



# VOCs Ultra-low Temperature Pretreatment System

## ——Pre-concentrator/Analyzer

## ➤ Comparison of analytical capabilities of pre-concentrators

	Pre 3900	Pre 4000	Pre 4100
116 factor	√	√	×
Sulfide	√	√	×
34 kinds of ODS	√	√	√
CF <sub>4</sub> & NF <sub>3</sub>	×	×	√

## Pre 3900 Atmospheric Pre-concentrator

The three-stage cold trap design is adopted, and the temperature of the cold trap can be quickly reduced to  $-196^{\circ}\text{C}$  by using liquid nitrogen as a refrigerant. With intelligent algorithm control, the consumption of liquid nitrogen is reduced. All sample streams adopt inertization treatment, suitable for the analysis of trace multi-component VOCs in the atmosphere, and meet the requirements of EPA TO-14A/15A and HJ 759 standards.

### Features

#### Rapid cooling

Liquid nitrogen directly reaches the cold trap, which can quickly cool down to  $-196^{\circ}\text{C}$ . Intelligent temperature control algorithm saves liquid nitrogen consumption.

#### High throughput

The standard configuration is 11 injection positions, and three additional 16-position autosamplers can be configured to support continuous sampling of up to 59 Suma tanks.

#### Wide injection concentration

The sample injection method can be a quantitative loop or a vacuum tank, and the sample volume is 1-1500mL, which is flexibly response to the analysis of ppt-ppm level content samples.

#### Precise sampling control

Using high-precision proportional valve combined with vacuum tank sampling method, there is no need to worry about the sample matrix will affect the sampling volume.

#### Friendly human-computer interaction

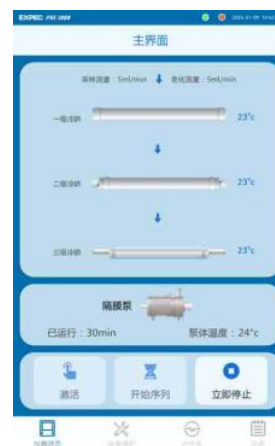
The instrument is designed with a rotating control screen, which is convenient for viewing the real-time status of the instrument and for quick inspection of leakage, system cleaning, etc.

#### Analytical efficiency

Automatic calculation of aging, cooling, GC waiting time, single analysis process 30min.



Pre 3900 Atmospheric Pre-concentrator



Control screen interface

### Application range

"Canister Sampling/Gas Chromatography-Mass Spectrometry for the Determination of Volatile Organic Compounds in Ambient Air" (HJ 759-2015)

"Technical Requirements and Detection Methods for Continuous Monitoring System of Volatile Organic Compounds in Ambient Air by Gas Chromatography" (HJ 1010-2018)

"Determination of Eight Kinds of Sulfur-Containing Organic Compounds such as Methyl Mercaptan in Stationary Pollution Source Waste Gas Bag Sampling-Preconcentration/Gas Chromatography-Mass Spectrometry" (HJ 1078-2019)

"Technical Specifications for Manual Monitoring of Ozone Depleting Substances and Fluorinated Greenhouse Gases in Ambient Air"

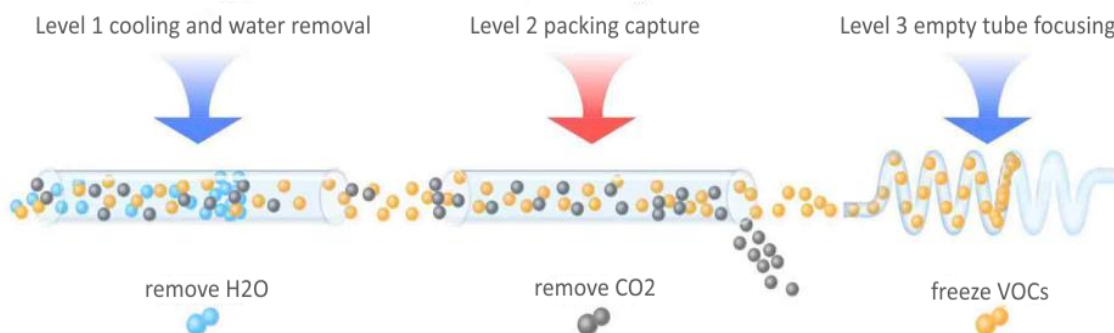
## Pre 4000 Atmospheric Pre-concentrator

The atmospheric pre-concentrator adopts Stirling refrigeration technology, no need to consume liquid nitrogen, and the low temperature reaches  $-180^{\circ}\text{C}$ , compatible with online analysis and laboratory analysis. The pre-concentrator removes water, enriches and concentrates VOCs, and performs rapid desorption and splitless injection after low-temperature focusing. It has the advantages of low peak broadening and high sensitivity, Meet ambient air 116 factor analysis, odor factor analysis, analysis of characteristic pollutants in industrial parks, etc.



Pre 4000 Atmospheric Pre-concentrator

### Product Principle



### Stirling refrigeration technology

#### No need for liquid nitrogen

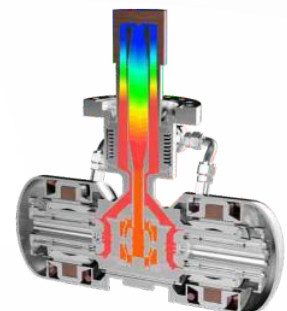
Free of daily maintenance, ready to use, saving the time and cost of preparing liquid nitrogen. No Dewar tank depressurization popping noise.

#### Extremely high temperature

When the low temperature limit reaches  $-200^{\circ}\text{C}$ , the cooling capacity is 10W, which is enough to meet the cooling requirements of the cold trap and achieve the effect of freezing VOCs with liquid nitrogen.

#### Low energy consumption

Follow the Carnot cycle, high energy conversion rate, more environmentally friendly and energy-saving.



## Pre 4000 Atmospheric Pre-concentrator

### Features

#### CO<sub>2</sub>&H<sub>2</sub>O Management technology

The primary cold trap removes water at low temperature without loss of VOCs, and the secondary cold trap has special packing, which effectively removes CO<sub>2</sub>, O<sub>2</sub> and N<sub>2</sub> while trapping VOCs.

#### Accurate sampling technology

The combination of high-precision mass flowmeter and diaphragm vacuum pump is used. Compared with the pressure control sampling method, it has the advantages of large sampling volume, unaffected by ambient temperature, and more accurate.

#### Three-level technology with multiple measures

The third stage is a capillary empty tube at -180°C. Low temperature realizes high-efficiency focusing, empty tube realizes micro-flow desorption, unique closed rotary valve technology, while both ends of the closed cold trap are heated and inlet pressurized, splitless pulse injection during desorption, low band broadening, high sensitivity.

#### Automated system leak detection

The atmospheric pre-concentrator can detect leaks in the system by means of pressurization or vacuum to ensure the airtightness of the system. The whole process is completed automatically, and the system prompts the leak detection result.

#### Flexible internal standard injection

Large-volume low-concentration internal standard gas can be used; it can also be directly connected to high-concentration internal standard steel cylinders, and the volume can be determined by quantitative ring, eliminating the trouble of standard gas dilution, and the accuracy is  $\leq \pm 2\%$ .

#### Friendly intelligent software

Can switch between laboratory sequence mode and online timing mode; automatically record the temperature, pressure and flow running trend graph of each sample for traceability; when running abnormally, SMS will report to the user.

### Application range

"Determination of 65 Volatile Organic Compounds in Ambient Air by Tank Sampling/Gas Chromatography-Mass Spectrometry" (HJ 759-2023)

"Technical Requirements and Detection Methods for Continuous Monitoring System of Volatile Organic Compounds in Ambient Air by Gas Chromatography" (HJ 1010-2018)

"Determination of Eight Kinds of Sulfur-Containing Organic Compounds such as Methyl Mercaptan in Stationary Pollution Source Waste Gas Bag Sampling-Preconcentration/Gas Chromatography-Mass Spectrometry" (HJ 1078-2019)

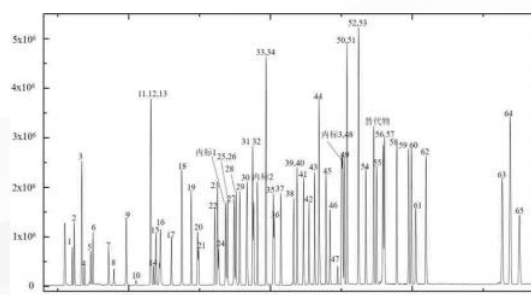
"Technical Specifications for Manual Monitoring of Ozone Depleting Substances and Fluorinated Greenhouse Gases in Ambient Air"

### Application cases

#### 65 kinds of VOCs analysis in HJ 759-2023

The latest HJ 759-2023 standard adds refrigeration methods other than liquid nitrogen. The atmospheric pre-concentrator adopts the innovative Stirling refrigeration technology without consuming liquid nitrogen, which not only meets Standard requirements, and easy to operate, high sensitivity, sharp peak shape, and lower using cost.

The specific analysis spectrum is shown on the right:



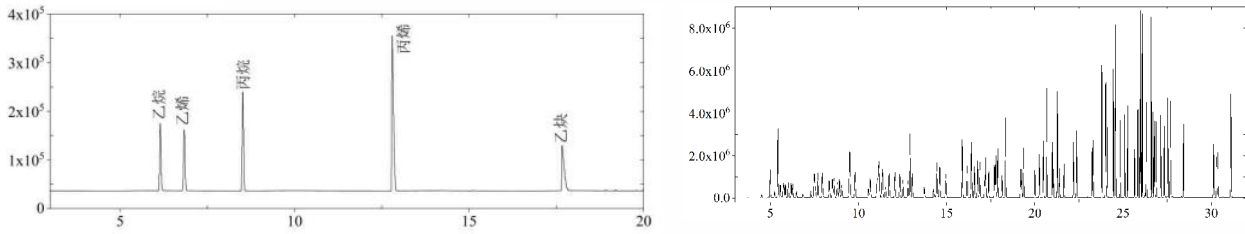
Total ion flow chromatogram of 65 kinds of VOCs in HJ759

# Pre-concentrator/Analyzer

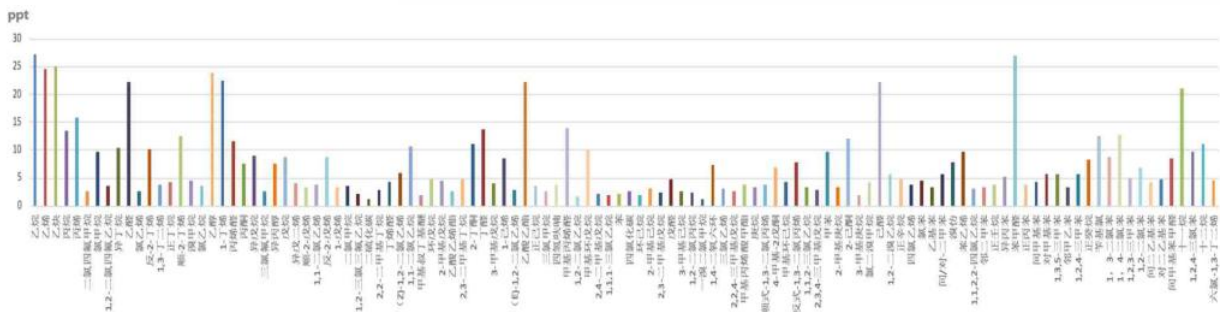
## 116 kinds of factor analysis detection

The ambient air VOCs analysis system introduces the column heart-cutting technology. After cutting the first five C2-C3 components (ethane, ethylene, acetylene, propane and propylene) to the Plot column, FID detects them, and the remaining 111 compounds are separated on a polymethylsiloxane column, and MS detector is used for detection. One injection can obtain 116 kinds of VOCs analysis results including aldehydes and ketones, which simplifies the analysis operation and improves the analysis efficiency.

The specific analysis spectrum is as follows:



116 kinds factor spectra

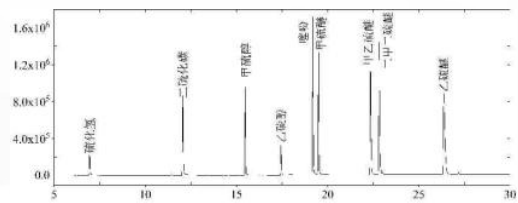


116 kinds factor detection limit

## Analysis of 8 organic sulfides in HJ 1078-2019

According to the standard requirements, the pre-concentrator collects 50ml, 10 ppb standard gas, removes water in the first cold trap at -60°C, captures in the second cold trap at -80°C, and then focuses on the third cold trap at -180°C for splitless injection analysis.

The specific analysis spectrum is shown on the right:

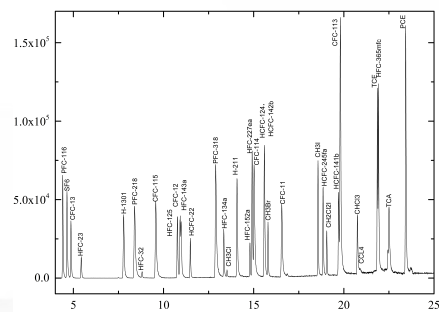


Total ion flow chromatogram of 8 organic sulfides in HJ 1078

## Technical specifications for manual monitoring of ozone-depleting substances and fluorinated greenhouse gases in ambient air

Collect 2000ml, 20ppt standard gas, capture at -80°C in the secondary cold trap, and capture in the third cold trap splitless injection analysis after focusing at -180°C.

The specific analysis spectrum is shown on the right:



34 kinds of ODS total ion flow chromatograms

## Pre 4100 Ambient Air ODS Pre-concentrator

For ODS applications, on the platform of the Pre 4000 Atmospheric Pre-Concentrator, the Pre 4100 Ambient Air Ozone Depleting Substances Pre-Concentrator was specially developed to meet 36 kinds of ODS detection. It meets the technical requirements of "Technical Specifications for Manual Monitoring of Ozone Depleting Substances and Fluorinated Greenhouse Gases in Ambient Air".



Pre 4100 single form

### Features

#### Refrigeration technology

Using Stirling refrigeration technology, compatible with online and laboratory applications.

#### High sensitivity technology

The cold trap reaches -160°C, the penetration volume of CF4 and NF3 is 2L, combined with the cold trap pulseless split technology, 90% of ODS detection limit is 0.1ppt.

#### Two-stage water removal

Water will be removed before and after sampling, and the water removal efficiency can reach more than 99.9%, avoiding cold trap blockage and retention time drift.

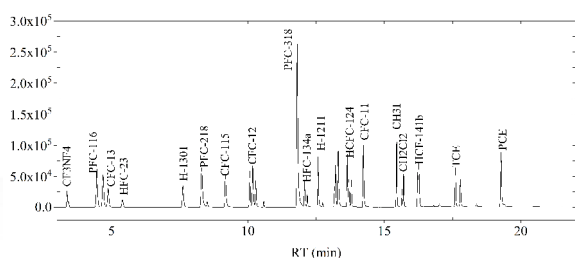
#### CO2/Argon Elimination

A special adsorbent is used to remove CO2 without loss of ODS, which avoids compounds being suppressed in mass spectrometry. Precisely control the temperature of the cold trap, and separate argon from CF4 and NF3 on the pre-concentrator.

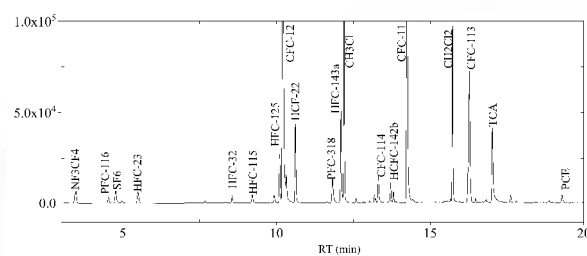


Ambient air ODS automatic monitoring system

### Sample spectrum



36 kinds of ODS standard spectra



Atmospheric sample of a background point

Customer hotline  
400-700-2658

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