GL Sciences

Purge and Trap Concentrator PT7000

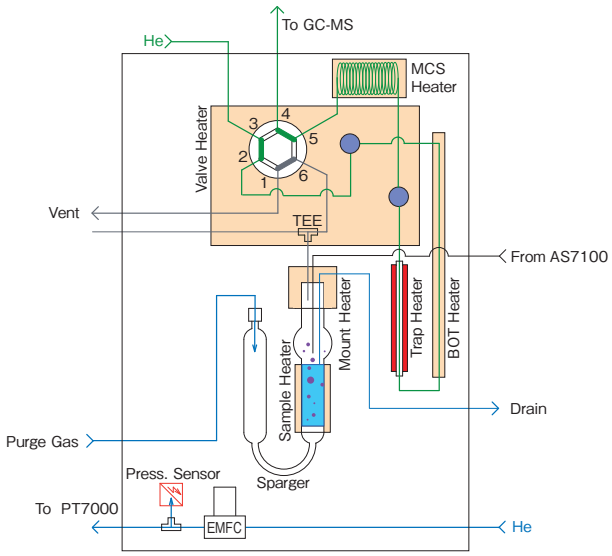
# PT7000


GL Sciences Inc.

# Purge and Trap, the simplest and most accurate method

## Purge and Trap method

Volatile organic compounds are purged from water samples by inert gas, then moved to head space phase, caught and concentrated in a trap tube. After that, the components which are desorbed by rapidly heating the trap tube are introduced into an analysis column. components can be efficiently recovered because they are forced into a head space vapor phase by purging. Therefore, unlike static head space sampling and SPME methods that cause their gas-liquid equilibrium changing by concentration of salt in the sample, dispersion of data due to matrix effects is less likely to occur, and a salting out operation is not required.Purge and Trap method has a very high operational advantage.




## System configuration

**Valve oven**

6-way valve and MCS unit etc. are installed here

**Sample tube**

The sample sent from the autosampler is purged by using an inert gas

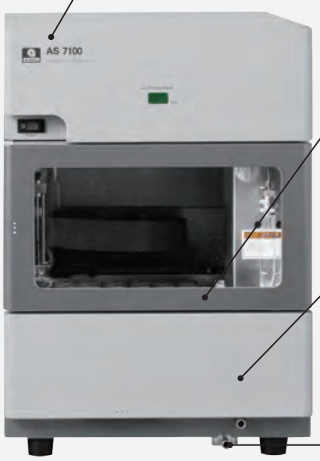
**Status display**

The status of the device is displayed by an LED

**Trap**

components purged are trapped here, then are thermally desorbed and introduced into a GC-MS.


PT7000




AS7100
vial autosampler

**Sample loop**

For weighing samples automatically and accurately.

**Vial tray**

Capable of setting 56 vials for 40 mL or 80 vials for 13 mL.*

**Electric cooling unit**

Standard function of cooling vials.

**Condensation discharge function**

Discharging condensation efficiently even in hot and humid environment.

## Comparison with other methods

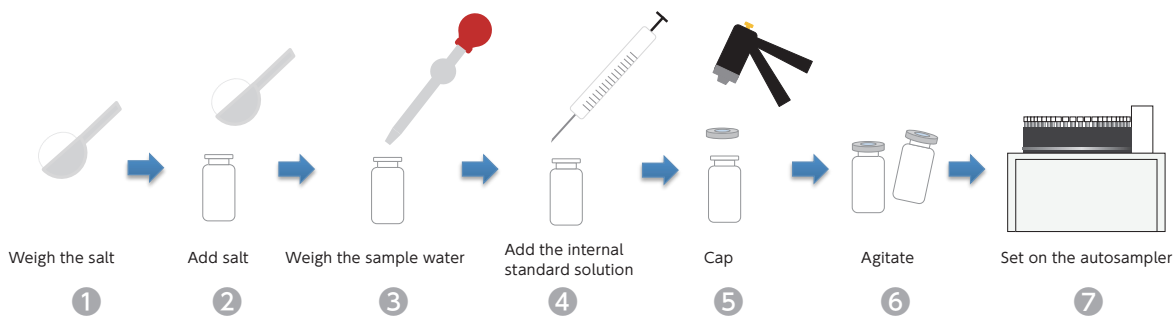
Purge and Trap has a significant operational advantage of fully automated weighing water samples and adding internal standard.Automated process also makes high-precision results without human-error or discrepancy in operation.

**Purge and Trap** | 2 STEP Purge trap method for simple analysis with ease


**Advantages**

1. To sample water, just fill the dedicated vial and secure with a cap.
2. Just set the samples on the autosampler and the analysis is performed automatically.

Head space (HS) method/head space trap (HS-TRAP) method/solid phase micro extraction (SPME) method



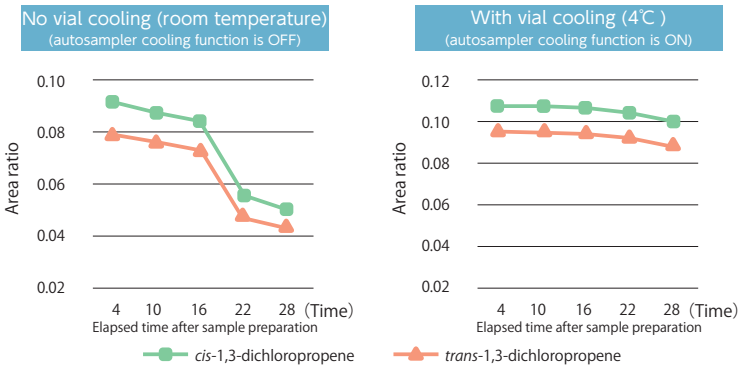

**Disadvantage**

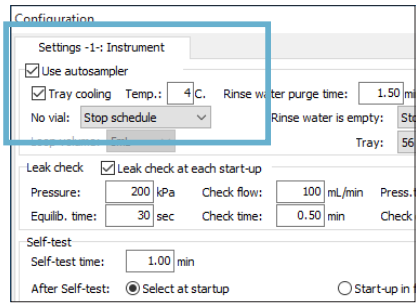
- A significant amount of preparation is required for all water samples, and it is labor-intensive.
- Weighing water samples and adding internal standard are performed manually, which may result in errors.

# Autosampler with various functions

## Built-in thermoelectric cooling

Thermoelectric vial cooling is included in a compact form factor.It is also possible to accurately analyze hydrolysable compound, by cooling the sample water.

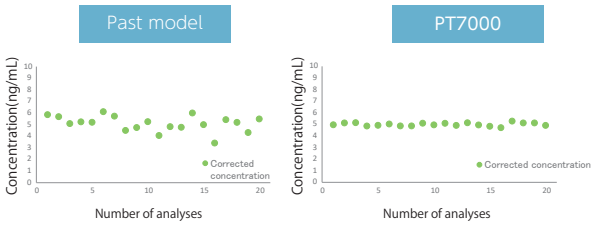



Comparison of the area ratio of 0.5 μg/L for a parallel test (0.1, 0.2, 0.5, 1, 2, 5 and 10 μg /L, 5 repeat measurements) (measured by PT-GC/MS)

## Internal standard solution automatic addition function

An automatic addition function is included which has high accuracy.Enabling accurate automatic addition of an internal standard 1, 4-dioxane-D 8 (Patent pending), complete with full automation of analysis.




Note) Image of concentration corrected by auto-added 1, 4-dioxane-D 8 in Analysis of 1, 4-dioxane

## Vial tray safe loading mechanism

Needles and vials are located internally for safety. In addition, it is possible to add and remove vials at any time even during analysis. During the movement of the needle there is a safety interlock mechanism that prevents the tray from being pulled out.

## 2 types of vials may be used

You can load max. 56 vials, 40mL, in the drawer tray. Also you can load max. 80 vials, 13mL, with the optional tray.

40mL vial

13mL vial

## Condensation discharging mechanism

It is fitted with a condensation discharging mechanism especially useful for humid climates similar to Japan.

## Automatic analysis function of a water blank

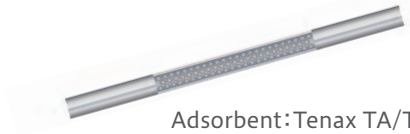
When analyzing a water blank, it can be automatically collected from the rinse bottle into the purge tube. It is not necessary to set a vial (The blank for the calibration curve is set for the vial)

## High-performance Trap

All Volatile organic compounds can be analyzed by one type of trap tube. There is no need to exchange the trap tube for each item.

- Volatile Organic compounds 25 components
- Geosmin, 2-methylisoborneol
- Vinyl chloride (Chloroethylene)
- Materials leaching component
- Epichlorohydrin
- 1,2,3-trichlorobenzene, etc.

**Analyze all of these in one trap tube.**
**No need to exchange the trap tube.**

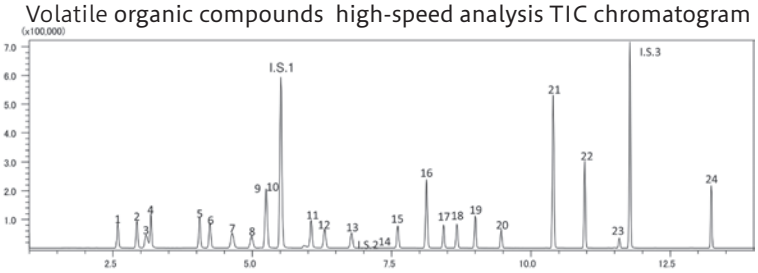


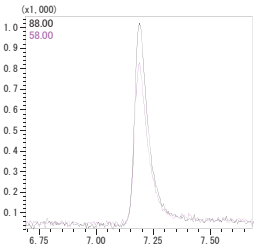
Adsorbent：Tenax TA/Tenax GR

## High-speed, high resolution separation

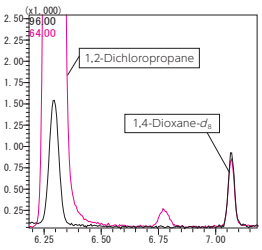
The combination of GC columns with high separation performance allows high-speed analysis of Volatile organic compounds. 1, 2-Dichloropropane and 1, 4-dioxane-D 8 that have the same mass number and are usually difficult to completely separate, can be completely resolved even with high-speed analysis.

Volatile organic compounds high-speed analysis TIC chromatogram




1,4-Dioxane
(5 μg/L)

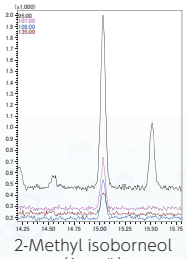



1,2-Dichloropropane (10 μg/L)
1,4-Dioxane-$d_8$ (4 μg/L)

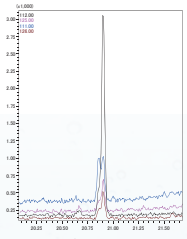
## Super high sensitivity

We have achieved the highest sensitivity in the world by making lines inert thoroughly and optimization of methods. This provides exceptional performance for the analysis of musty smell in water that is difficult to be analyzed with high-sensitivity. Naturally you don’ t need any burdensome operations such as salting-out or cryo-focus.

It is possible to obtain high S/N ratio in simultaneous analysis of Volatile organic compounds including 1, 4-dioxane.



2-Methyl isoborneol
(1 ng/L)



Geosmin
(1 ng/L)

# Features

## Compact design

Both the Purge and Trap device and the autosampler are compact and space-saving designed, because a cooling water circulator is not required.

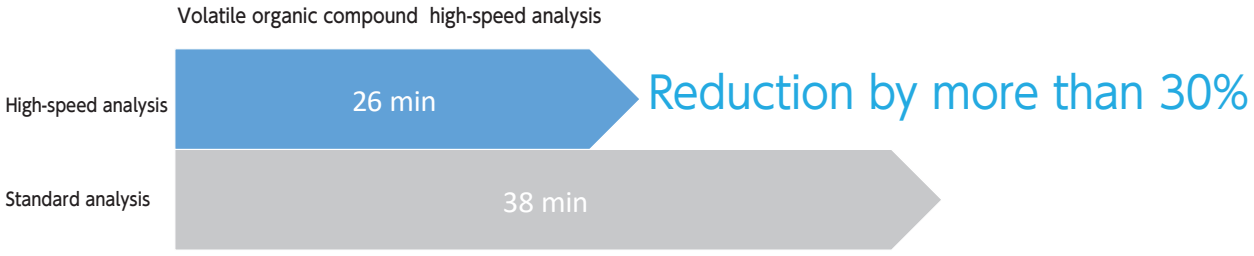
570 mm

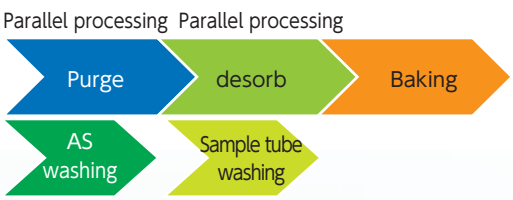
PT7000


Competitor`s products

## Overlapping parallel processing

Because a pressure method is used without the requirement of a syringe drive for water sampling or cleaning of the lines, rapid processing is achieved without unnecessary operations.In addition, the operation of the autosampler and PT main instrument are overlapped to reduce the waiting time for cleaning and to accelerate the analysis cycle.



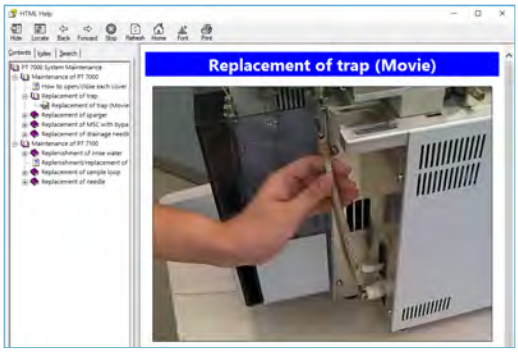




| | Time for 1 analysis |
|---|---|
| Volatile organic compound (high-speed analysis) | Approximately 26 minutes |
| Volatile organic compound | Approximately 38 minutes |
| Musty smell substances | Approximately 33 minutes |

# High maintenance characteristic

## Fully featured help function

A Help function is included that provides information about the procedures for replenishment of rinse water, parts replacement; such as sample tubes and the autosampler needle. Video instructions are included so that anyone can easily maintain the system; even for unskilled operators.




Help video screen

## Easily replace the rinse water

The rinse water can be refilled easily using a dedicated bottle with a special finger tight connector.

Detachable with one touch/single operation.
No need to stop the gas.

## Trap tube　Easy access

Accessible from the front panel (No tool required). The trap tube can be easily exchanged with a wrench. A flexible heater is used, with simple installation and removal.

# Exclusive dedicated software PT Link for maximum operability

PT Link is simple, easy-to-use software that anyone can operate; it can be set-up from a single screen and without any requirement for complex configuration.

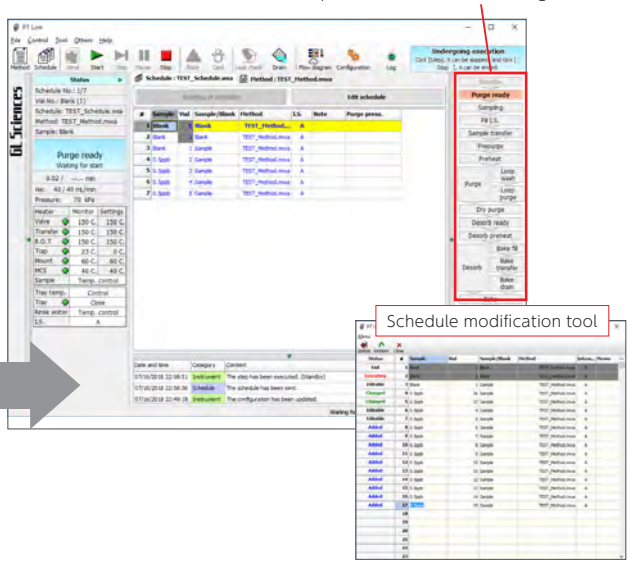
In addition, a rich QA/QC log function supports reliable and accurate operation. Note functions, real-time channel diagram display, scheduling, and vial-specific tools are also included for the highest operability.

## Upgraded schedule setting, which is much easier to use

The convenient scheduling feature makes it easy to enter/edit information, using auto-copy and auto-vial-numbering (increment, copy) functions. In addition, it is possible to schedule the execution up to 560 lines, and these can be added to without interrupting the operation.

※Unlimited number of methods.

You can monitor the complete operating process of the PT7000 at a glance.




## Vial Selection tool

Automatically enter a vial number and method with simple click operation.

It is easy to set replicates for a vial number.

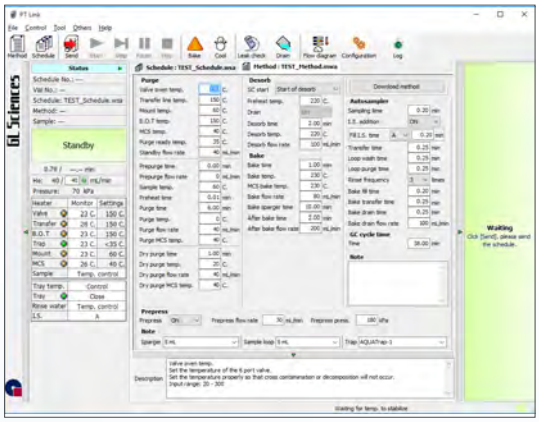
## Simple operation method screen

The method can set-up in one screen, no need to switch tabs.

## Various memo functions

In addition to the conventional memo, a dedicated memo function, "sample tube", "samples loop" and "Trap Tube" are included.

Additional information can be freely recorded when you create a method.

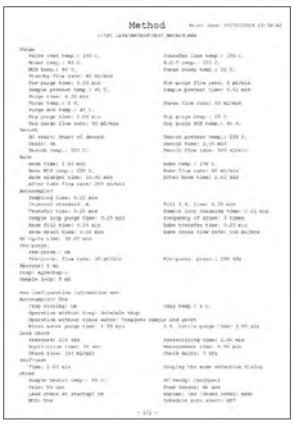


## Customization of the Operation Screen

The status display and process screen can be customized, such as On/Off, position and color scheme.

## Printing function

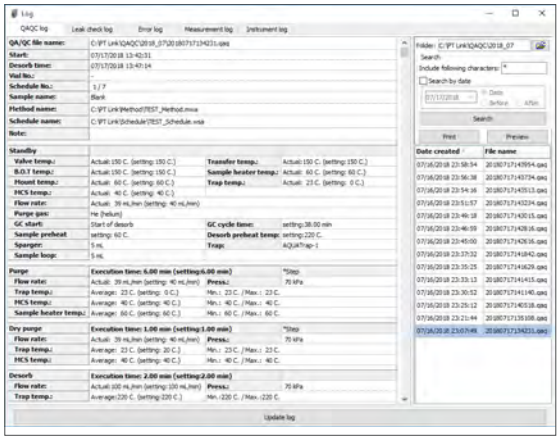
Useful methods for creating reports and schedule printing function have been added.



# Comprehensive log function

An information rich QA/QC log ensures complete confidence in your analysis results.In addition, the leak check log has a detailed record of the start time and pressure record of the leak check, making it easier to manage the status.

QA/QC log screen

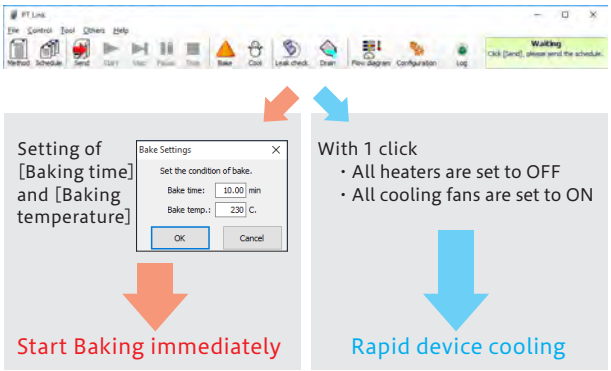


### Other log functions

- Measurement log
- Device log
- Error log
- Leak check log

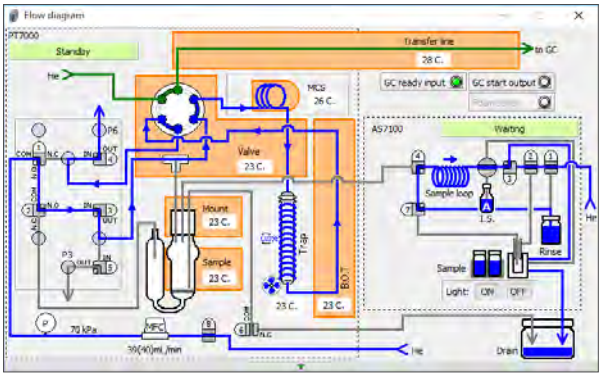
## Direct mode

Each mode may be executed without including baking or cooling methods. Leak check and discharge can be done with just one click. It is not necessary to put another method into the schedule to run it.



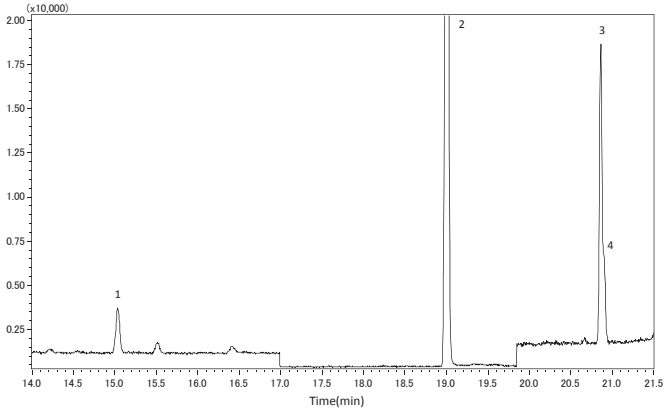

## Real time flow path diagram

The flow path diagram is synchronized in real time with the progress of the process right up to completion of the analysis.
It is easy to monitor the internal function, and if an error occurs, it is possible to quickly identify the location of the problem.

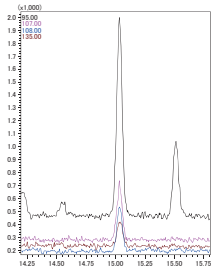


## Geosmin , 2-Methylisoborneol

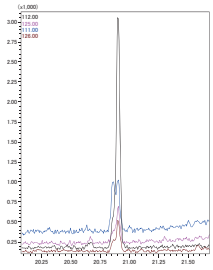
### TIC Chromatogram



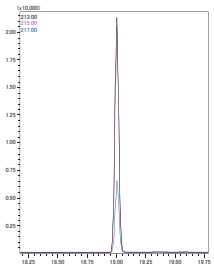

| | | |
|---|---|---|
| System | PT-GC-MS | |
| Trap | AQUA TRAP 1 | |
| Column | InertCap 5MS/Sil (0.25 mm I.D. × 30 m df = 0.50 μm) | |
| Col.Temp. | 60 ℃ (1 min hold) - 4 ℃ /min - 120 - 10 ℃ /min - 170 ℃ - 20 ℃ /min - 220 ℃ (5 min hold) | |
| Carrier Gas | He 120 kPa | |
| Detection | MS SIM | |
| Sample Size | 20 mL | |
| Sample | 1. 2-MIB | (1 ng/L) |
| | 2. 2,4,6-Trichloroanisole-$d_3$ | (20 ng/L) |
| | 3. Geosmin-$d_3$ | (5 ng/L) |
| | 4. Geosmin | (1 ng/L) |



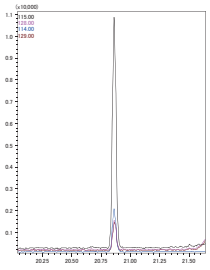
2-MIB
(1 ng/L)



Geosmin
(1 ng/L)



2,4,6 - Trichloroanisole - $d_3$
(20 ng/L)



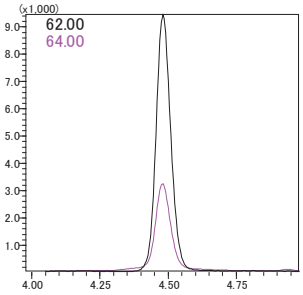
Geosmin - $d_3$
(5 ng/L)

## Chloroethylene and 1,4-Dioxane

### SIM Chromatogram

PT method①

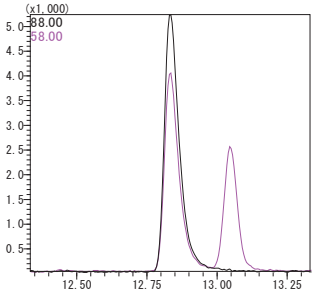
Purge Time : 1 min




Chloroethylene (0.5 μg/L)

PT method②

Purge Time : 18 min

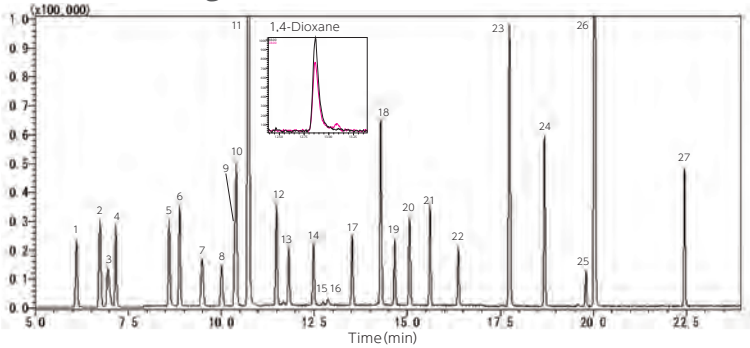



1,4-Dioxane (5 μg/L)

| | |
|---|---|
| System | PT-GC-MS |
| Trap | AQUA TRAP 1 |
| Column | InertCap AQUATIC (0.25 mm I.D. × 60 m df = 1.00 μm) |
| Col.Temp. | 40 ℃ (1 min hold) - 5 ℃ /min - 100 ℃ - 10 ℃ /min - 200 ℃ (10 min hold) |
| Carrier Gas | He 180 kPa |
| Detection | MS SIM |
| Sample Size | 5 mL |

# Volatile organic compound

## TIC Chromatogram




| | |
|---|---|
| System | PT-GC-MS |
| Trap | AQUA TRAP 1 |
| Column | InertCap AQUATIC (0.25 mm I.D. × 60 m df = 1.00 μm) |
| Col.Temp. | 40 ℃ (1 min hold) – 5 ℃ /min – 100 ℃ – 10 ℃/ min – 200 ℃ (10 min hold) |
| Carrier Gas | He 180 kPa |
| Detection | MS SIM |
| Sample Size | 5 mL |

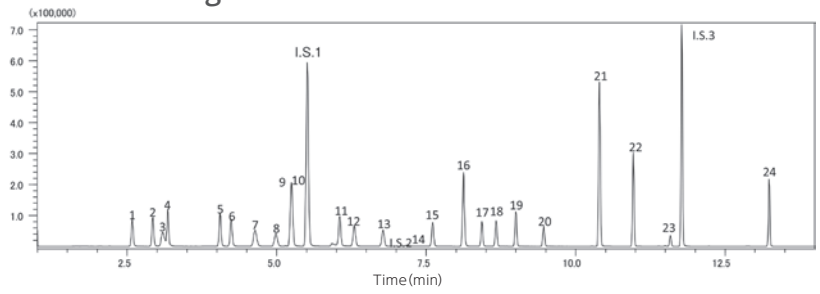
Sample

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 (I.S.)
12. Trichloroethylene
13. 1,2-Dichloropropane
14. Bromodichloromethane
15. 1,4-Dioxane-$d_8$ (I.S.)
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 (I.S.)
27. 1,4-Dichlorobenzene

VOCs (0.5 μg/L each)、1,4-Dioxane (5 μg/L)

# Fast analysis of Volatile organic compound

## TIC Chromatogram



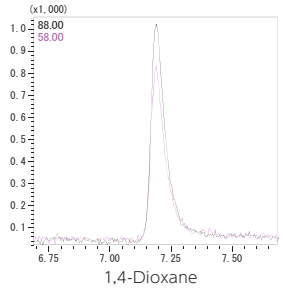

Sample

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. Trichloroethylene
12. 1,2-Dichloropropane
13. Bromodichloromethane
14. 1,4-Dioxane
15. *cis* -1,3-Dichloropropene
16. Toluene
17. *trans* -1,3-Dichloropropene
18. 1,1,2-Trichloroethane
19. Tetrachloroethylene
20. Dibromochloromethane
21. *m,p* -Xylene
22. *o* -Xylene
23. Bromoform
24. 1,4-Dichlorobenzene

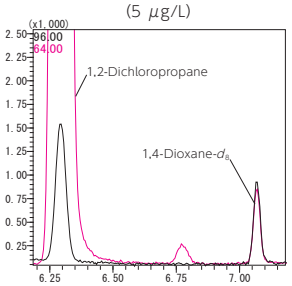
I.S.1 Fluorobenzene (5 μg/L)
I.S.2 1,4-Dioxane-$d_8$ (4 μg/L)
I.S.3 *p* -Bromofluorobenzene (5 μg/L)

VOCs (1 μg/L each)
1,4-Dioxane (10 μg/L)

| | |
|---|---|
| System | PT-GC-MS |
| Trap | AQUA TRAP 1 |
| Column | InertCap AQUATIC (0.25 mm I.D. × 30 m df = 1.00 μm) |
| Col.Temp. | 40 ℃ (1 min hold) – 5 ℃ /min – 70 ℃ – 15 ℃ /min – 200℃ (5 min hold) |
| Carrier Gas | He 100 kPa |
| Detection | MS SIM |
| Sample Size | 5 mL |




1,4-Dioxane
(5 μg/L)



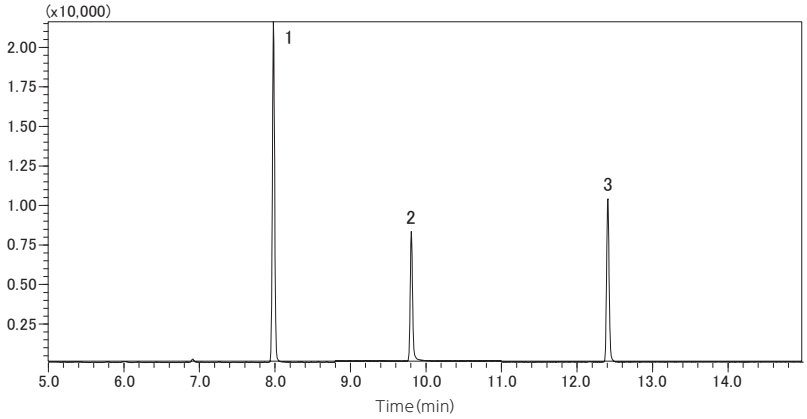

1,2-Dichloropropane (10 μg/L)
1,4-Dioxane-$d_8$ (4 μg/L)

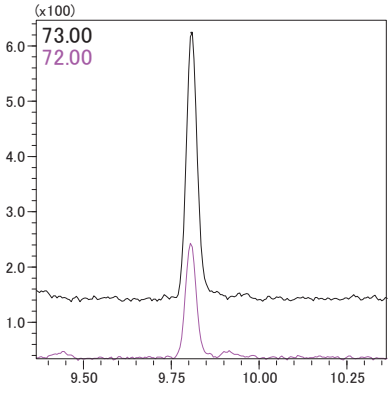
1,2-Dichloropropane (10 μg/L)
1,4-Dioxane-$d_8$ (4 μg/L)

# Applications

## Methyl isothiocyanate

### TIC Chromatogram



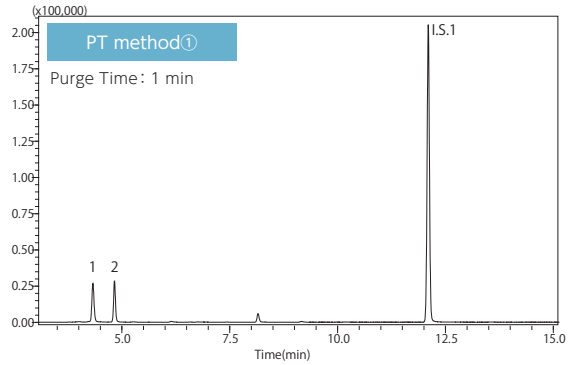



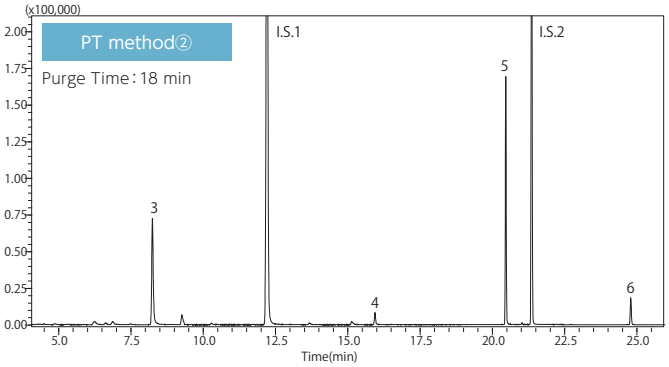

| | |
|---|---|
| System | PT-GC-MS |
| Trap | AQUA TRAP 1 |
| Column | InertCap AQUATIC (0.25 mm I.D. × 60 m df = 1.00 μm) |
| Col.Temp. | 40 ℃(1 min) - 15 ℃ /min - 200 ℃(10 min) |
| Carrier Gas | He 180 kPa |
| Detection | MS SIM |
| Sample Size | 5 mL |

| | | |
|---|---|---|
| Sample | 1. Fluorobenzene | (0.08 μg/L) |
| | 2. MITC | (0.2 μg/L) |
| | 3. *p*-Bromofluorobenzene | (0.08 μg/L) |

## Elution of materials and installations for water supply

### TIC Chromatogram



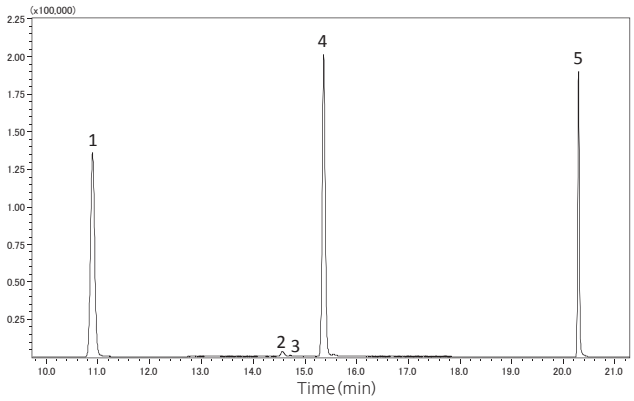



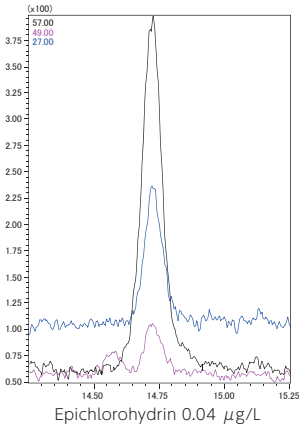

| | |
|---|---|
| System | PT-GC-MS |
| Trap | AQUA TRAP 1 |
| Column | InertCap AQUATIC (0.25 mm I.D. × 60 m df = 1.00 μm) |
| Col.Temp. | 40 ℃ (1 min hold) - 3 ℃ /min - 80 ℃ - 20 ℃ /min- 200 ℃ (10 min hold) |
| Carrier Gas | He 180 kPa |
| Detection | MS SIM |
| Sample Size | 5 mL |

| | | |
|---|---|---|
| Sample | 1. 1,3-Butadiene | (1 μg/L) |
| | 2. 1,2-Butadiene | (1 μg/L) |
| | 3. Vinyl acetate | (1 μg/L) |
| | 4. Epichlorohydrin | (1 μg/L) |
| | 5. Stylene | (1 μg/L) |
| | 6. *N,N*-Dimethylaniline | (1 μg/L) |
| | I.S.1. Fluorobenzene | (5 μg/L) |
| | I.S.2. *p*-Bromofluorobenzene | (5 μg/L) |

# Epichlorohydrin

## TIC Chromatogram



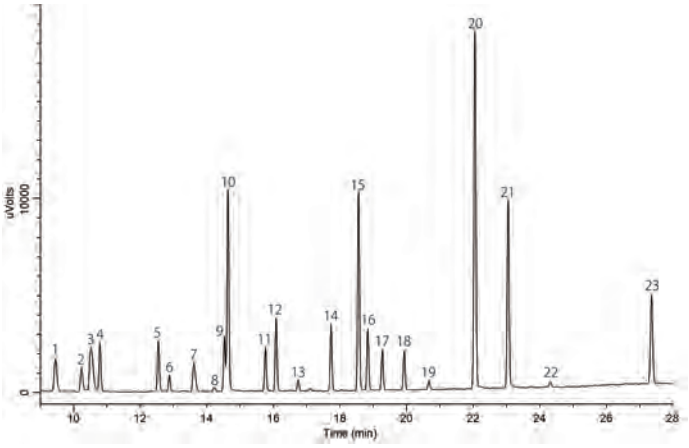




| | |
|---|---|
| System | PT-GC-MS |
| Trap | AQUA TRAP 1 |
| Column | InertCap AQUATIC (0.25 mm I.D. × 60 m df = 1.00 μm) |
| Col.Temp. | 40 ℃(1 min hold) - 3 ℃ /min - 80 ℃ - 20 ℃ /min - 200 ℃(10 min hold) |
| Detection | MS SIM |
| Sample Size | 5 mL |

Sample
1. Fluorobenzene (5 μg/L)
2. Epichlorohydrin-$d_5$ (0.5 μg/L)
3. Epichlorohydrin (0.04 μg/L)
4. Toluene-$d_8$ (0.5 μg/L)
5. *p*-Bromofluorobenzene (5 μg/L)

# Volatile organic compound

## Chromatogram




| | |
|---|---|
| System | PT-GC-FID |
| Trap | AQUA TRAP 1 |
| Column | InertCap AQUATIC (0.25 mm I.D. × 60 m df = 1.00 μm) |
| Oven Temp. | 40 ℃(1 min hold) - 5 ℃ /min - 100 ℃ - 10 ℃ /min - 200 ℃ (5 min hold) |
| Split flow | 5 mL/min |
| Carrier Gas | He 150 kPa |
| Detection | FID 200 ℃ Auto Range |
| Make up gas | $N_2$ 30 mL/min |
| Sample Size | 5 mL |

Sample
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. Trichloroethylene
12. 1,2-Dichloropropane
13. Bromodichloromethane
14. *cis* -1,3-Dichloropropene
15. Toluene
16. *trans* -1,3-Dichloropropene
17. 1,1,2-Trichloroethane
18. Tetrachloroethylene
19. Dibromochloromethane
20. *m,p* -Xylene
21. *o* -Xylene
22. Bromoform
23. *p* - Dichlorobenzene

## AQUA TRAP low blank trap tube

AQUA Trap is an aged trap tube that is optimized for high-sensitivity analysis. It is packed at our factory in Japan, and each lot is carefully managed. Because it has undergone a significant aging process, it is low-blank and can be used immediately after purchase. Since the trap tube used in the PT7000 and the conventional model use a common straight tube type, it is possible to use this trap tube with the conventional model as a common part. In addition, we offer the AQUA TRAP 1 as a common trap for musty smell substances and VOC analysis.

## InertCap™ high separation pre-column

The PT7000 system includes a standard analysis column conforming to the requirements of official standard methods.

### For Volatile organic compound analysis InertCap™ AQUATIC

Liquid phase : 25 % Diphenyl – 75 % Dimethylpolysiloxane
This is a special column developed for the simultaneous analysis of Volatile organic compounds using the Purge and Trap method.Since a cyano group is not used with the liquid phase, as it can cause polarity fluctuations, this column boasts excellent stability and separation of water samples.


### For musty smell analysis InertCap™ 5MS/Sil

Liquid phase : 5 %Diphenyl - 95 % Dimethylpolysiloxane

This is a fine polarity column that achieves excellent separation for the analysis of musty smell substances. Designed specifically for use with high-sensitivity GC-MS; analysis is achieved by improving the heat resistance using an Arylene structure and low bleeding.

## Ice-Free VOC standard sample preparation kit

To support accurate analysis, GL Sciences provides products that are useful for the preparation of certified standard materials and standard samples. The ice-free VOC standard sample preparation kit is a combination of special refrigeration cores and aluminum blocks. The preparation of a standard sample can be done precisely while suppressing the volatility of high-volatility compounds.

# Specification

## PT7000 Purge and Trap Concentrator

| | |
|---|---|
| Sperger | Glass with frit 5 mL , 25 mL |
| Trap | Glass lining stainless , 1/8" O.D. ×12" L , ambient +5 ℃ ～ 350 ℃ |
| GC injection | Split |
| Auto swiching valve | 2 position 6port , ambient+5 ℃ ～ 300 ℃ |
| Log | QA/QC , Leak check , error , analysis , instrument |
| Gas supply | He or $N_2$ , 99.999 % pure , 0.4 ～ 0.6 MPa |
| Sample heater setting range | 20 ～ 100 ℃ |
| Mount heater setting range | 20 ～ 100 ℃ |
| Voltages | AC100 V ±10 % 50/60 Hz |
| Software | PT Link , English/Japanese |
| Operating system | Windows 10 Pro 32 bit/64 bit |
| Dimensions | 220(W) × 500(D) × 480(H)mm *Protruding parts not included |
| Weight | max.18 kg *include cryofocussing unit |

AS7100 Vial autosampler

| | |
|---|---|
| Sample vial | 56 positions(40mL vial) 、80 position (13mL vial,Option) |
| Sample roop volume | 5 mL , 20 mL |
| I.S. injection | 2 bottles , 2 µL |
| Gas supply | He or $N_2$ , 99.999 % pure , 0.4 ～ 0.6 Mpa |
| Cooling system | Electric cooling system , Setting range 3 ～ 15 ℃ , 1 ℃ step |
| Cleaning | Heated blank water |
| Voltages | AC100 V ±10 % 50/60 Hz AC 220 V ± 10 % 50/60 Hz |
| Dimensions | 340(W) × 500(D) × 480(H)mm *Protruding parts not included |
| Weight | 35 kg |

## Condition

| | |
|---|---|
| Temperatures | 18 ～ 27 ℃ |
| Humidity levels | 30 ～ 70 % * |

* : There is no condensation.

GL Sciences

*Everything you need for your critical separation*

Distributors

GL Sciences, Inc. Japan
22-1 Nishishinjuku 6-chome
Shinjuku, Tokyo, 163-1130, Japan
Phone: +81-3-5323-6620
Fax: +81-3-5323-6621
www.glsciences.com
email: world@gls.co.jp

AA665-20200106PDF(KR)