	185.0	100.00	Ref.1	109.0	403.23		220.0	16.13			
8	Target	SIM	1	Nereistoxin	T	70.0	100.00	Ref.1	149.0	51.20		103.0	20.00			
9	Target	SIM	1	Allidochlor	T	138.0	100.00	Ref.1	173.0	6.98		56.0	234.88			
10	Target	SIM	1	Dichlobenil	T	171.0	100.00	Ref.1	173.0	76.00		136.0	22.00			
11	Target	SIM	1	EPTC	T	128.0	100.00	Ref.1	189.0	25.60		132.0	22.40			
12	Target	SIM	1	Biphenyl	T	154.0	100.00	Ref.1	153.0	37.60		152.0	26.00			
13	Target	SIM	1	Butylate	T	146.0	100.00	Ref.1	156.0	93.10		174.0	60.92			
14	Target	SIM	1	Mevinphos	T	127.0	100.00	Ref.1	192.0	31.60		164.0	10.00			

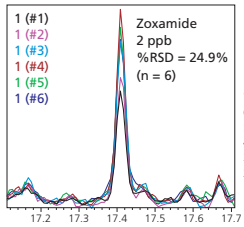
High-sensitivity, high-accuracy analysis is enabled in comparison to the group measurement method. In a batch analysis of 434 components, favorable repeatability and calibration curves were obtained, even down to the trace-quantity region, improving quantitative performance.

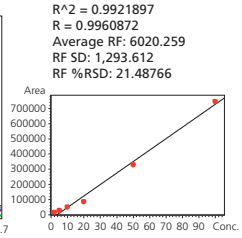
Smart SIM





Conventional Method (Group Measurement)



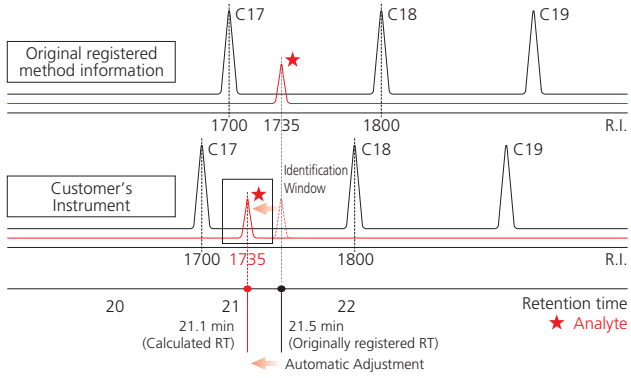


Functions Using Retention Indices

Automatic Adjustment of Compound Retention Time (AART)

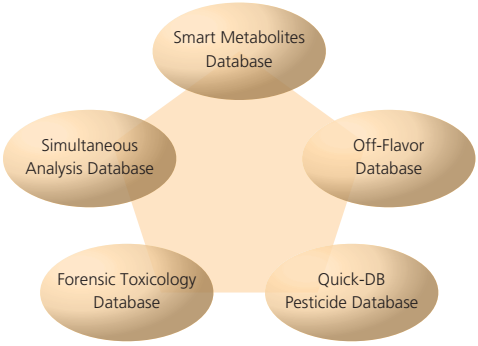
The AART (Automatic Adjustment of Retention Time) function can estimate the retention times of target components from retention indices and the retention times of an alkane standard mix*.

* Requires alkane mix which is sold separately.

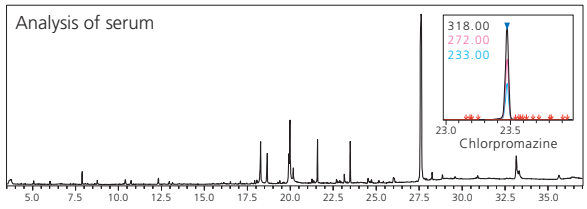


Databases Specific to All Kinds of Industries

Databases are available for a variety of industries, and contain analysis conditions optimized for multicomponent batch analysis. Analysis can start immediately just by automatically correcting the retention times utilizing the AART function.

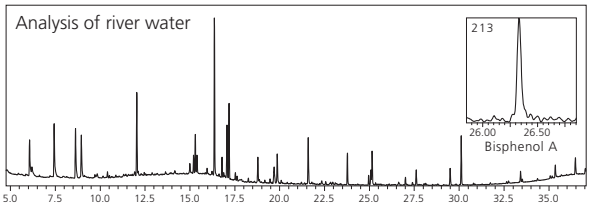


GC/MS Forensic Toxicological Database



It is pre-registered with more than 1400 mass spectra including free-, TMS- and TFA-body types for compounds that are required in forensic toxicological analysis of drugs of abuse, drugs for psychiatric and neurological disease, and other medicines and pesticides.

Compound Composer Database Software for Simultaneous Analysis (Environmental Analysis)

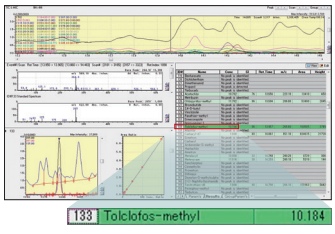


Simultaneous GC/MS analysis supporting identification and quantification of 942 environmental pollutants can be performed.
The retention times and calibration curve information of environmentally hazardous chemical substances are registered, so approximate concentrations can be obtained, even when it is difficult to obtain standards.

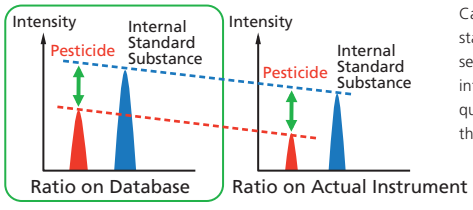
Quantitation Analysis Without Using Standard Samples

Quick-DB™ GC/MS Residual Pesticides Database is preregistered with calibration curves created utilizing pesticide surrogates, enabling quantitative analysis without having to create methods using standards. A total of 474 components (for scan or SIM mode) are contained in the database, enabling the comprehensive quantitative analysis of pesticides.

(Compound Composer Database Software and GC/MS Forensic Toxicological Database also contain this function.)



(Tolclofos-methyl: 10 ng/mL)



Calibration curves of the relative ratio of internal standard substances are preregistered. A semi-quantitative value is acquired by adding an internal standard to a sample. If accurate quantitative values are required, be sure to quantify them using a conventional method.

Multianalyte Data Analysis with More Efficiency Using LabSolutions Insight

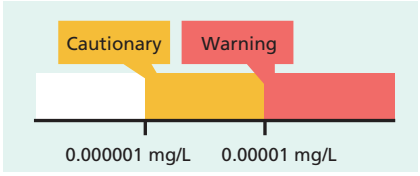
LabSolutions Insight quantitative analysis support software includes functionality for enhancing the throughput of multianalyte data analysis, making it especially helpful for routine analysis. Quantitative results for a series of data sets can be displayed at the same time for data analysis. Chromatograms for each set of sample data can be displayed side-by-side for each compound, making it easy to confirm peak detection and quantitative results. Color-coded flagging functionality makes it easy to quickly see peaks from any of multiple analytes that exceed criteria values. That drastically decreases the number of peaks that need to be checked and improves the efficiency of quantitative analysis processes.

More Efficient Multianalyte Data Analysis

Users can select the optimal method for displaying data based on their workflow. For example, data analysis windows can be displayed for each target compound or each set of measurement data, or quantitation or area values can be displayed as a list. If necessary, quantitative analysis can be repeated with peaks directly corrected, which provides intuitive operability.

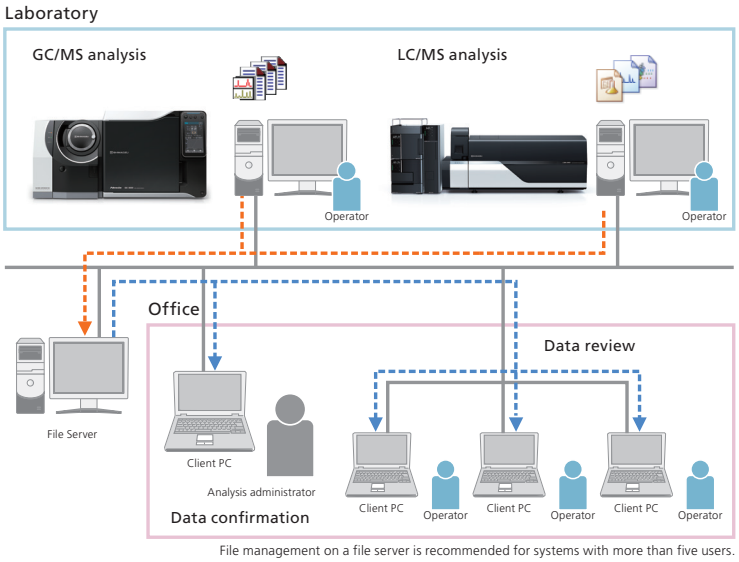
Visualization of Quantitative and Accuracy Control Results

Quantitative and accuracy control results can be presented more clearly by using the flagging function to color-code result values that exceed specified criteria values or by only displaying flagged results. Five levels of criteria values can be indicated for quantitative results, making it easy to confirm the corresponding criteria value range for the detected compounds. Flagging immediately reflects results from any corrections made to manual peak integration or calibration curves.



Network Support

Data acquired from multiple systems can be reviewed or confirmed using client computers connected via a LAN or other network. If multiple systems are used, data obtained from each system can be reviewed from any client computer. Even in the case of multiple analysts using the same system, the ability to separate analytical work from measurement work improves efficiency.



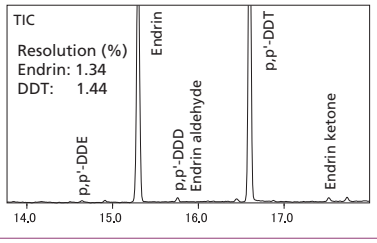
File management on a file server is recommended for systems with more than five users.

Inert Flow Path Achieves High-Sensitivity GC/MS Flow Path

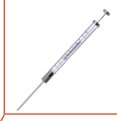
Minimizing adsorption and other losses in the flow path from sample injection to the detector is important for stable, high-sensitivity measurements using GC/MS. The flow lines in the GCMS-QP series and the GCMS-TQ series consist of high-quality, highly reliable consumable parts, so even trace concentrations of components can be detected with high sensitivity and favorable repeatability.

Glass liner

The glass liner recommended for GC/MS analysis uses a proprietary inactivation technology to dramatically suppress active sites. After packing into the insert, the wool is subjected to a complete inactivation treatment. This product is controlled throughout from production to final inspection to provide 100 % satisfaction.



Micro-syringe



Autosampler syringes feature improved durability, clarity, and accuracy, achieving reliable injection accuracy.

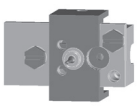
GC septum

Our lineup now includes low bleed septa, which maintain optimal seal performance even when the injection cycles are increased, and can be used even at high temperatures. This reduces sensitivity variations due to leaks.

Ferrules and gold gasket

The high-quality Vespel ferrule is easily attached and designed to resist leaking. The gold gasket is inactive, and adsorption does not occur.

Ion source



Designed with a shield that blocks radiant heat generated by the filament, and an ion source treated with an oxide coating, active spots inside the ion source are not prone to occur, which enables high-sensitivity analysis with long-term stability.

Capillary columns

For the SH-Rxi™ series, a high-quality fused silica like no other is used as the raw material. Our proprietary surface inactivation technology and optimal process to mask silanol groups result in a low-bleed column with very impressive inactivation performance, even with respect to polar compounds comparable to acidic and basic substances.

Configure Optimal Analysis Systems to Meet Your Needs

For GC/MS analysis, different system configurations may be required depending on the application and sample-introduction needs. The GCMS-QP2020 NX offers a wide variety of system configurations and sample-introduction devices to enable an expanded range of applications.

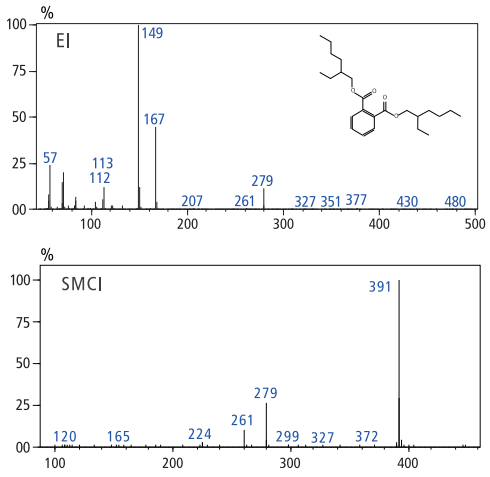
SMCI Unit

SMCI stands for Solvent Mediated Chemical Ionization, a soft ionization method for GCMS. The headspace reagent gas from the sample bottle is introduced into the GCMS ionization unit to be ionized, which then causes chemical ionization (CI) of the target molecule via protonation.* Previous CI methods have required the use of flammable reagent gas cylinders, but SMCI can be carried out with a general organic solvent such as methanol or acetonitrile, together with nitrogen or argon gas. This results in greater safety and lower running costs.

SMCI unit＋GCMS-QP2020 NX

SMCI can obtain the same results as previously-existing CI methods, but is less dependent on the compound. For example, it has been difficult to verify the molecular weight of phthalate esters using EI or previously-existing CI method, whereas SMCI can identify the quasi-molecular ions.

* Patent pending

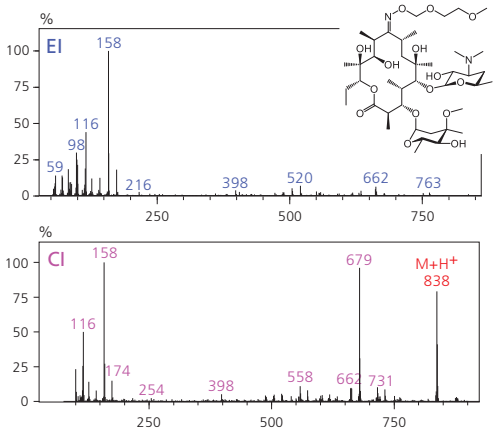


The mass spectrum of bis(2-ethylhexyl) phthalate (MW=390) obtained using different ionization methods

DI-2010 Direct Inlet System

Direct sample injection (DI) is a method in which a sample is injected directly into the ion source without passing through the gas chromatograph (GC). This is an effective method for measuring the mass spectra of synthetic compounds, and can be used easily for the usual GC-MS configuration. By using this in combination with Smart EI/CI ion source, EI and CI mass spectra can easily be collected.

Components that are thermally degradable or difficult to vaporize are not suited to GC analysis. Their mass spectra can be obtained easily using the DI probe.



Mass Spectrum for Antibiotic Roxithromycin

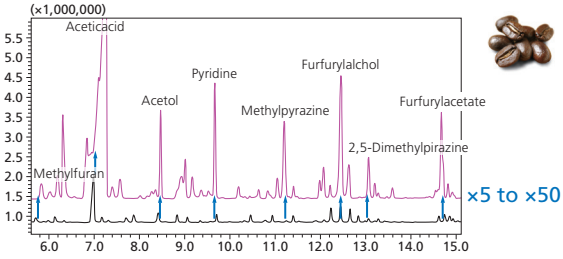
OPTIC-4 Multimode Sample Inlet System

The OPTIC-4 multimode sample inlet is a GC injection port that enables a variety of sample injection modes for GC-MS, including large-quantity injection, inlet derivatization, thermal desorption, and DMI (difficult matrix introduction).
Combining this with an autosampler enables automatic replacement of inserts, improving productivity in multisample analyses.

HS-20 Headspace Analysis System

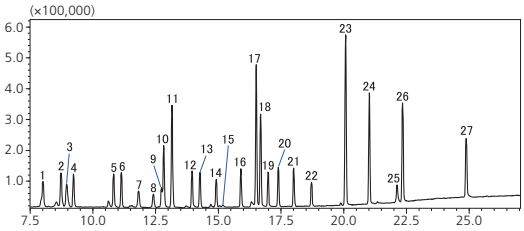
The HS-20 series of headspace samplers provides strong support for all volatile component analyses, for everything from research to quality control.
There is a loop model capable of static headspace analysis, and a trap model capable of trap headspace analysis.

High-Sensitivity Analysis of Fragrant Components in Coffee

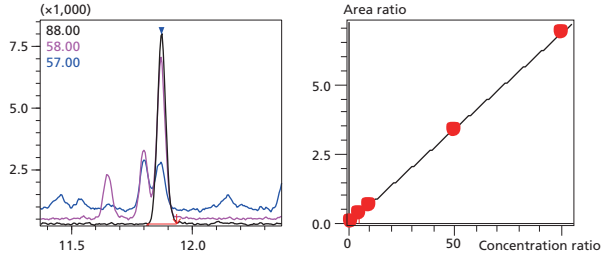


Trace quantities of fragrant components undetectable with conventional headspace samplers can be qualified and quantified by combining the high-sensitivity, electronically cooled trap with GC-MS.

Aqueous VOC Analysis



1. 1,1-dichloroethylene, 2. dichloromethane, 3. MTBE, 4. *trans*-1,2-dichloroethylene, 5. *cis*-1,2-dichloroethylene, 6. chloroform, 7. 1,1,1-trichloroethane, 8. carbon tetrachloride, 9. 1,2-dichloroethane, 10. benzene, 11. fluorobenzene (IS), 12. trichloroethylene, 13. 1,2-dichloropropene, 14. bromodichloromethane, 15. 1,4-dioxane-d8 (IS), 16. 1,4-dioxane, 17. *cis*-1,3-dichloropropene, 18. toluene, 19. *trans*-1,3-dichloropropene, 20. 1,1,2-trichloroethane, 21. tetrachloroethylene, 22. dibromochloromethane, 23. *m*,*p*-xylene, 24. *o*-xylene, 25. bromoform, 26. *p*-bromofluorobenzene (IS), 27. 1,4-dichlorobenzene

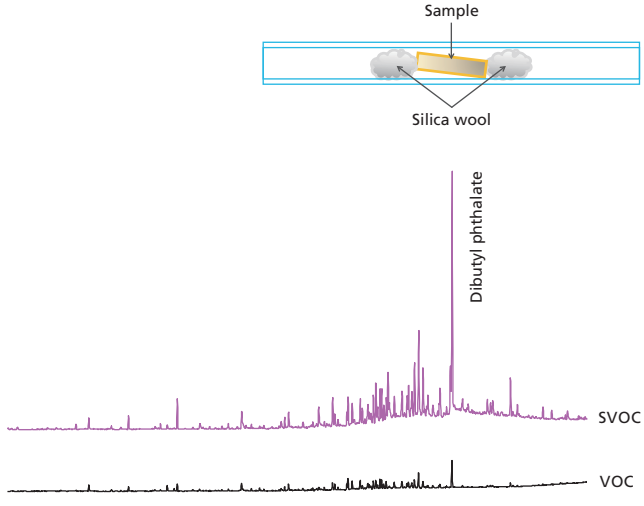


SIM Chromatogram (5 µg/L) and
Calibration Curve (1 to 100 µg/L) of 1,4-Dioxane

Analysis of a trace amount of volatile organic compounds can be performed with the loop mode.

TD-30 Thermal Desorption System

Thermal desorption systems heat samples in a sample tube and then concentrate the thermally desorbed gases before injection into a GC-MS. They are commonly used to measure volatile organic compounds (VOCs) in the atmosphere or measure trace components that are generated from plastic or other samples.
The TD-30R can accommodate 120 samples for excellent processing capacity and offers outstanding expandability, such as functionality for retrapping components or for automatically adding an internal standard substance.

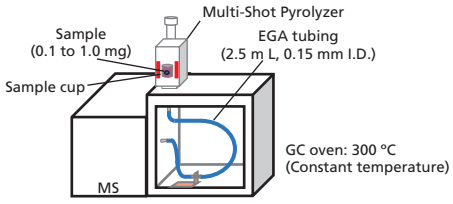


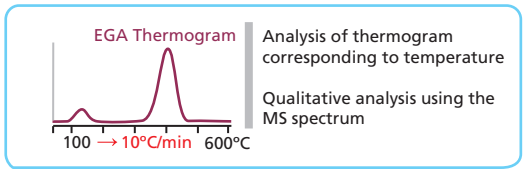
Analysis of Gas Produced by Rubber

Pyrolysis System

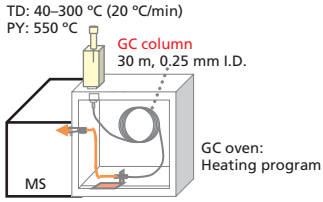
High molecular compounds are subjected to pyrolysis at temperatures of 500 °C or higher, and the obtained pyrolytic products are analyzed with GC and GC-MS. These pyrolytic products reflect the structure of the original high molecular compounds. Accordingly, they enable the identification and higher order structural analysis of the polymers. Search software utilizing a pyrolysis library assists in the identification.

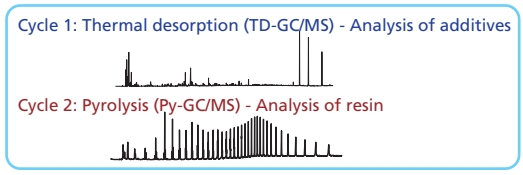
EGA-MS





Single-Shot (Thermal Desorption, TD) Double Shot (Pyrolysis, PY)-GC/MS





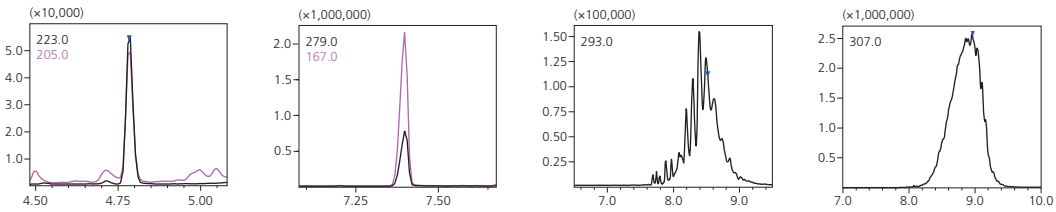
Py-Screener™ Phthalate Ester Screening System

The use of phthalate esters is restricted in toys and food packaging, and they are expected to be classified as restricted substances in the RoHS(II) directives. This system is simple to operate, even for novices. It consists of special software to support a series of procedures from sample preparation to data acquisition, data analysis and maintenance, as well as special standard samples and a sampling toolkit.

Sample Preparation Does Not Require Organic Solvents
Standard samples and test samples can be prepared without using organic solvents.

Standard Samples Containing Phthalate Ester for Py-GC/MS

Preparation of Resin Standard Samples

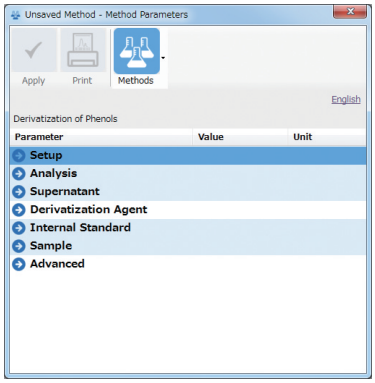


1. DBP: 162 mg/kg
2. DEHP: 2577 mg/kg
3. DINP: 4206 mg/kg
4. DIDP: 138973 mg/kg

Mass Chromatogram of Compounds Detected When Measuring a PVC Cable

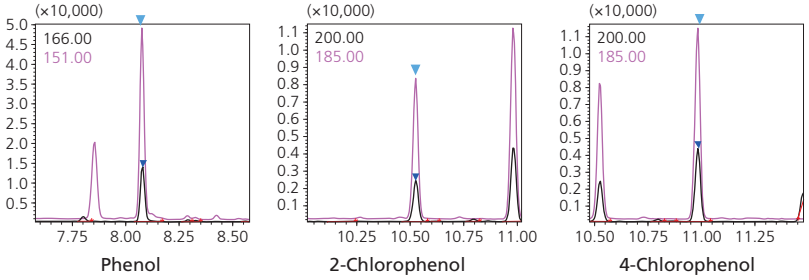
AOC-6000 Multifunctional Autosampler System

This is compatible with three sample introduction methods: liquid injection, HS (headspace) injection, and SPME (solid-phase microextraction) injection. It can be controlled with GCMSsolution software.
The overlap function, which improves the efficiency of continuous analysis, can also be used. Automatic syringe replacement (10 µL to 1000 µL) and a stirring function enable sample dilution, the automatic addition of internal standard substances, and the automatic creation of calibration curve samples.



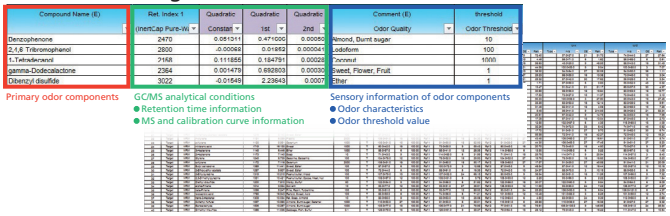
AOC-6000 Control Software

● Automatic derivatization analysis of phenols—Standard solution added water (0.0001 mg/L)



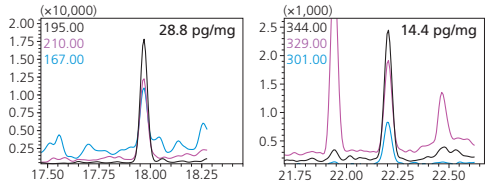
GC/MS Off-Flavor Analyzer

Information Registered in Database



This system combines GC-MS with a database of major odor-causing substances and sensory information (types of smells and odor thresholds). It provides the total solution required for off-flavor analysis.

This product was developed in cooperation with Daiwa Can Company.



Mass Chromatogram of 2,4,6-Trichloroanisole (Left) and 2,4,6-Tribromoanisole (Right) in Food Packaging

Check of the Quality of a Smell

Name	Conc	Unit	Threshold	Description
Benzophenone	2.543	pg/mg	10.000	Almond, Burnt sugar
2,4,6-Tribromophenol	2241.933	pg/mg	100.000	Lodoform

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