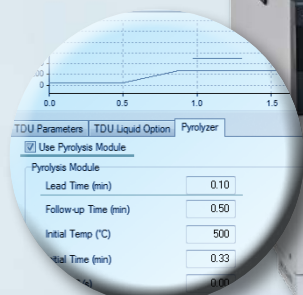




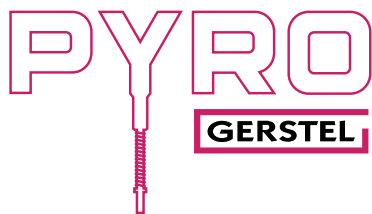
GERSTEL

Automated Pyrolyzer

PYRO



PYRO
GERSTEL



Automated Pyrolysis System

GERSTEL PYRO

The GERSTEL PYRO enables highly flexible and efficient automated pyrolysis of solids and liquids at up to 1000 °C combined with determination in a GC/MS system of the thermal decomposition products. If required, thermal desorption and pyrolysis of the same sample can be performed in sequence, enabling the analyst to obtain the cleanest possible pyrogram and the maximum amount of information in the shortest possible time. Some key areas in which the PYRO is used are production quality control; product development; and forensic science.

Efficient and accurate analysis

When combined with the industry standard GERSTEL MultiPurpose Sampler MPS, up to 196 samples can be pyrolyzed automatically in one batch. With just one method and one sequence table the analyst can set up the complete system including thermal desorption, pyrolysis, and GC/MS analysis. This reduces the risk of error and enables a highly efficient work-flow, while providing sensitive and reliable results. The Pyrolyzer is very easy to operate. The sample is placed in a sample holder that is mounted onto the TDU pyrolysis insert and placed in the MultiPurpose Sampler PYRO tray. The sample is automatically inserted into the TDU Pyrolyzer. Similar to standard thermal desorption operation, pyrolysis break-down products are transferred directly to the GC column or refocused in the GERSTEL Cooled Injection System CIS before being introduced as a narrow band onto the GC column for separation. The GERSTEL PYRO can also be used for manual operation with the TDU as needed.

Wide range of pyrolysis temperatures

The initial thermal desorption can be performed at temperatures ranging from ambient to 350 °C. Pyrolysis is performed at temperatures from 350 °C to 1000 °C. Standard pulsed pyrolysis can be performed, and the temperature, as well as the temperature program, can be varied from sample to sample. Programmed heating can be



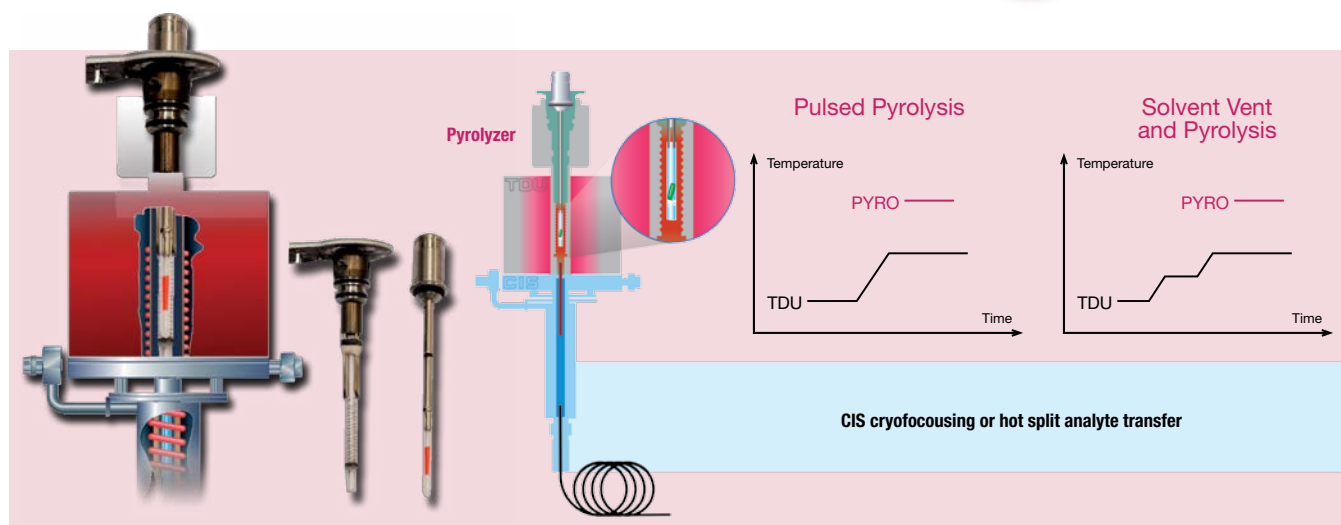
specified at rates ranging from 0.02 to 100 °C/s, which means that optimal analysis conditions can be chosen for each sample type and for every conceivable matrix.

Split interface and cryo trap

Pyrolysis breakdown products are transferred to the GC/MS system using the GERSTEL Cooled Injection System (CIS) PTV-type inlet. The CIS can be used either simply as a heated split interface or as an intermediate cryofocusing trap in order to focus volatiles and trace analytes. A wide concentration range can be covered by the system while ensuring best possible recovery, excellent GC separation and maximum information content.

Low sample-to-sample carry-over

The valve-free liner-in-liner concept eliminates sample-to-sample carry-over and the TDU and CIS liners are heated over their entire lengths ensuring best possible recovery and minimizing contamination. The platinum filament is connected at four different points ensuring accurate monitoring of the filament resistance and accurate temperature control delivering reliable results at all times. Change over between standard TDU operation and pyrolysis operation is performed in less than ten minutes. If the liner needs to be changed another 5 minutes are needed. The complete system including the GC/MS can be used in a highly flexible manner to the greatest possible benefit of the laboratory.

**GERSTEL**

Features and Benefits

Efficient automation

- Up to 196 samples analyzed in a single batch using the MPS
- Time and cost savings
- Higher sample throughput
- Easier method development using automated sequence

Standard pulsed pyrolysis

- Generates results that are comparable with existing pyrolysis data
- Enables the use of pyrolysis GC libraries

Thermal desorption with solvent venting and pyrolysis of the same sample

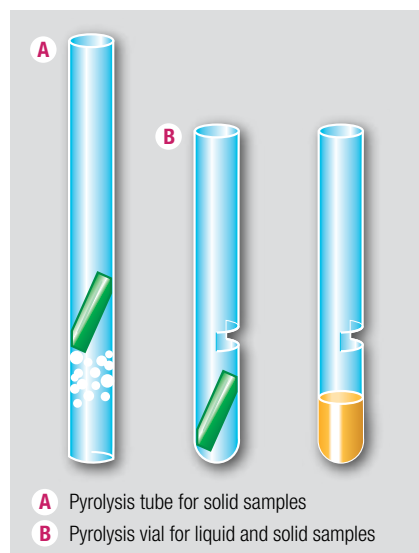
- Thermal desorption analysis and pyrolysis is performed on a single sample resulting in separate GC/MS chromatograms
- Sample is purged and cleaned using thermal desorption prior to the pyrolysis step
- A clean pyrolysis profile is obtained without interfering contaminants that are unrelated to the polymer structure
- Suitable for polymers in solution, enabling exact and reproducible sample amounts to be introduced
- Suitable for humid samples, saves time by eliminating external drying step
- Clearer and more accurate information is obtained from the sample

Selectable cryo trapping

- Analyte focusing directly in the CIS liner provides improved peak shape
- Reliable results and more information, especially for volatiles and trace analytes

Dedicated sample holders available for liquids and solids

- Flexible use for a wide range of sample types
- Best possible sample introduction
- Supports relatively large sample amounts; samples can be introduced in solution using a syringe for better accuracy
- Easy sample introduction and preparation saves time and improves productivity



Split- or splitless operation

- Accurate analysis results across a wide concentration range
- Enables solvent vent mode for analyte concentration & sample clean-up prior to pyrolysis
- Optimal transfer of analytes to the GC column depending on the analysis requirements

Freely selectable pyrolysis temperature from 350-1000 °C

- Optimal temperature can be chosen for each sample
- Meaningful and accurate results
- Different samples or sample types can be analyzed at different temperatures in one automated batch, saving time and improving productivity
- Samples can be analyzed at different temperatures in one automated batch for fast method development and optimization

Flexible and proven resistance heating using Pt filament

- Freely selectable pyrolysis temperature from 350-1000 °C
- Freely selectable heating rate from 0.02-100 °C/s in steps of 0.01 °C/s
- Easier method optimization since any temperature can be chosen by mouse-click
- highly flexible, multiple sample types can be analyzed in one automated sequence without hardware changes

Liner in liner system

- No transfer line is needed between pyrolyzer and GC/MS inlet
- Simple and reliable system with less active surface and negligible memory effects
- Less maintenance required, higher uptime
- Better accuracy and more reliable results

MPS

Flexible modular system

- Fast change over between pyrolysis, standard TDU or liquid introduction operation
- Different samples and sample types can be analyzed using the system
- Best possible system utilization and return on investment (ROI)
- Enables fast and flexible response to new tasks and challenges, for example, in a trouble-shooting environment
- As needs change, the system is easily expanded to meet new requirements saving cost

Small foot-print, mounted on top of GC/MS

- No additional bench space required, saves cost
- Logistically an easy addition to existing instruments, no need to rearrange the lab

GC back flush in combination with pyrolysis

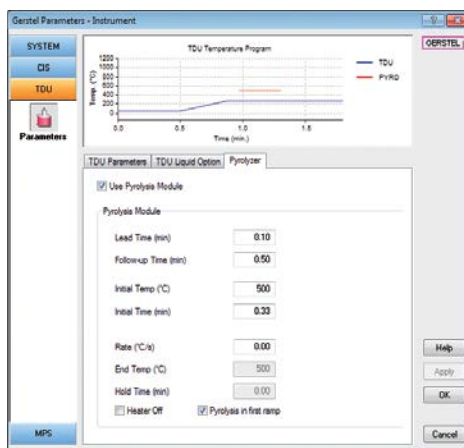
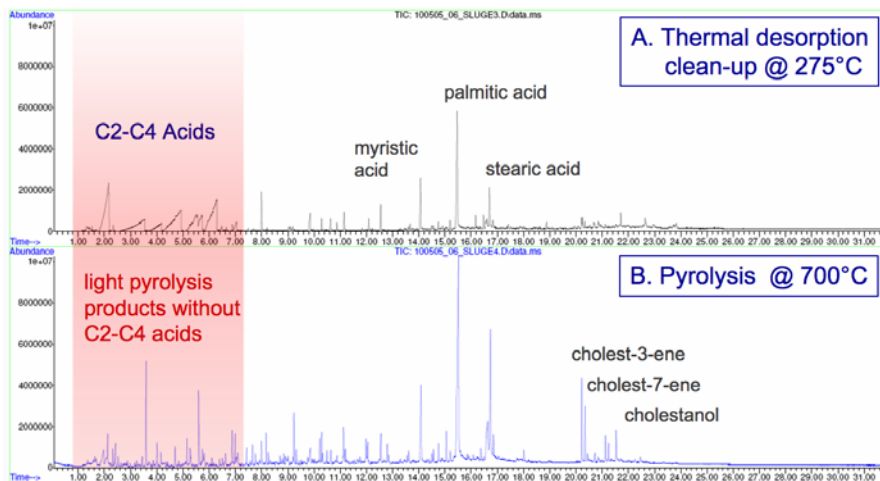
- Interfering compounds can be kept out of the GC column and MS during pyrolysis
- Back flush of unwanted high-boilers from GC column shortens GC runs and keeps the GC/MS clean

No valve in sample flow path

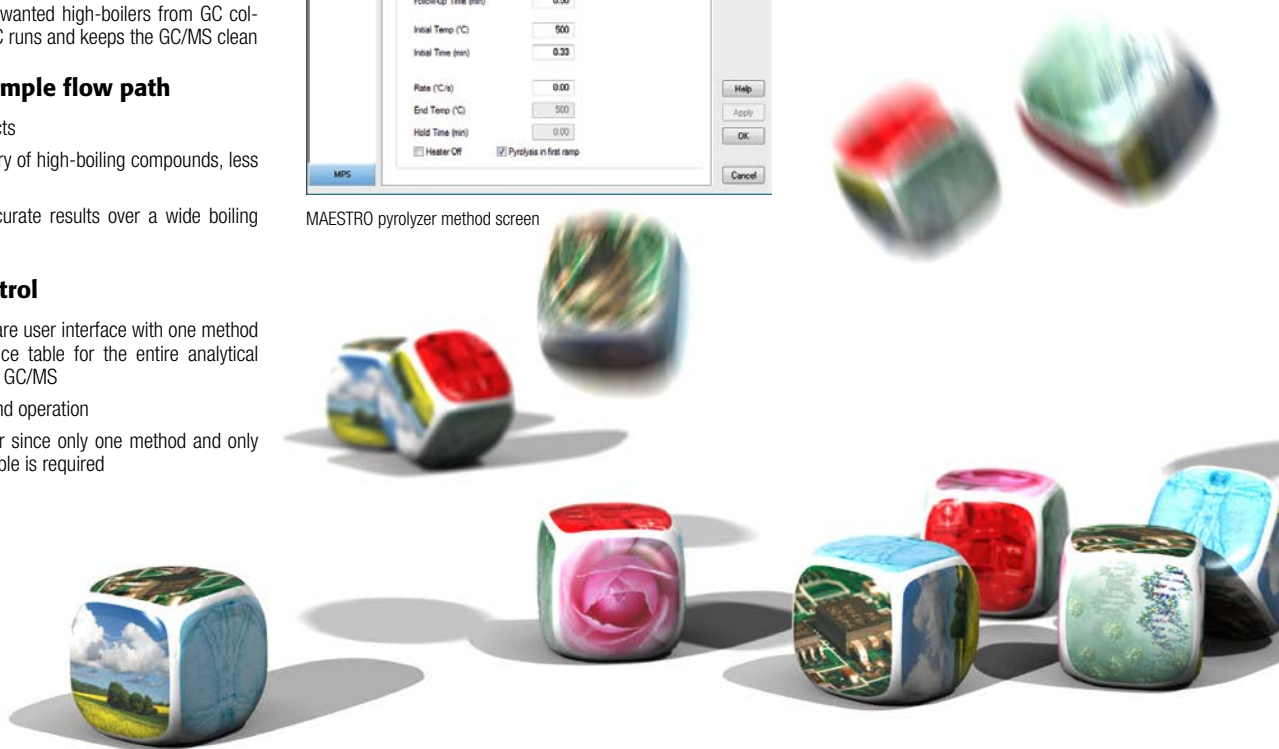
- No memory effects
- Improved recovery of high-boiling compounds, less discrimination
- Reliable and accurate results over a wide boiling range

MAESTRO control

- Integrated software user interface with one method and one sequence table for the entire analytical system including GC/MS
- Simple control and operation
- Less risk of error since only one method and only one sequence table is required



Thermal desorption prior to pyrolysis eliminates interfering contaminants, in this case C2 - C4 carboxylic acids



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G L O B A L A N A L Y T I C A L S O L U T I O N S

GERSTEL, Inc., USA
+1 410 - 247 5885
sales@gerstel.us

GERSTEL BRASIL
+55 11 5665 8931
gerstel_brasil@gerstel.com

GERSTEL GmbH & Co. KG, Germany
+49 208 - 7 65 03-0
gerstel@gerstel.com

GERSTEL AG, Switzerland
+41 41 - 9 21 97 23
swiss@ch.gerstel.com

GERSTEL K.K., Japan
+81 3 57 31 53 21
info@gerstel.co.jp

GERSTEL LLP, Singapore
+65 6622 5486
sea@gerstel.com



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