

# OPTIC-4 Pyro

High Temperature MultiMode Pyrolyzer  
for Gas Chromatography



## OPTIC-4 Pyro



OPTIC-4 Pyro is special configuration of our OPTIC made for pyrolysis with a maximum temperature of 700 °C.

### Liquid sample:

The sample is injected into the inlet with an autosampler or in manual mode. The liquid sample is introduced while the inlet is cold, after the injection the solvent is blown away and the OPTIC is heated with a very fast ramp rate to the pyrolysis temperature.

### Solid sample:

The sample is placed into the liner or microvial and the liner is placed into the inlet. After this the OPTIC inlet is heated to the pyrolysis temperature. Changing the liners can be done with the LINEX (liner exchanger) to automate the pyrolysis.

## One inlet, more analytical options

The patented low thermal mass design of the inlet body together with direct resistive heating provide fast linear temperature programming up to 700 °C at rates as high as 60 °C/s. In addition to standard sampling modes, the programmable inlet can operate effectively with Pyrolysis, Large Volume Injections, Cold Injections or Thermal Desorption sample introduction and combination of the mentioned techniques. With the options for sub-ambient cooling, cryogenic trapping and automated liner exchange, OPTIC-4 is the world's most versatile inlet for Gas Chromatography.

## OPTIC-4 Pyro, possible analysis modes

### - LVI-Pyrolysis

LVI Pyrolysis can easily be done with the OPTIC inlet, just like regular LVI injections.

### - Single Shot GC analysis

With this method or mode the sample is heated after introduction with a fast speed to the pyrolysis temperature. Only one temperature step is used.

### - Double Shot GC analysis

This technique allows a sample to be sequentially analysed for volatile components. Volatile components contained in a sample are first desorbed at relatively low temperatures, this is followed by fast pyrolysis step at high temperature.

### - Multistep programmed pyrolysis (Multi Shot)

Analytical runs may be programmed for up to nine temperature steps per sample.

### - Sample Cup or Micro Vial

A small glass sample cup is available to introduce a solid or liquid sample.

### - Evolved Gas Analysis (EGA)

The sample is dropped into the inlet which is at a relatively low temperature (ca. 40-100°C). The inlet is then programmed to a much higher temperature (ca. 700°C). Compounds "evolve" from the sample as the temperature increases. A plot of detector response versus furnace (inlet) temperature can be obtained.

### - Thermal Desorption (TD)

Thermal desorption is simply a technique for analyzing of the constituents evolving from the sample over a given temperature range.

### - Reactive Pyrolysis

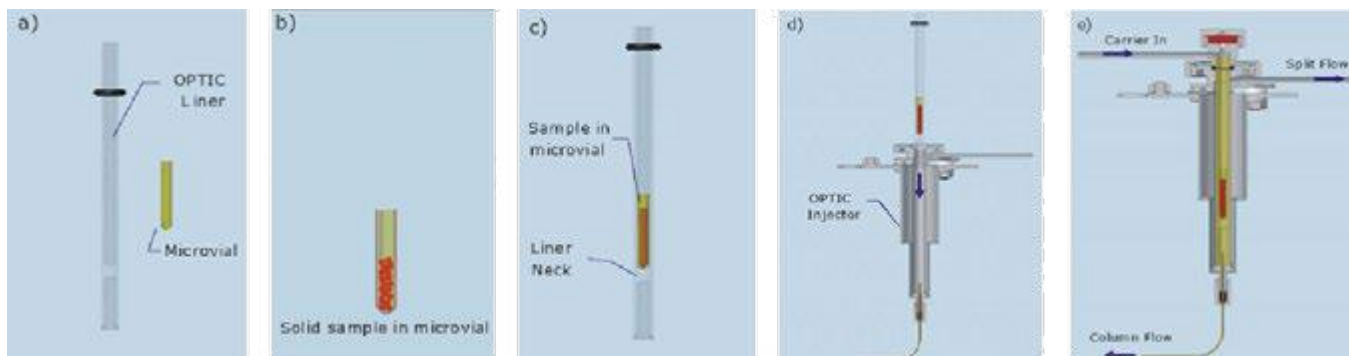
Thermally assisted Hydrolysis and Methylation (THM) can easily be done under Helium conditions.

### - TED-GC-MS

Thermal Extraction Desorption gas chromatography mass spectrometry (TED-GC-MS). This method consists of thermal extraction of the sample via thermogravimetric analysis (EGA), collection of the evolved gaseous decomposition products on a solid-phase adsorber and analysis of the loaded adsorber using Thermal-Desorption-GC-MS.

## Pyrolysis on top of the column

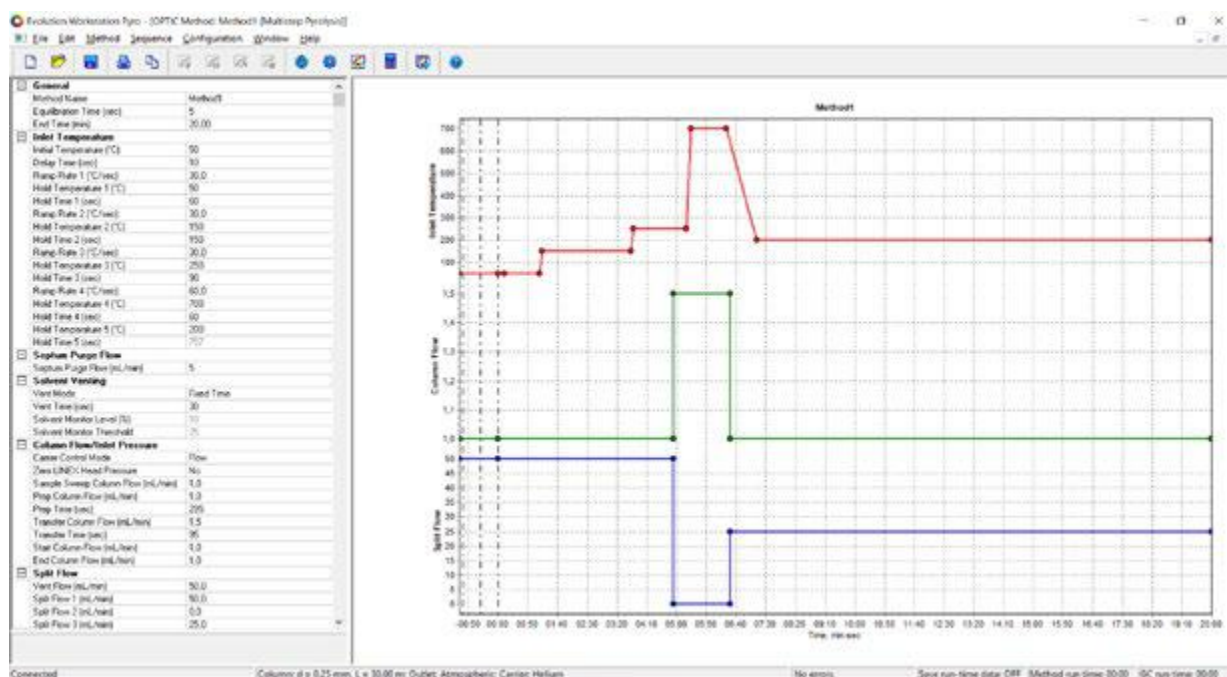
The pyrolysis with OPTIC-4 Pyro can be done in manual mode or fully automated with our LINEX and the CTC Analytics PAL system. The pyrolysis happens on top of the column so compounds are transferred to the column in a very fast way. A fast transfer results in better peak shapes.



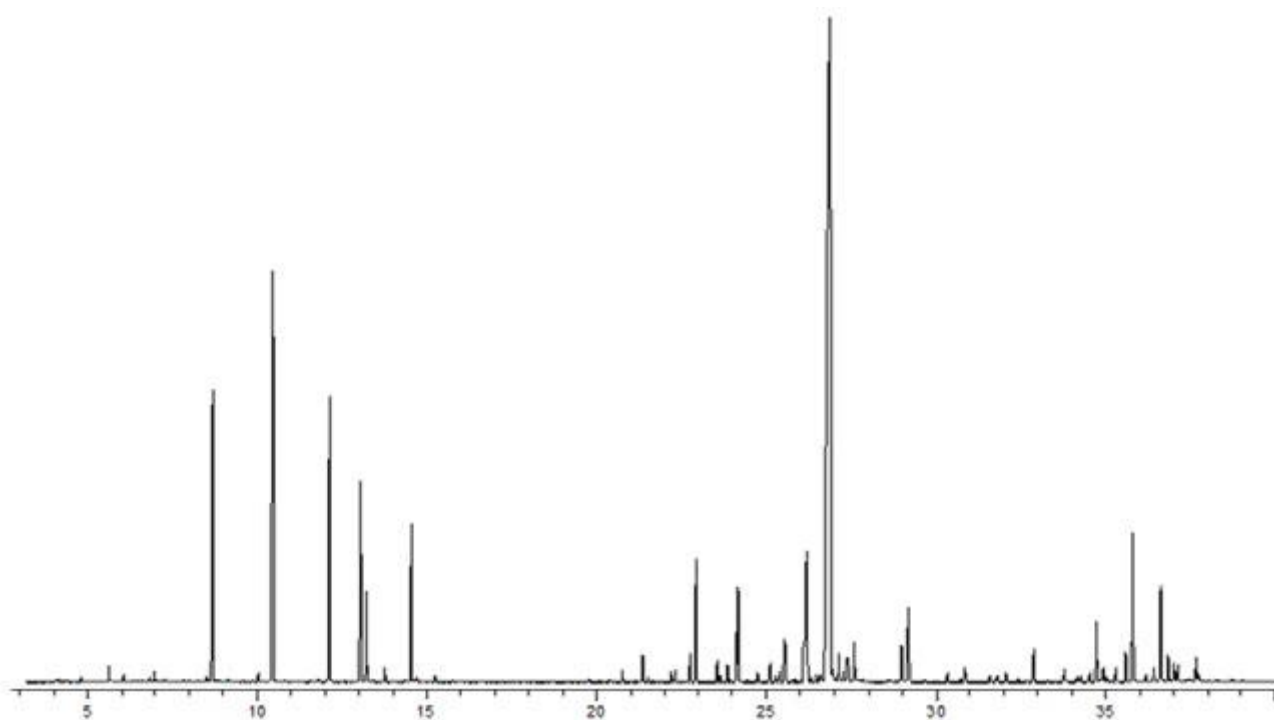
## Control software

Evolution Workstation software offers state of the art OPTIC inlet control in a user-friendly way. Based on years of experience it extends OPTIC-4 features and optimizes the analytical output.

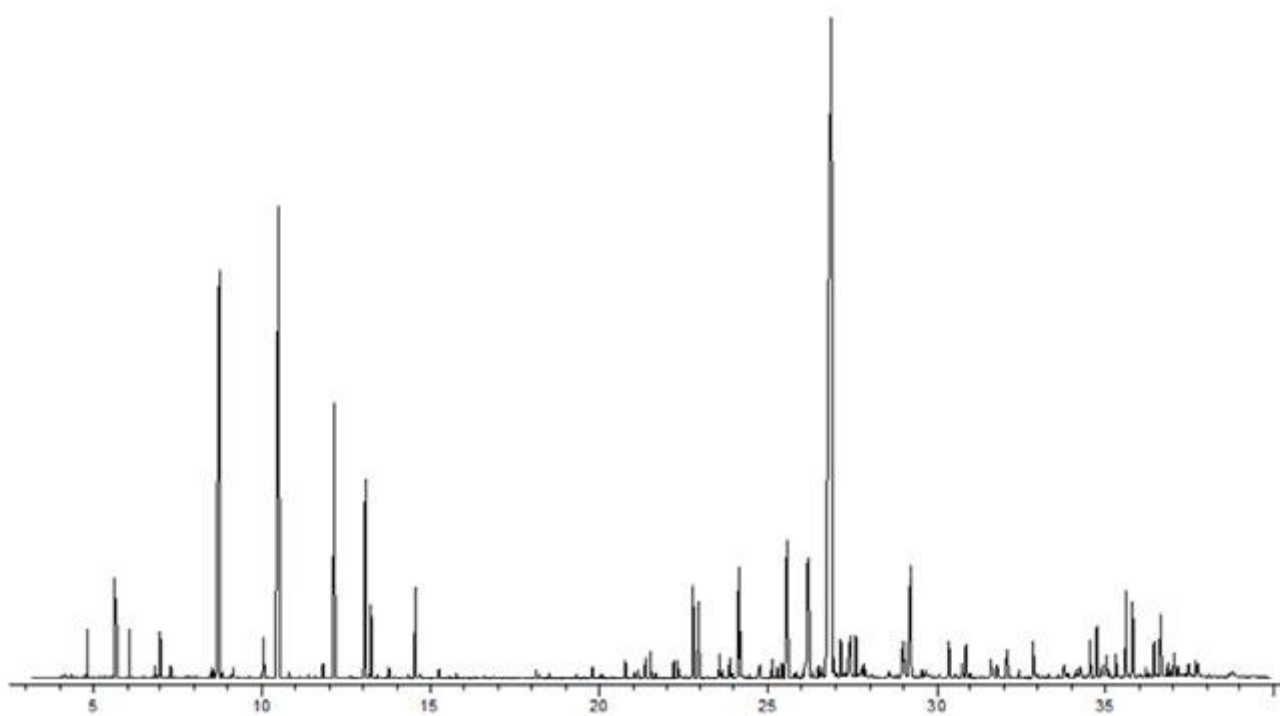
- Supplied with every OPTIC-4
- Complete status information at any moment during run or standby state
- Real-time graphical run-time parameters display
- Possibility to save the run-time data for every injection
- Up to 9 steps for both pressure or flow programming
- Build in column flow/pressure calculator
- Free updates



## Pyrograms at 600°C and 700°C



Pyrolysis polycarbonate at 600°C (split flow = 125 mL/min)



Pyrolysis of polycarbonate at 700°C (split flow = 125 mL/min)

For some polymers a higher pyrolysis temperature is helpfull.

## Automated Liner Exchanger Option (LINEX)

LINEX can be used for automated Pyrolysis and Direct Thermal Desorption. Liners or TD tubes are transported between tray and inlet by the CTC PAL Systems equipped with a gripper. Any of the OPTIC liners can be handled by LINEX.

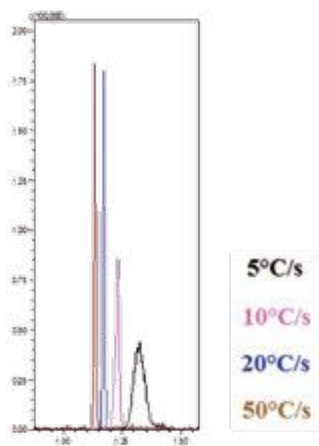
With LINEX it is also possible to store the liner with caps, the caps are removed by the capping/de-capping station and placed into the OPTIC inlet. Next could be a liquid injection of an internal standard. The solvent of the standard will be vented away and the TD tube will be heated.



## CryoTrap option

Cryogenic cold trapping is frequently used for narrowing the chromatographic band and improving the detection limit. The cryotrap uses LN<sub>2</sub> or CO<sub>2</sub> for cooling, due to our low thermal mass the cooling is really fast. The CryoFocus has direct heating of the cooling chamber, resulting in very fast heating of the trap.

After trapping the analytes must be released from the cryotrap using a highly accurate and very fast heating ensuring that they are introduced onto the column in a very sharp band. With a fast heating cryo-trap better detection limit and better resolution can be seen on the detector.



A fast heating trap will give very sharp peaks.

## Specifications

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### General

- Dimensions: 34 cm x 14 cm x 34 cm (h x w x d), weight: 6.7 kg (controller)
- Ambient operating temperature range: 18 – 40 °C, ambient operating humidity: 40 – 70 %
- Mains power: 100 - 240 VAC, 50-60 Hz
- Typical power consumption: 150 W, maximum power consumption: 450 W

### Inlet

- Full electronic pressure/flow control
- Maximum operating temperature: up to 700 °C at a GC oven temperature of 35 °C
- Cooling: air (down to 35 °C), LCO<sub>2</sub> (down to -50 °C), LN<sub>2</sub> (down to -180 °C)
- Temperature ramp rates: 0.1 - 60 °C/sec
- Up to nine temperature program ramps including negative

### EFC

- Full electronic control of column, split and septum purge flows
- Pressure range: 7 -700 kPa
- Total flow range: 5 - 500 ml/min He (main channel), 1 - 100 ml/min He (aux. channel)
- Pressure sensor: accuracy : ± 1 % full scale, repeatability: ± 0.2 % full scale
- Flow sensors: accuracy : ± 1 % full scale, repeatability: ± 0.2 % of full scale
- He, N<sub>2</sub> or H<sub>2</sub> as carrier gas at a maximum pressure of 700 kPa
- Solvent sensor in the split line

### Interfaces

- LAN and USB
- Four auxiliary relay outputs (30 V/500 mA max.)
- Remote start/stop to GC and autosampler

### Software

- Method and sequence definition and development
- Real-time system status display
- Automatically generated optimization sequences
- Direct control of the instrument in Standby mode
- System run log file
- Password protection with two access levels

### Cryogenic Trap Option

- Operating temperature range : -150 °C to +350 °C
- Temperature ramp rates: 1 - 60 °C/sec

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## Contact