

# TurboMatrix

thermal desorbers for GC



unrivaled **performance**  
and **flexibility** through **innovation**

# easy-to-use systems



PerkinElmer On-line Ozone Precursor System, comprising of a Clarus GC (left) and a TurboMatrix TD (right).

Thermal desorption is a technique that simplifies and speeds a wide range of gas chromatography (GC) applications, including indoor and outdoor air monitoring, analysis of outgassing from semiconductor materials, polymers, upholstery and furnishings, packaging, pharmaceuticals, and analysis of flavors and fragrances.

As the undisputed market leader in GC sample handling, we took the next step to offer you even more benefits for your lab. PerkinElmer offers a family of five different TurboMatrix™ Thermal Desorber (TD) models in both single-tube and automated 50-tube configurations:

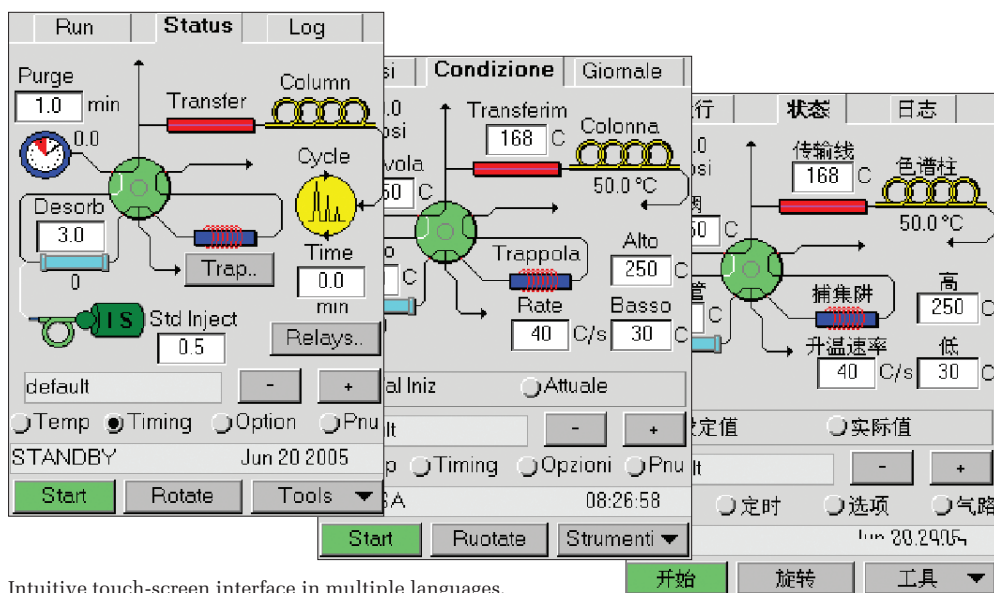
- TurboMatrix 100 TD – single-tube and manual pneumatics
- TurboMatrix 150 ATD – 50-tube autosampler and manual pneumatics
- TurboMatrix 300 TD – single-tube and programmable pneumatic control

- TurboMatrix 350 ATD – 50-tube autosampler and programmable pneumatic control
- TurboMatrix 650 ATD – 50-tube autosampler, programmable pneumatic control and a variety of other accessories for a wide range of applications.

This broad offering allows you to match technology to your laboratory and applications needs.

## Incredibly easy to use

An intuitive, color touch-screen interface allows you to choose any one of eight operating languages including English, Japanese, Chinese, French, German, Italian, Spanish or Russian. With a few quick presses of the touch screen, you can set parameters, recall stored methods and start sampling – making it easy for both sophisticated users and those new to the technique. The display automatically adapts to the hardware configuration, showing functions as they are added or removed. For routine analysis, the thermal desorber can be set for one-touch operation. All you need to do is load the tubes and press Start.



Intuitive touch-screen interface in multiple languages.

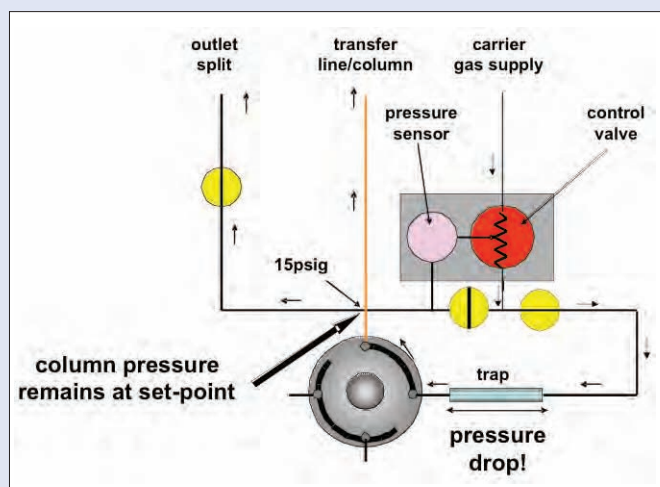
# provide unmatched productivity

## PPC boosts performance and productivity

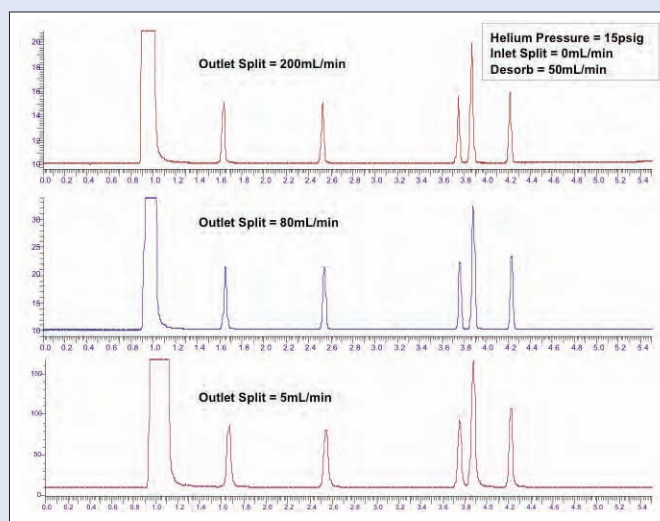
TurboMatrix 300, 350 and 650 models all come standard with programmable pneumatic control (PPC). This feature revolutionizes thermal desorption applications by providing a very easy and convenient way of setting gas flows and pressures. In addition, PPC is the enabling technology that delivers many other features and benefits that will maximize your analyses. These include:

- Electronic carrier gas control of pressure, flow or velocity within the GC column provides maximum flexibility.\*
- Electronic mass flow controllers allow the user to set and monitor the flow rates for all splits and desorption flow rates, delivering increased productivity through ease-of-use.
- All applied conditions are stored in a single method and provide the user with a complete record and status of analytical conditions. With the remote control software (RSC), such methods may be archived and printed.
- Resettability of gas flows and pressures for ease-of-use to quickly set up a method and obtain the same results each time an analysis is run.
- Pressure-pulsed trap desorption allows the user to increase or decrease the carrier-gas pressure during trap desorption to improve desorption efficiency and give better recoveries and peak shapes.
- Method sequencing allows the use of different flows and pressures in methods to enable different analyses to be performed in the same run and also to simplify method development and optimization.
- MS mode ensures that internal valving and pneumatics are continually swept with a low flow of carrier gas to minimize build-up of air, water and organic contaminants that would otherwise interfere with analyses (especially with a mass spectrometer detector).
- Automatic reduction of gas flows when system is idle delivers cost savings by ensuring gas conservation once an analysis is complete.

\* Patents pending or granted



All the PPC hardware and control resides in the thermal desorber. This allows its design to be fully optimized to provide the best analytical performance. One of the most important benefits is that the carrier-gas pressure applied to the transfer line or column inlet is no longer affected by the impedance of the trap and associated plumbing – even during desorption at high split flows. This ensures that peak shape and retention time are not dependent on the set split-flow rate.



# additional features to benefit all users

Much care and attention has been given in the design of the TurboMatrix Thermal Desorbers to provide users with a comprehensive range of features, yet maintain a very high standard of performance. While PPC is perhaps the most exciting development, many additional features have been incorporated as standard to improve the performance and application of these instruments. These include:

- Electronic cooling of the trap eliminates the need for liquid cryogen for most applications, allowing trapping of gases like ethane, ethylene and acetylene.
- High temperature desorption capability allows the determination of analytes up to n-C<sub>44</sub> hydrocarbons.
- Powerful diagnostics (such as leak checking) provide early indication of errors.
- Automatic sample re-collection capability (TurboMatrix 650 only) enables repeat analysis.
- Tube and trap flow impedance testing allows the ability to monitor packing integrity.\*
- Powerful method sequencing capability enables efficient method optimization.
- Easy transfer-line and trap installation deliver ease-of-use and maintenance.
- Optimized dry purge of both the tube (TurboMatrix 650 only) and the trap eliminates sample moisture.\*
- Column back-flushing using the PerkinElmer PreVent™ system maximizes throughput.
- Gas conservation/economy mode delivers lower operating costs.
- Automatic tube conditioning during run maximizes the use of “spare” time during chromatography to further clean tubes.
- Automatic addition of standard mixture to tube both before sampling\* and before analysis to monitor sample integrity and improve analytical quantification.
- Tube sample stacking technique improves detection limits even further.

\* Patents pending or granted

- Separate trap-clean-and-test function to condition a trap eliminates exposure to the column and the need to check for cleanliness afterwards.
- Ability to function with any brand GC delivers maximum system flexibility.

## Confirmatory analysis

The TurboMatrix 650 ATD allows sample-split re-collection on the same or different tubes, delivering the ability to audit samples and perform confirmatory analysis and repeat analysis under a different set of conditions.

## Integrity testing

Sensors monitor all aspects of system operation to ensure that the instrument is working as it should and provide an early indication of possible problems with the analysis. Analytical techniques such as tube and trap impedance testing and the standard addition options help ensure sample integrity. All of these are designed to provide the user with the highest confidence in the final analytical results.

## Reduced cost per sample

The TurboMatrix Thermal Desorbers save money and minimize laboratory waste. After each use, all sample tubes can be reconditioned and conveniently reused. The system provides cryogen-free operation down to -30 °C, reducing operating costs. Unlike other techniques, thermal desorption requires no solvents, thus reducing cost, risk of contamination, analyst exposure and the need for solvent disposal.

## Maximize sample throughput

Since the thermal desorber unit can run simultaneously with the GC, you can start your next desorption run as the GC processes the previous run for maximum productivity.

# upgradeable systems expand as your needs change

Enhance the capabilities of your TurboMatrix Thermal Desorber by adding specialized accessories. Our accessories allow you to analyze special samples, improve system performance and increase efficiency.

## On-line air sampling accessory

This accessory allows TurboMatrix Thermal Desorbers to monitor volatile compounds directly from atmospheric air or from other air-sampling devices such as canisters.

## Internal standard addition accessory

A fixed amount of a gas standard can be automatically introduced onto the sample tube prior to desorption for internal standard calibration.

## Liquid nitrogen cooling accessory

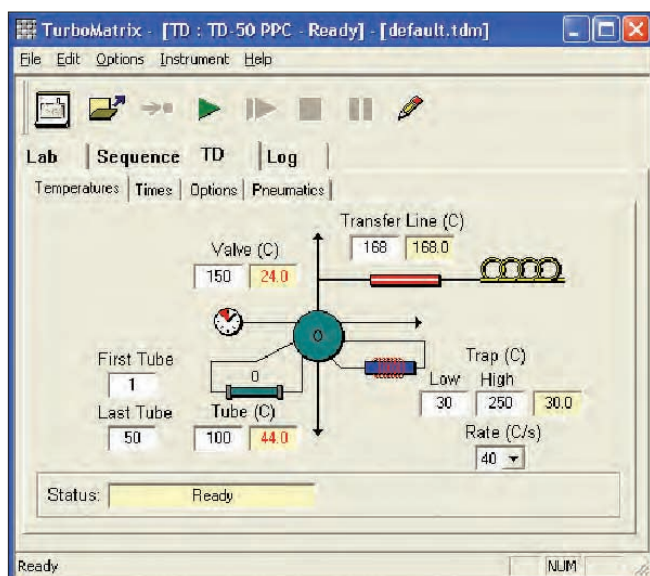
For samples with very weak adsorption that require cooling below -30 °C, the liquid nitrogen cooling accessory cools the cold trap down to -100 °C, extending sampling capabilities to a larger array of analytes.

## Remote control software

While the graphical user interface allows easy control of the thermal desorber, a remote control software package for a PC is also available. Running under Microsoft® Windows XP, the software provides complete control of the sampler and displays the status of all parameters. Methods and sequences can be easily edited, stored and downloaded to the instrument. The remote control software can be used in conjunction with PerkinElmer® TotalChrom® Chromatography Data Systems (CDS). This integration provides a traceable trail from sampling through reporting. The tube number and the status of the analysis appear on the report.

## STS sequential tube sampler

A portable alternative to continuous or “on-line” air monitoring techniques for atmospheric monitoring situations is available. Where it is necessary to profile site data over periods of 24 hours or longer, the STS sequential tube sampler allows collection of aliquots of the air sequentially onto a series of adsorbent tubes. The timing sequence is programmable.



Remote control software provides easy control.



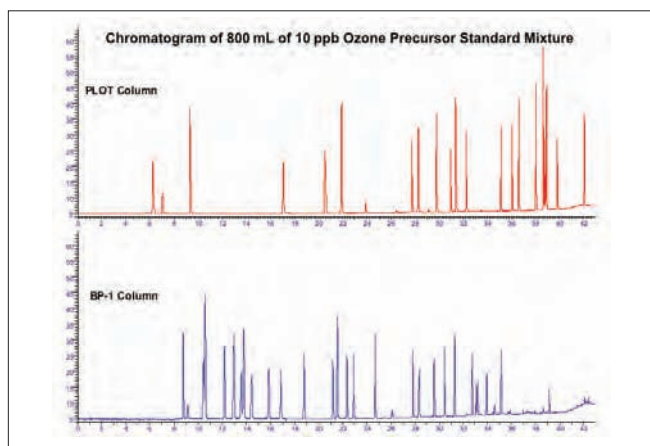
The portable STS sequential tube sampler for air monitoring.

# unsurpassed flexibility

TurboMatrix Thermal Desorbers can solve problems and provide answers for difficult applications in many industries. Thermal desorption is instrumental for monitoring environmental levels of organic pollutants and simplifies many routine determinations of volatiles in products such as disc drives and wafers in semiconductor manufacture, polymers, pharmaceuticals, foods and paints.

## Ozone precursors analysis

In the United States, the Clean Air Act of 1970 gave the Environmental Protection Agency (EPA) responsibility for maintaining clean air. Six parameters are measured routinely in ambient air: SO<sub>x</sub>, NO<sub>x</sub>, PM<sub>10</sub>, Pb, CO and ozone. In the 1990s, the Clean Air Act was expanded to include volatile organic compounds (VOCs) that contribute to the formation of ground-level ozone. These measurements are implemented through Photochemical Assessment Monitoring Stations (PAMS). Similar recommendations have also been made in Europe following the 1992 Ozone Directive and United Nations Economic Commission for European protocol on controlling VOC emissions. PerkinElmer, in conjunction with the U.S. EPA, developed an analyzer and methodology for collecting and automatically measuring C<sub>2</sub>-C<sub>11</sub> without the use of liquid cryogen. The PerkinElmer Ozone Precursor Analyzers incorporate an on-line TurboMatrix Thermal Desorber and a Clarus® Gas Chromatograph.



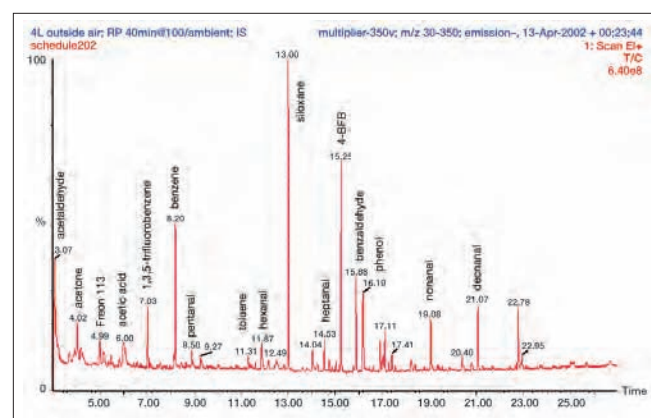
## Air toxics analysis

The PerkinElmer Air Toxics Analyzers integrate several analytical techniques into a single, unified system solution, performing tube-based sampling in accordance with established methodologies such as U.S. EPA Method TO-17. Tube-based sampling offers greater convenience as well as some analytical advantages over traditional canister-based analysis. Comprised of a TurboMatrix Thermal Desorber, Clarus Gas Chromatograph and Clarus Mass Spectrometer (MS), the systems provide outstanding analytical performance as well as several unique features to simplify and speed analysis. Thermal desorbers with PPC incorporate a powerful dry-purge technique that allows for analysis under extreme levels of humidity/moisture, while a unique capability of the Clarus GC/MS offers the benefits of both full-scan and single-ion monitoring simultaneously within a single analytical run.

Both air toxics and ozone precursor analyses can now be performed on the same thermal desorber.



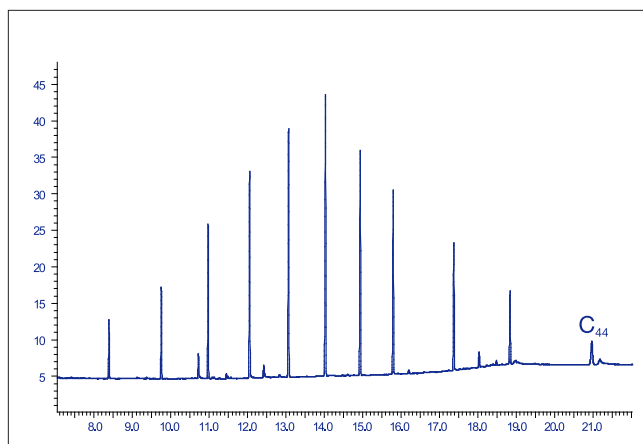
PerkinElmer Air Toxics Analyzer.



for a wide **range** of applications

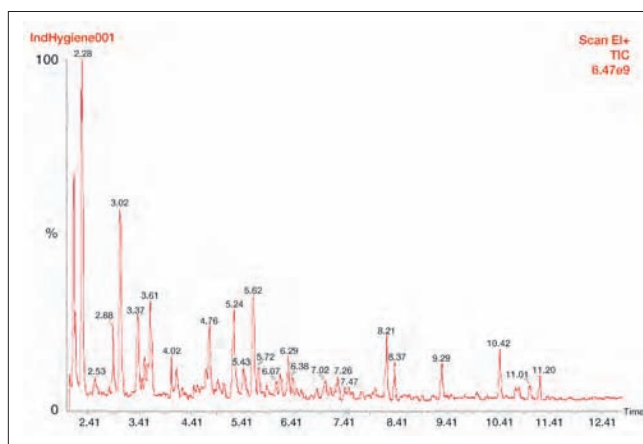
### Materials testing

The release of volatile compounds can signature quality issues in a host of products such as disc drives and wafers in semiconductor manufacture, automobile and household upholstery manufacture and in a variety of packaging and building materials. TurboMatrix Thermal Desorbers can be used to characterize volatiles for QA/QC of many solid-matrix materials. Materials releasing lower volatility and higher molecular weight compounds require higher thermal-desorption temperatures. As an example, the chromatogram opposite shows the ability of the TurboMatrix Thermal Desorbers to desorb up to C<sub>44</sub> hydrocarbons.



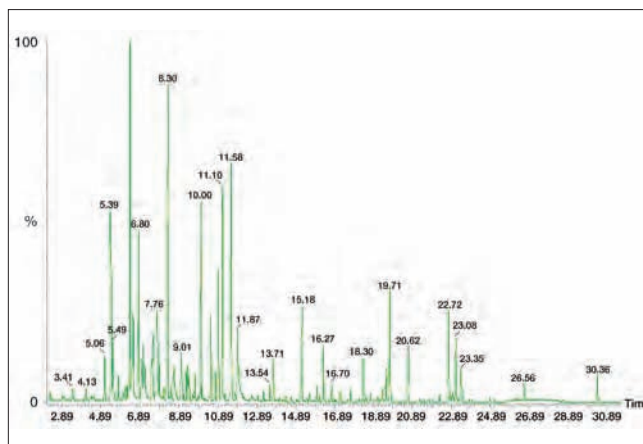
### Occupational health and safety

Thermal desorption, coupled with GC or GC/MS, has gained worldwide recognition for occupational health and safety monitoring. Worker exposure to trace levels of toxic airborne compounds can be monitored either by diffusive sample collection or pumped sampling onto a thermal-desorption tube at the worker's breathing zone level. Key benefits of thermal desorption include cost advantages of automation, high sensitivity, high desorption efficiencies and no solvent interferences with the analysis. The chromatogram opposite was obtained using a pumped sample of 6000 mL of factory air for 60 minutes at 100 mL/min.



### Flavors and fragrances

Determining a flavor/aroma profile can be critical in the beverage, food and cosmetics industries, both in the R&D of new fragrances and flavors and in QA/QC roles to assure uniformity and consistency. Thermal desorption, in conjunction with GC/MS, permits analysis of volatile and semivolatile organics directly from small sample sizes without the need for solvent extraction or other steps of sample preparation. The total-ion chromatogram opposite displays volatiles found in a sample of perfume.



# PerkinElmer, Inc.

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## Flexible systems expand as your needs change

Every laboratory is unique in its sample-handling requirements. Some labs need to run a high number of tube samples on a routine basis such as those involved in the quality control of disc drives and wafer manufacturing that require thermal desorption to troubleshoot quality problems in their processes. Environmental labs may need to run on-line air analyses for applications including monitoring ozone precursors, as well as tube samples for workplace and urban air-quality monitoring.

With the TurboMatrix family of five Thermal Desorber models, PerkinElmer provides a system to meet the needs of any laboratory. And you can adapt your system to changing requirements by adding accessories that provide even more capabilities.

### TurboMatrix 100 TD

Provides exceptional analytical performance in a single-tube, manual-pneumatics model. Upgradeable to the TurboMatrix 150 ATD.

### TurboMatrix 150 ATD

Provides exceptional analytical performance in an automated sample-tube handling system for unattended analysis of up to 50 samples. Concurrent desorption of the next sample while the current sample is undergoing GC analysis optimizes productivity.

### TurboMatrix 300 TD

Incorporates PPC to provide enhanced ease-of-use, functionality and performance in a single-tube model. Upgradeable to the TurboMatrix 350 ATD.

### TurboMatrix 350 ATD

Incorporates PPC for enhanced ease-of-use, functionality and performance in an automated sample-tube handling system for unattended analysis of up to 50 samples. Concurrent desorption of the next sample while the current sample is undergoing GC analysis optimizes productivity. Also incorporates loading of internal standard into clean tubes to provide sample-integrity validation and to improve precision (repeatability) of the analysis. Allows the ability to condition tubes during chromatography to minimize downtime and enhance productivity and also includes a separate trap-clean-and-test function, which saves time and protects the GC column and detector.

### TurboMatrix 650 ATD

Incorporates all of the performance features of the TurboMatrix 350 ATD plus the ability to re-collect sample for repeat analysis, the ability to perform dry purge without the internal standard accessory and the ability to perform tube and trap impedance measurement as a diagnostic of system performance. Provides truly outstanding analytical performance in an automated sample-tube handling system for unattended analysis of up to 50 samples.

## PerkinElmer – the clear choice in gas chromatography

PerkinElmer is the only chromatography supplier who develops, manufactures, supports and services every product it offers to provide a truly integrated system. This means one expert supplier – with best-in-class instruments and a world-class service and support organization – can address all of your applications and troubleshooting needs, from sample handling to data handling. In addition, TurboMatrix Thermal Desorbers can be interfaced to almost any GC system, giving you access to PerkinElmer's proven technology regardless of the brand or model GC you have in your laboratory.

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