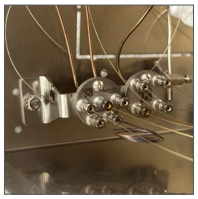
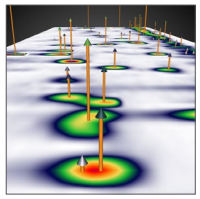
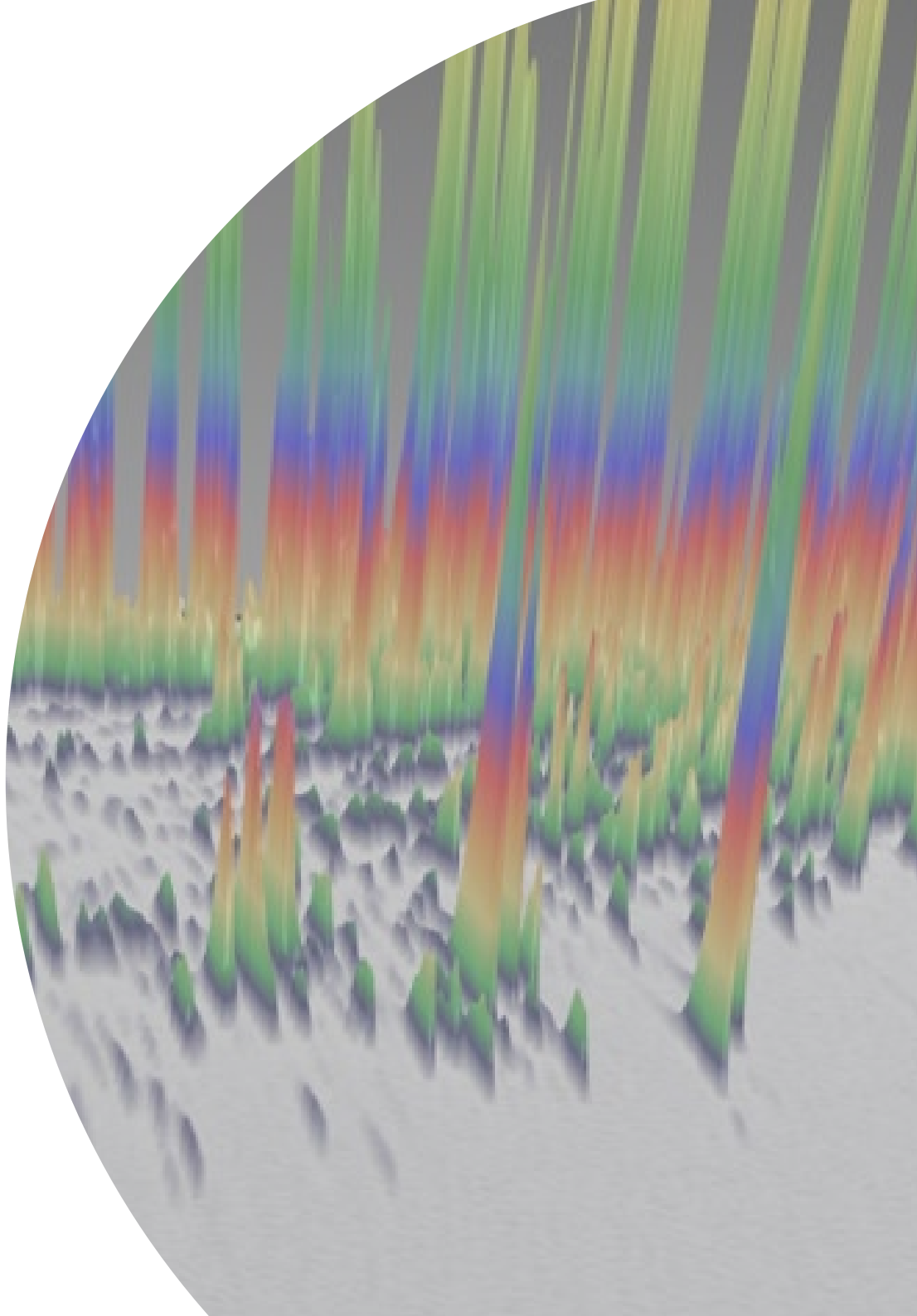
SepSolve Analytical


INSIGHT®

Outstanding GC×GC performance for both flow and thermal modulation



Harness the power of GC×GC

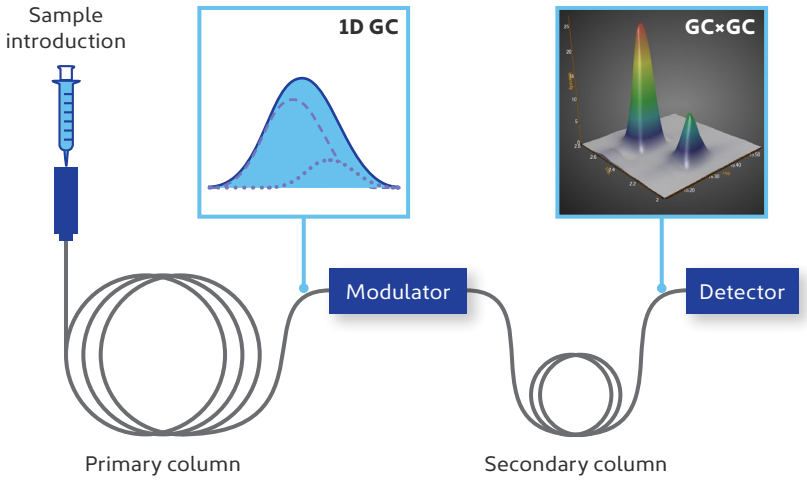
Comprehensive two-dimensional gas chromatography (GC×GC) uses two columns running simultaneously to provide a second dimension of sample separation, and therefore the ability to reveal 'hidden' analytes.

Integral to all GC×GC configurations is the modulator, which splits up the flow from the first column into narrow bands, before injecting them onto the faster-eluting second column. It therefore not only preserves the separation achieved in the first column, but avoids overloading the second column.

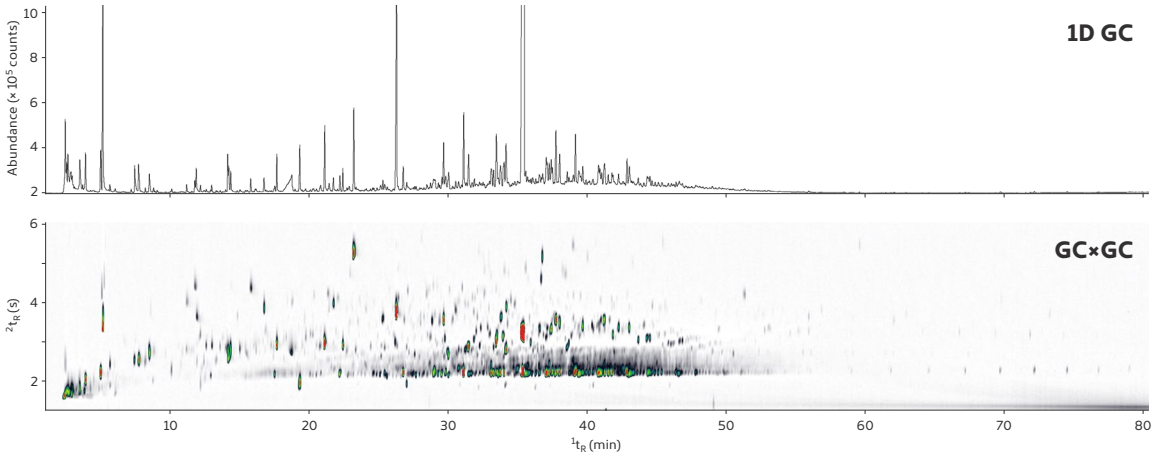
This process can be carried out either by flow modulation or thermal modulation. Both methods have their advantages for certain applications, and at SepSolve we provide two high-performance modulators that are compatible with GCs from all major manufacturers – INSIGHT®-Flow and INSIGHT®-Thermal.

With this choice, plus precise control and flexibility in operation, you're guaranteed to find the perfect GC×GC setup, whatever your application.

Take your GC analysis into a new dimension with INSIGHT modulation.



A typical analytical system for GC×GC, showing how the modulator has a central role in coupling the primary and secondary columns, and so enabling the separation of two peaks that have overlapped in 1D GC.



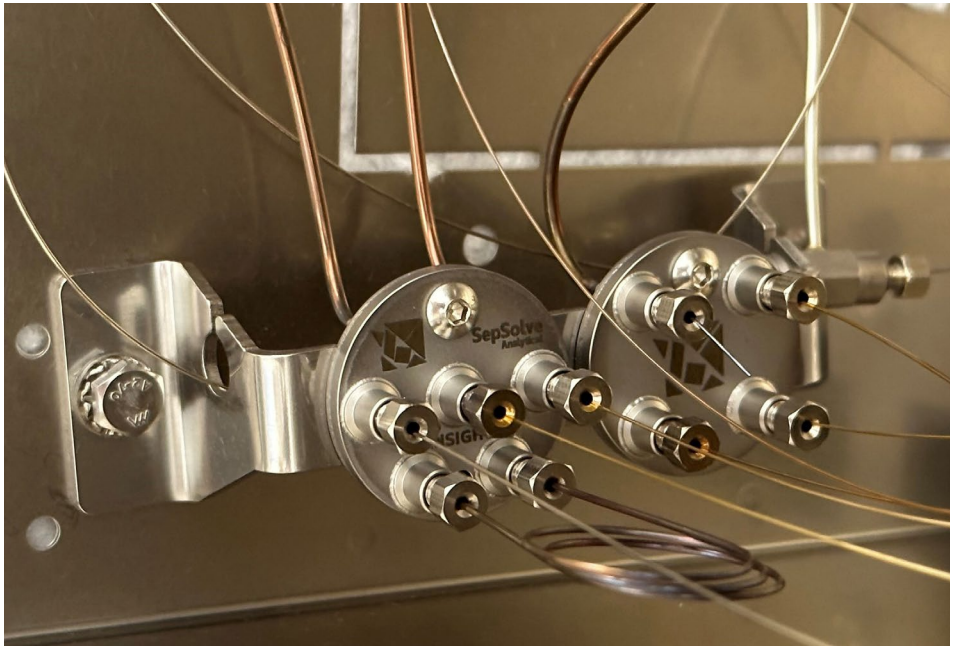
For this complex sample, GC×GC resolves about 10 times as many compounds as 1D GC – typical of the improvement in separating power that a well-chosen modulator can provide.

Introducing the INSIGHT® modulator series

INSIGHT GC×GC modulators are fully compatible with GCs from all major manufacturers, to deliver the benefits of additional separation capacity to a new or existing workflow.

INSIGHT-Flow

INSIGHT-Flow is a reverse-fill/flush flow modulator delivering robust, repeatable analyses. This makes it ideal for GC laboratories requiring routine, high-throughput analyses, or discovery-based applications involving volatile species (<C_7), such as breath biomarker studies and aroma profiling.



INSIGHT-Thermal

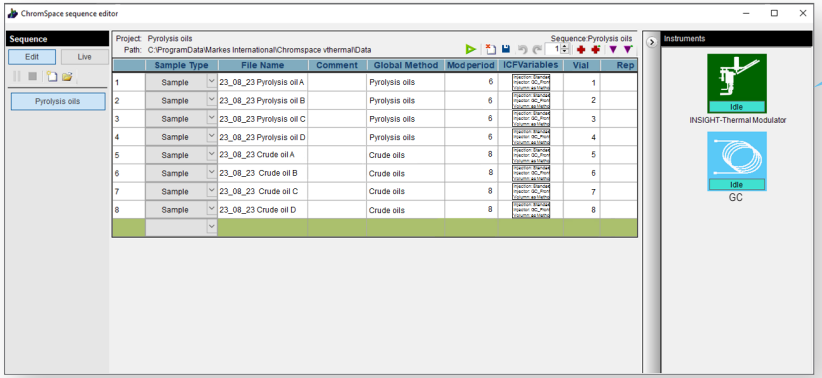
INSIGHT-Thermal uses delay loop modulation and cryogen-free focusing to provide the enhanced sensitivity and peak capacity needed to characterise trace-level compounds in complex matrices, such as environmental screening and petrochemical fingerprinting.

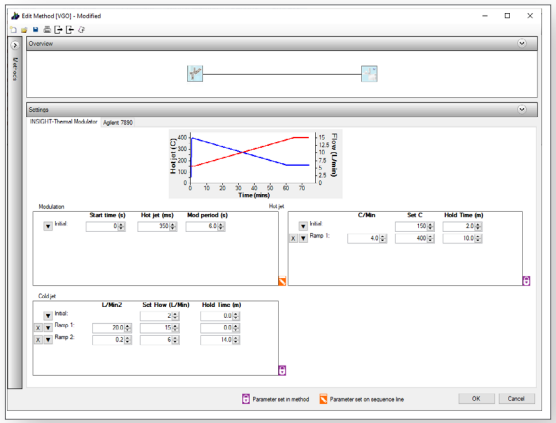
Fully unattended analysis to maximise sample throughput

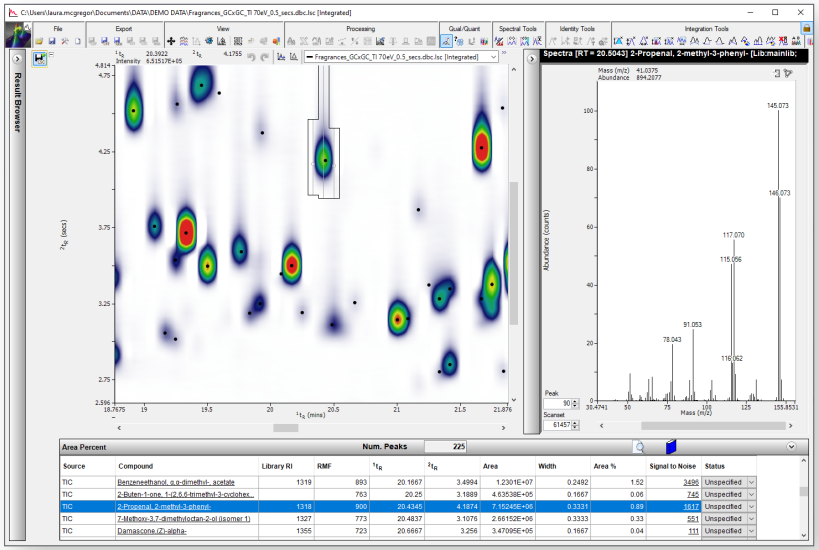
INSIGHT® modulators are fully controlled through the easy-to-use ChromSpace® software suite, meaning you can confidently leave your instrument running unattended, even if the samples require different modulation settings.

The ChromSpace platform provides flexible, automated analysis using INSIGHT modulators – including unlockable parameters for fast creation of method development sequences (shown).

ChromSpace also includes full qualitative and quantitative data-processing capabilities, with time-saving tools to simplify everyday use of GC×GC.





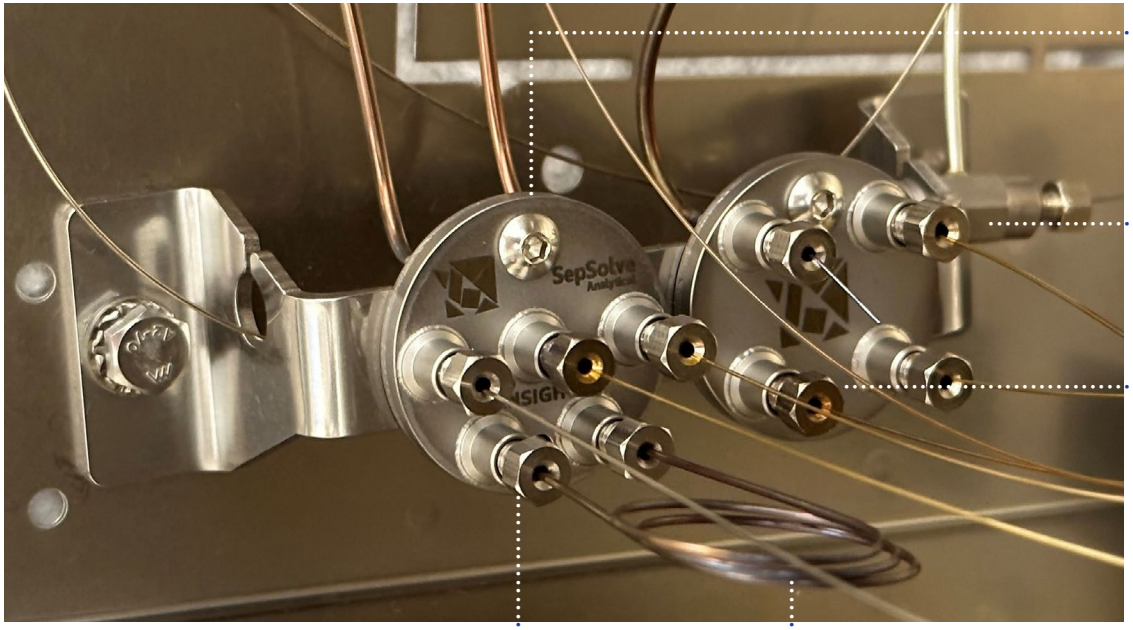


INSIGHT-Flow:

Robust modulator for repeatable, affordable multi-dimensional GC

The INSIGHT-Flow modulator uses differential flows to 'fill' a sample loop and then 'flush' it in the opposite direction onto the second column.

The result of this approach is a robust and repeatable modulator with low running costs, allowing routine GC laboratories to benefit from the full power of GC×GC peak separation.



Consumable-free operation for low running costs.

Optional bleed line control kit for faster column changes.

Secure mounting bracket, accommodating either:
- Two INSIGHT-Flow devices for dual-channel GC×GC
- An optional 4-port splitter (pictured) for robust parallel detection.

Innovative design to ensure the widest possible volatility range (C_1 to C_{60}), and the flexibility to perform heart-cutting, splitting for parallel detection or backflushing.

Interchangeable sample loop for greater flexibility in method development.

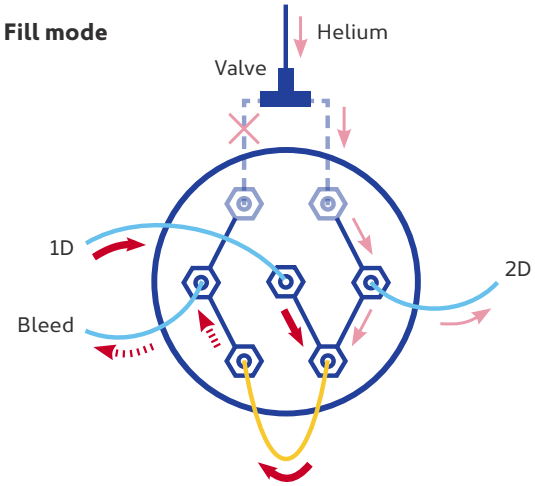
Why choose INSIGHT-Flow?

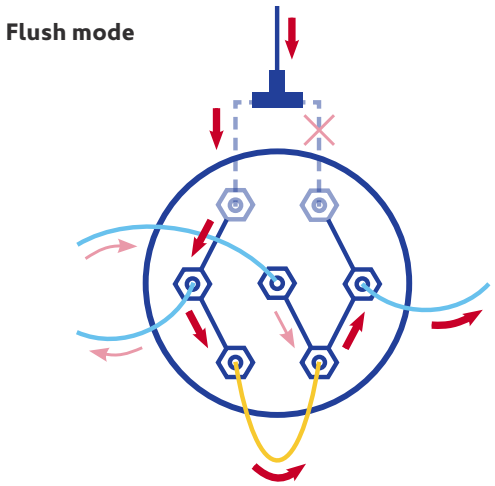
The reverse-fill/flush design of the INSIGHT-Flow modulator ensures complete transfer of analytes and sharp, symmetrical peaks, while an interchangeable sample loop provides greater flexibility in method development.

How INSIGHT-Flow works

INSIGHT-Flow uses a two-stage process involving the sample loop to achieve effective modulation.

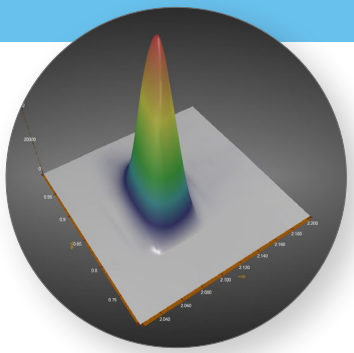
In **fill mode**, the primary column eluate enters the sample loop, while the modulation valve directs auxiliary carrier gas to the secondary column. Upon switching of the valve to **flush mode**, the contents of the sample loop are flushed rapidly onto the secondary column as a narrow chromatographic band.





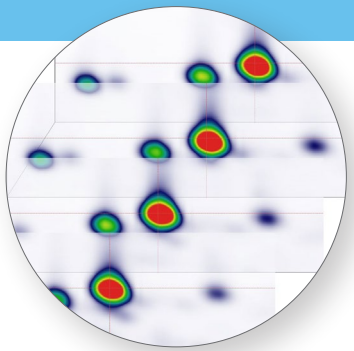
No volatility restrictions

Flow modulation doesn't rely on cold-jet trapping, meaning very volatile analytes (such as the CCl_2F_2 shown here) can be modulated efficiently without any need for liquid cryogen or chiller units.



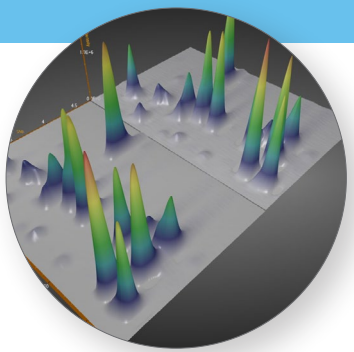
Outstanding repeatability

The valve-based design of INSIGHT-Flow allows identical configurations to be installed across multiple instruments, with a dedicated EPC for each column ensuring repeatable retention times.



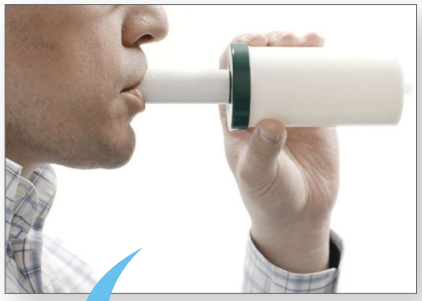
Flexible configuration

INSIGHT-Flow is easily configured for heart-cutting, backflushing, parallel detection and even a dual-channel mode to double productivity.

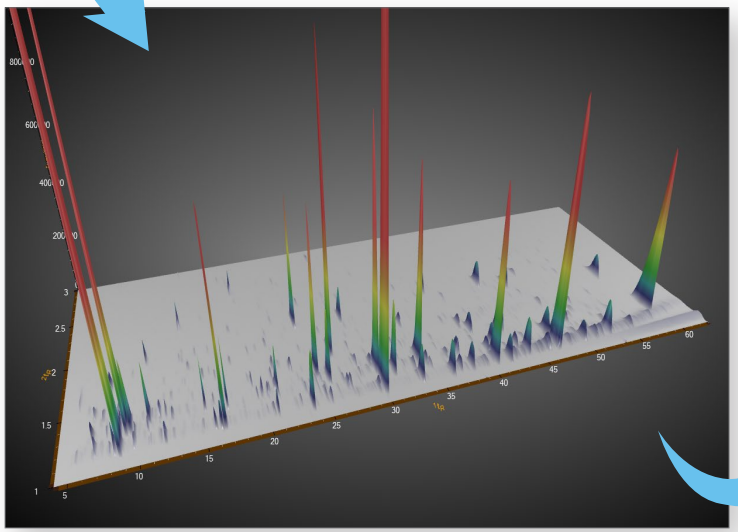


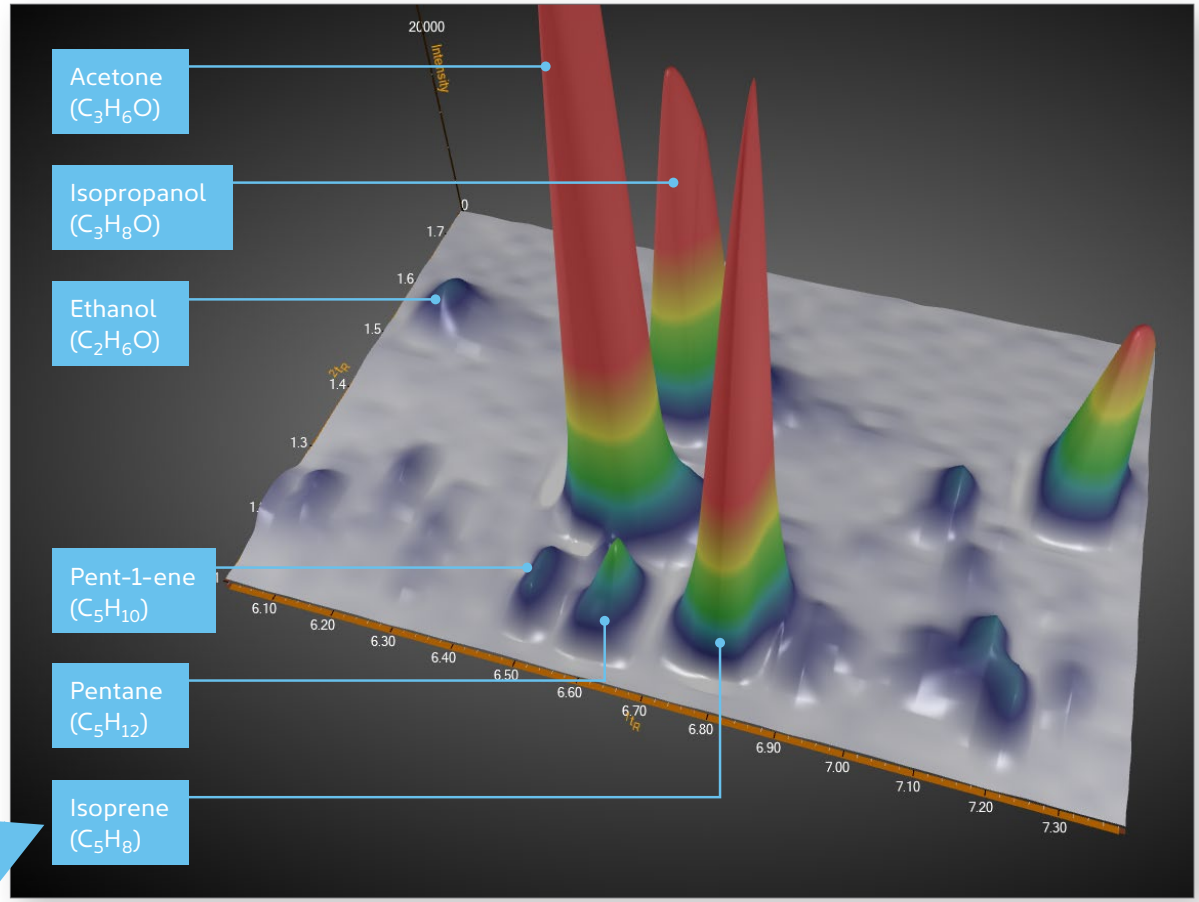
Tackle a wider range of samples

Flow modulation doesn't suffer from the same volatility restrictions as thermal modulation, because it doesn't rely on trapping analytes using a cold jet. INSIGHT-Flow can therefore efficiently modulate analytes as volatile as methane, making it an ideal fit for breath biomarker discovery.



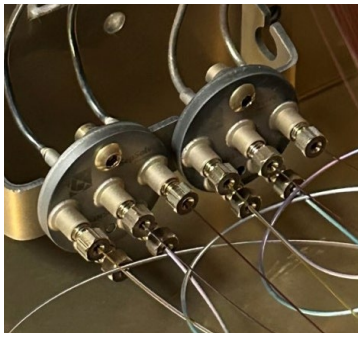
INSIGHT-Flow is well-suited to the analysis of very volatile compounds, such as the breath biomarkers shown here.

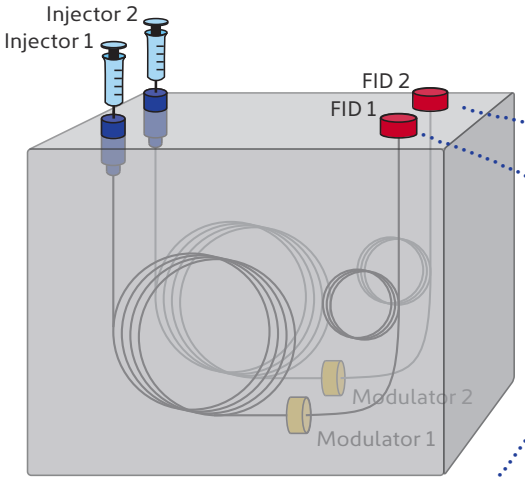




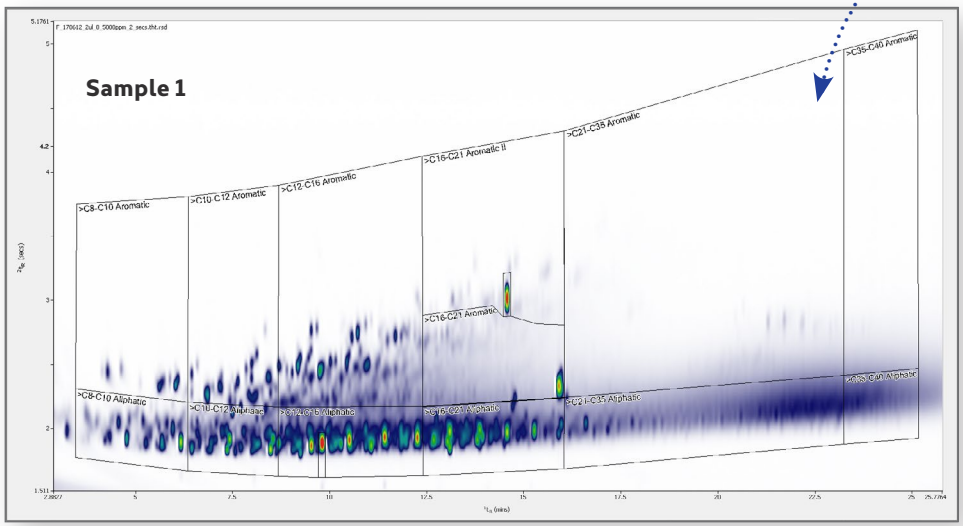
Dual-channel GC×GC for enhanced productivity

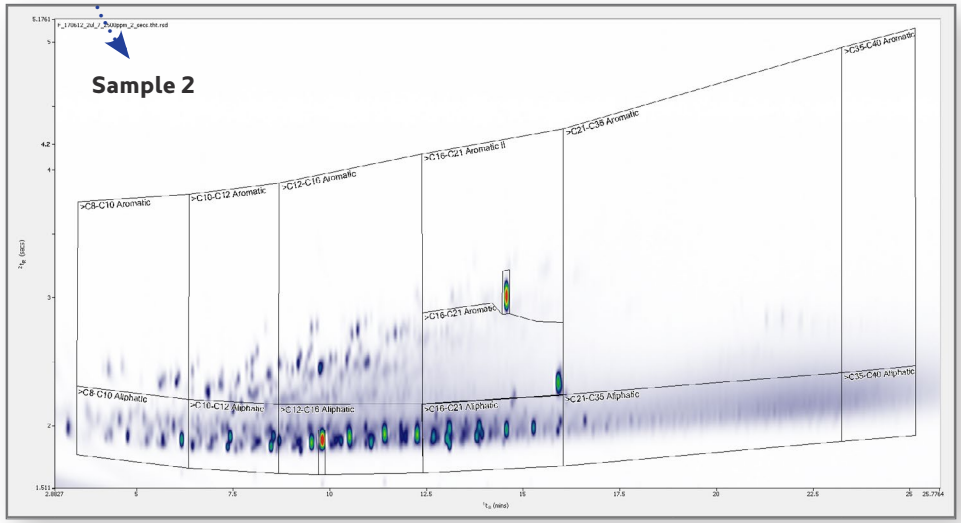
The compact design of INSIGHT-Flow enables two devices to be installed within the same GC oven.
This allows the simultaneous analysis of two samples using dual injection – optimising lab productivity.





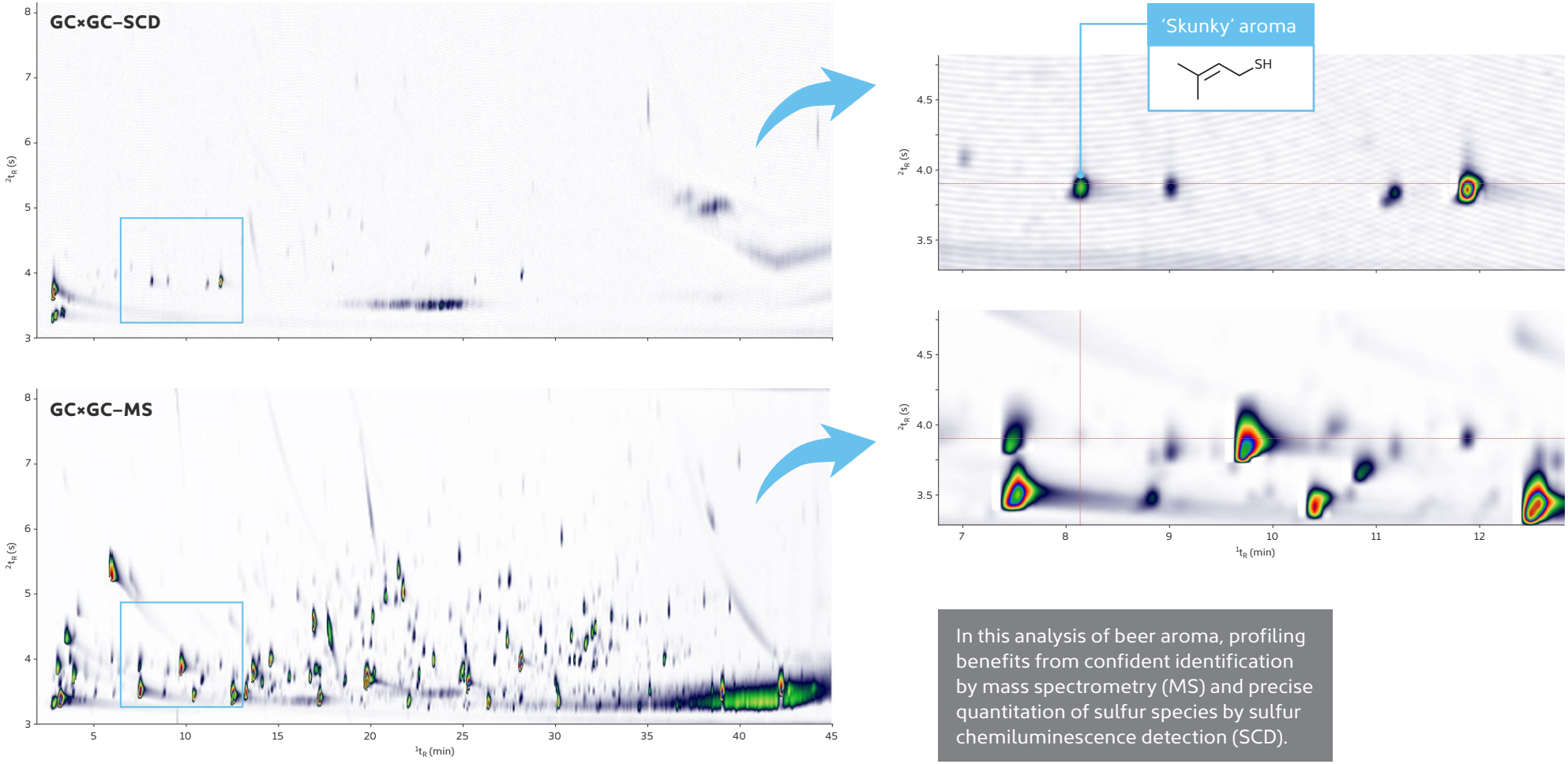
Using two INSIGHT-Flow modulators in a dual-channel configuration immediately doubles productivity, for a swift return on investment. This is illustrated for environmental monitoring of total petroleum hydrocarbons (TPH) , with full instrument control and group-type data analysis in SepSolve's ChromSpace® software.





Another level of information with parallel detection

Using parallel detection enables simultaneous acquisition by two detectors, for complementary information on sample composition. Whereas this can be more challenging to configure in thermally-modulated systems, optimal alignment of retention times can easily be achieved with INSIGHT-Flow.



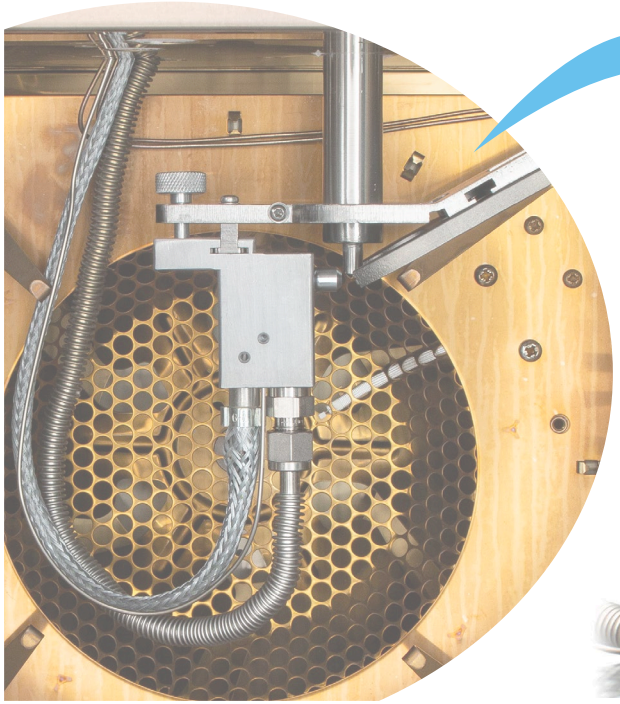
In this analysis of beer aroma, profiling benefits from confident identification by mass spectrometry (MS) and precise quantitation of sulfur species by sulfur chemiluminescence detection (SCD).

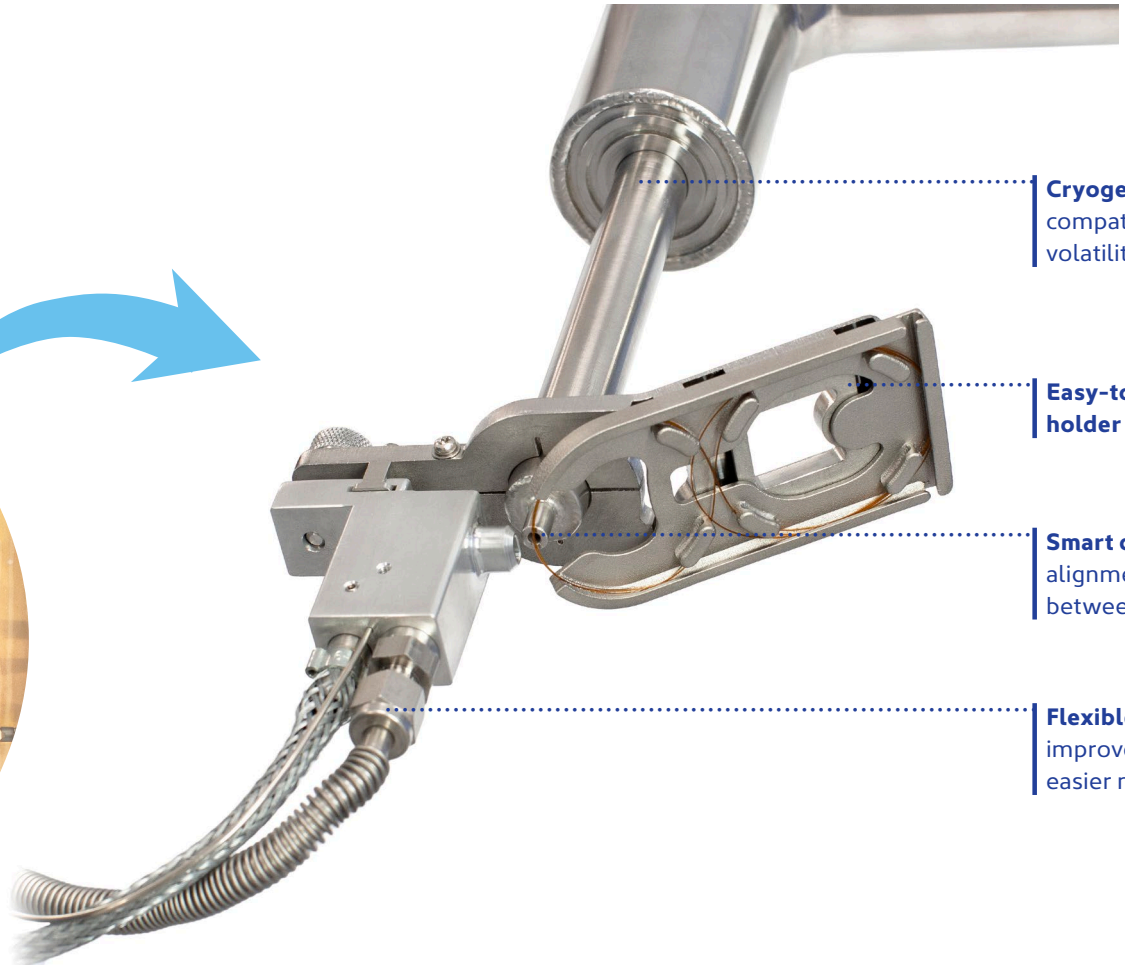
INSIGHT-Thermal:

Cryogen-free thermal modulator with unbeatable productivity

The INSIGHT-Thermal modulator delivers outstanding sensitivity and peak capacity, making it the ideal choice for screening trace-level analytes in complex mixtures.

The INSIGHT-Thermal modulator uses a precisely-controlled hot and cold jet to retain and desorb analytes, prior to their injection as a focused band onto the second column.





Cryogen-free cold jet compatible with a wide volatility range (C_7 to C_{50+}).

Easy-to-configure column holder for fast system set-up.

Smart design for precise alignment of the column between the jets.

Flexible jet control for improved productivity and easier method optimisation.

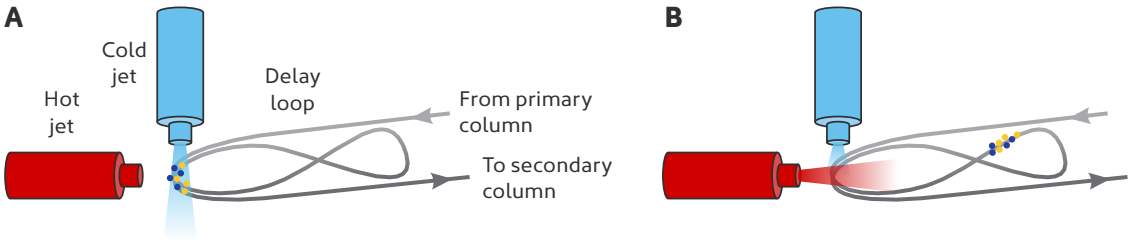
Why choose INSIGHT-Thermal?

INSIGHT-Thermal has been designed for ease-of-use and improved productivity, with cryogen–free operation, advanced jet control and the flexibility to be retrofitted to all popular GCs.

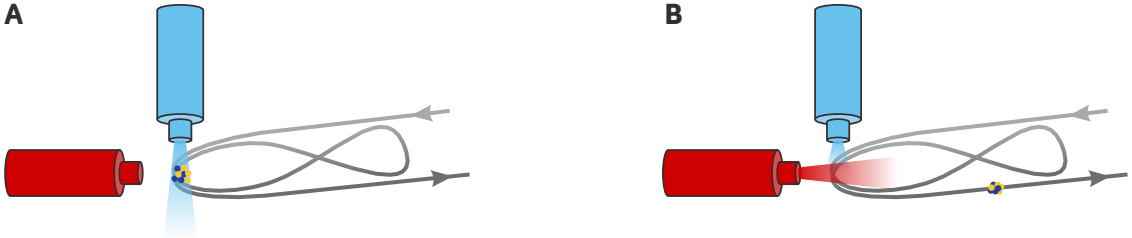
How INSIGHT-Thermal works

INSIGHT-Thermal uses two-stage operation by way of a delay loop:

Stage 1: (**A**) The cryogen-free cold jet traps the primary column eluate, before (**B**) a pulse of hot air (or nitrogen) arrives from the hot jet, deflecting the cold jet, and forcing analytes onto the next cooling stage of the modulation process.

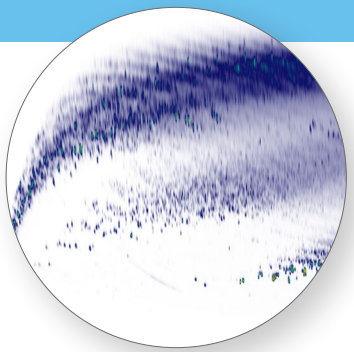


Stage 2: The process repeats at the second modulation point, (**A**) focusing the analytes into a narrow band prior to (**B**) injection onto the secondary column for sharp, modulated peaks.



Superior sensitivity

The focusing capability of the cold jet provides sharp, narrow peaks (typically <100 ms wide) for unrivalled sensitivity and peak capacity in GC×GC.

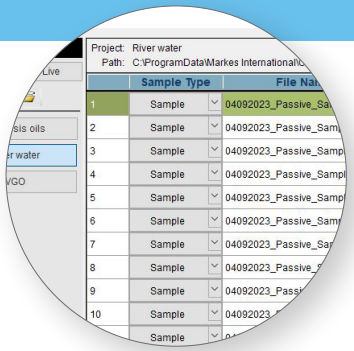


Smart design

The smart design of the column holder locks the column in the correct position, with precise alignment of the modulation loops between the jets, for fast yet accurate set-up and repeatable results.

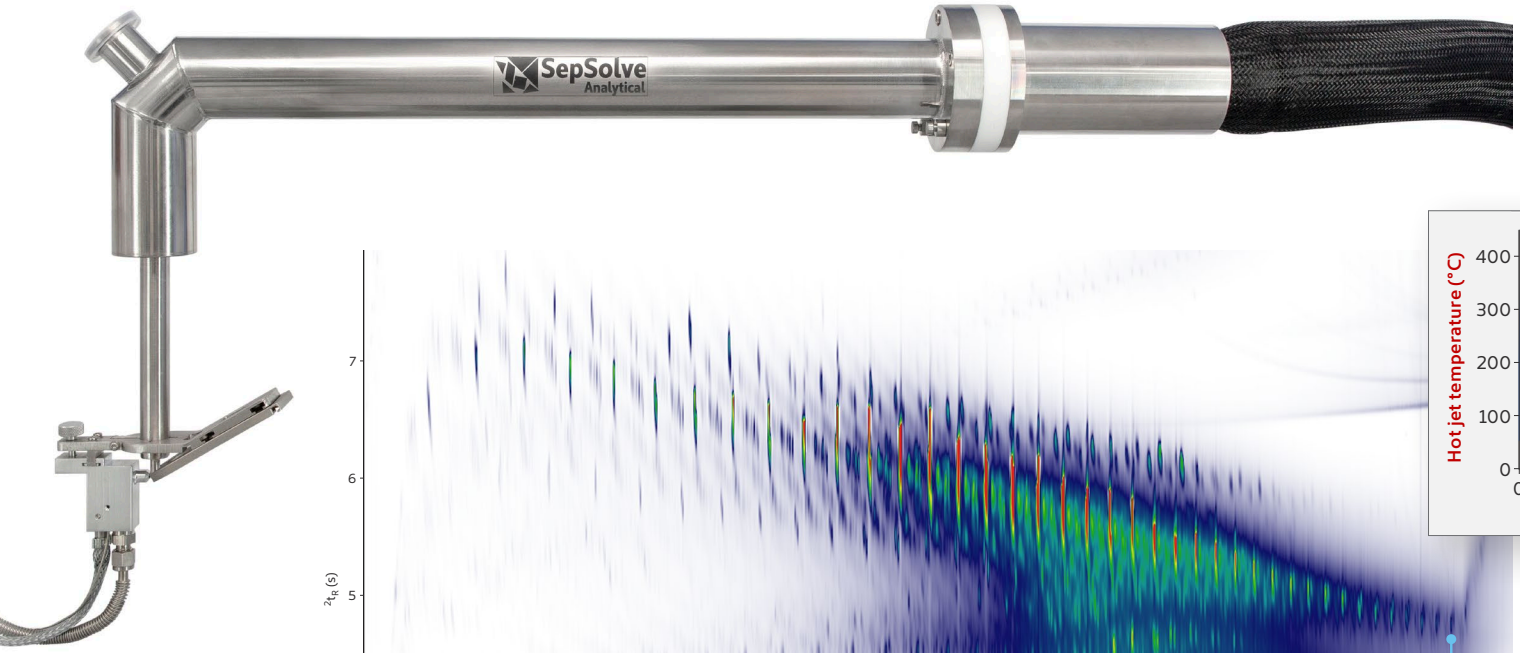
Improved flexibility

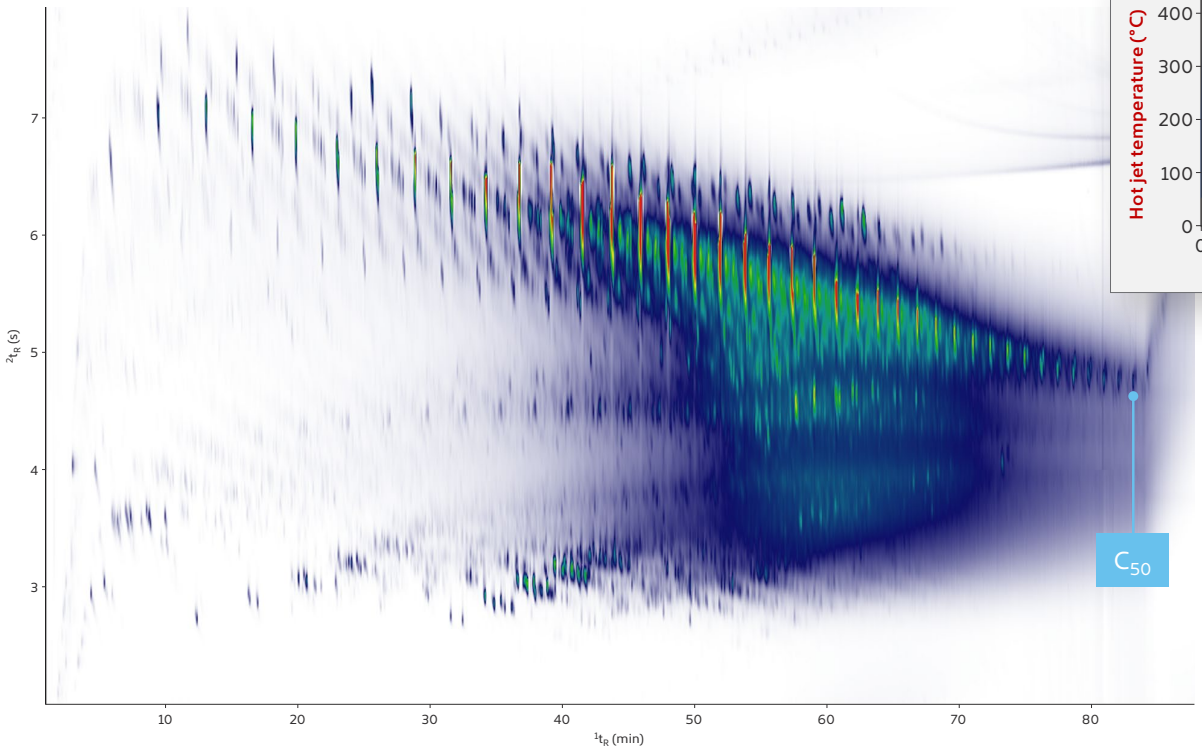
Full software control enables easy sequencing of sample batches, with changeable jet parameters to improve flexibility, productivity and performance.

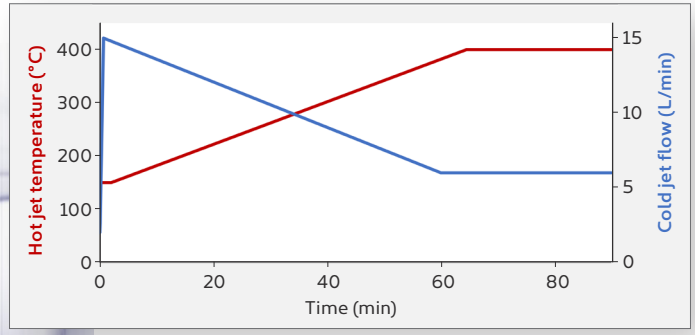


Extended analyte range

INSIGHT-Thermal is suitable for even the most complex samples, such as petrochemicals. This is a result of its excellent chromatographic resolution across a wide analyte range – thanks to flexible control of jet flows enabling compatibility with high boilers (C_{50+}).



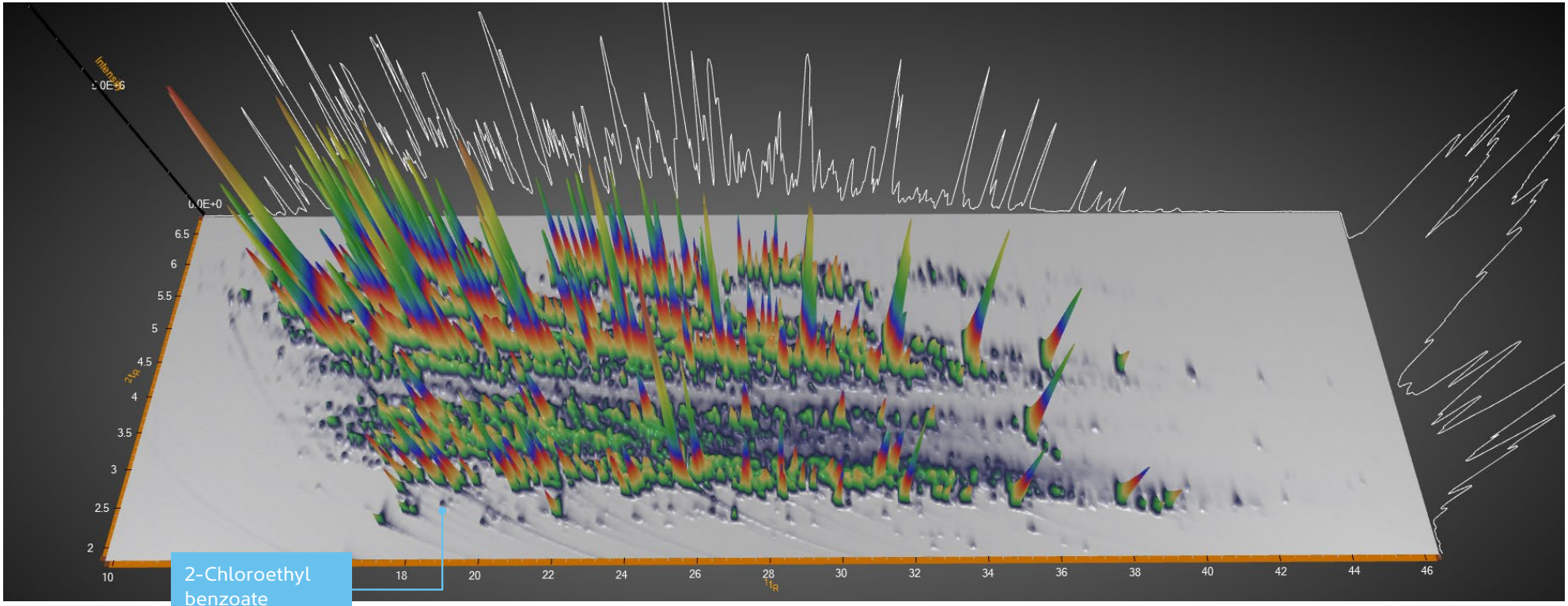




In this vacuum gas oil, over 3000 peaks were resolved using GC×GC–FID with INSIGHT-Thermal, with advanced jet control (including the ramped flow rates, shown inset) providing efficient modulation of high-boilers.

Detailed chemical characterisation

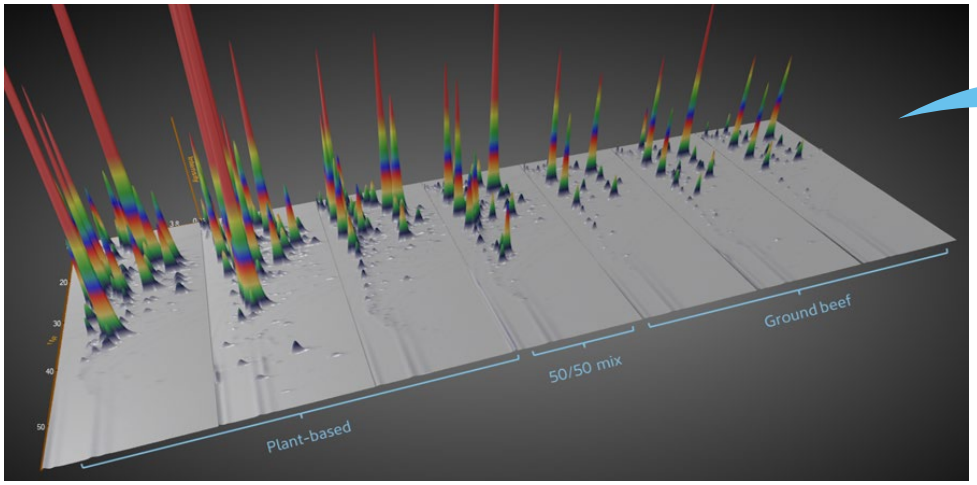
Non-target screening applications – for example, the identification of contaminants in novel fuels – often require trace-level sensitivity to ensure that no compounds of importance are overlooked. Thermal modulators, such as the INSIGHT-Thermal, have a major advantage for the detection of trace contaminants, due to the focusing effect from the reconcentration of the analyte bands during the trapping process.

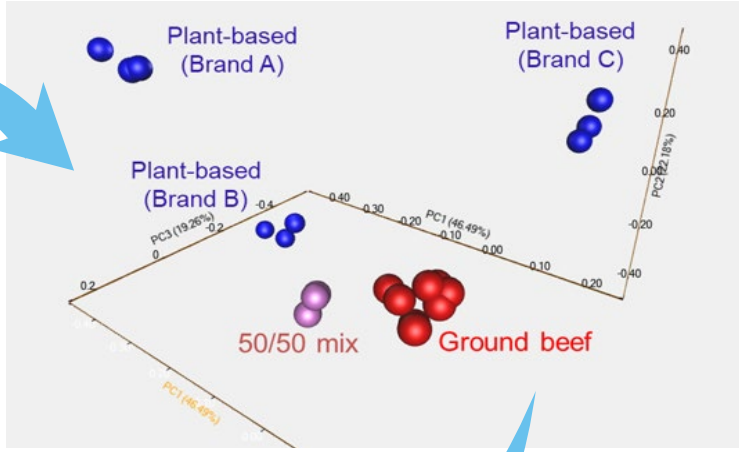


GC×GC–MS with INSIGHT-Thermal provides detailed characterisation of a pyrolysis oil from mixed waste plastic, enabling identification of possible contaminants. In a 1D GC analysis, the trace chlorinated species shown would have co-eluted with numerous compounds, and therefore been overlooked.

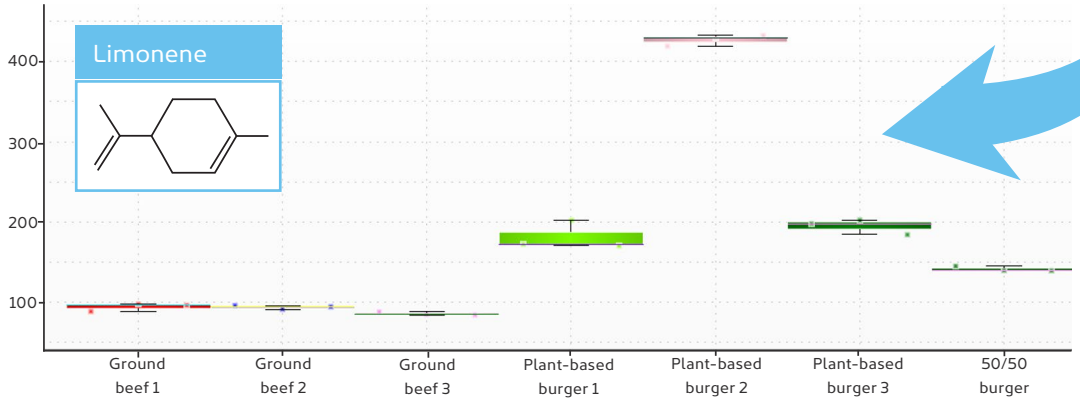
Transforming GC×GC data into meaningful results

Processing GC×GC data has often been compared to looking for a needle in a haystack – but thankfully this is no longer the case, software tools are now available to streamline GC×GC data analysis and quickly identify the differences between complex chromatograms. With **ChromCompare+** a batch of GC×GC datafiles can now be compared in minutes instead of days (or even weeks).





The Feature Discovery option in ChromCompare+ automatically finds the key differences between complex chromatograms. Here, the aroma profiles of beef burgers were compared to various plant-based meat substitutes, with limonene increased in the latter.



What can GC×GC do for you?

Visit **www.sepsolve.com** to see the wide range of applications that have benefitted from the enhanced separation of GC×GC.

Biomarker discovery

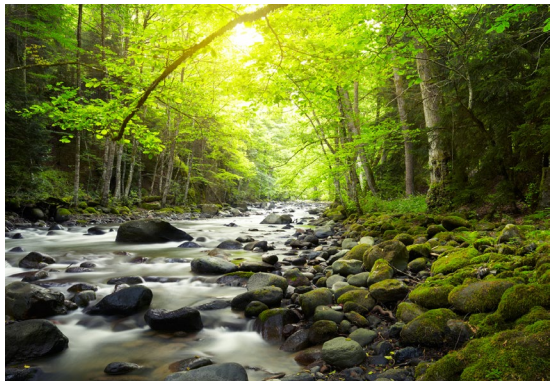
Food & beverage aroma

Petrochemical fingerprinting

Odours & emissions

Fragrance profiling

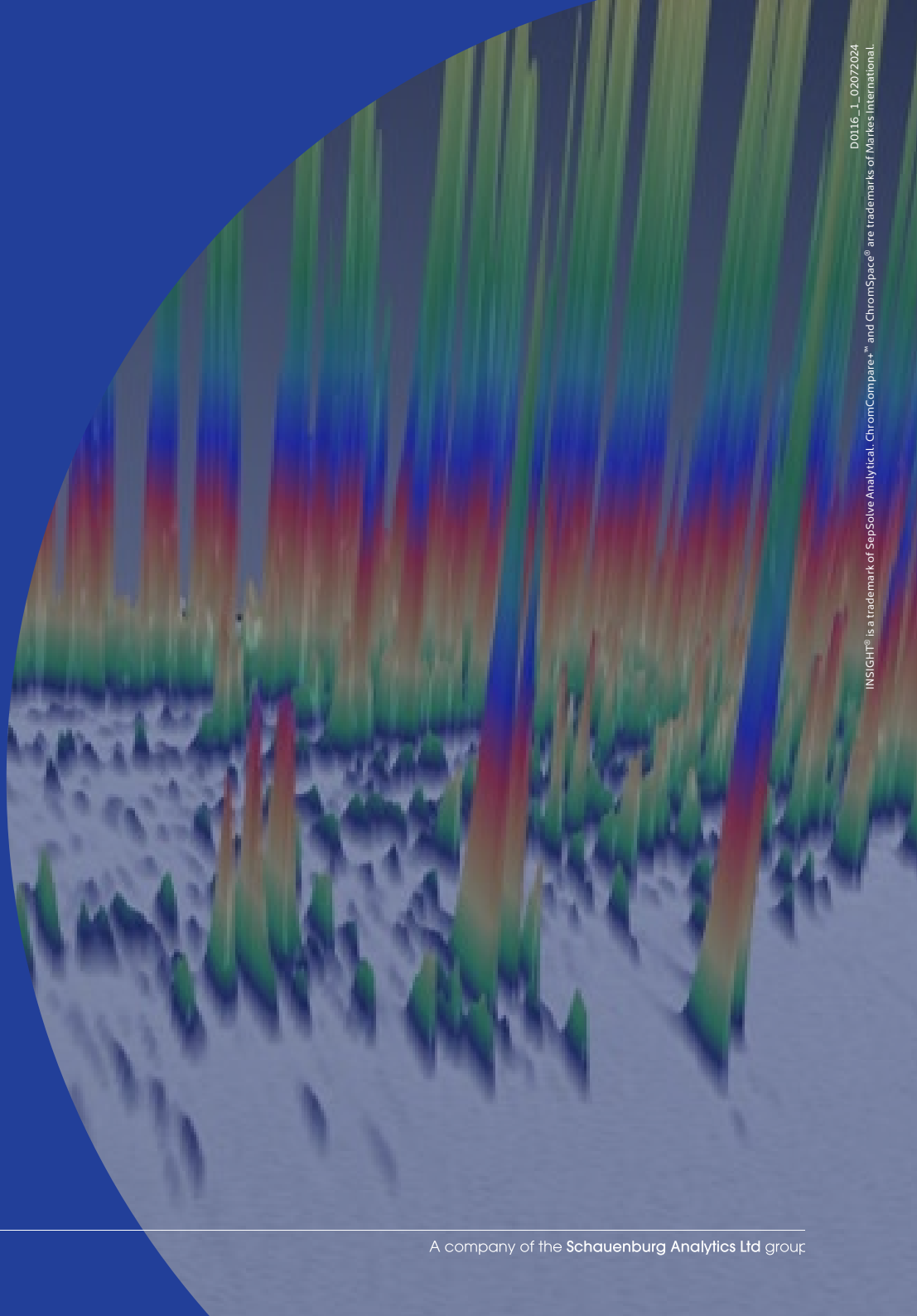
Environmental monitoring



About SepSolve Analytical

SepSolve Analytical provides analytical platforms for separation scientists, including equipment for automated sample introduction, advanced GC separation, state-of-the-art mass spectrometry, and powerful data analysis.

Together, these tools enable you to discover more about your sample, and to deliver higher throughput for both research and routine applications. To ensure you get the best from your investment, our experienced application chemists provide access to the training and support you need, at support centres around the globe.



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SepSolve Analytical

UK: 4 Swan Court, Forder Way, Peterborough
T: +44 (0)1733 669222

Canada: 826 King Street North, Waterloo, Ontario
T: +1 519 206 0055

Germany: Bieberer Straße 1–7, 63065 Offenbach am Main
T: +49 (0)69 668 108 920

hello@sepsolve.com

www.sepsolve.com