GL Sciences

Gas Chromatography

OPTIC-5

Pyrolyzer

Inlet for Pyrolysis
Can be used with any GC or GC–MS
Liquid and Solid samples

Introduction

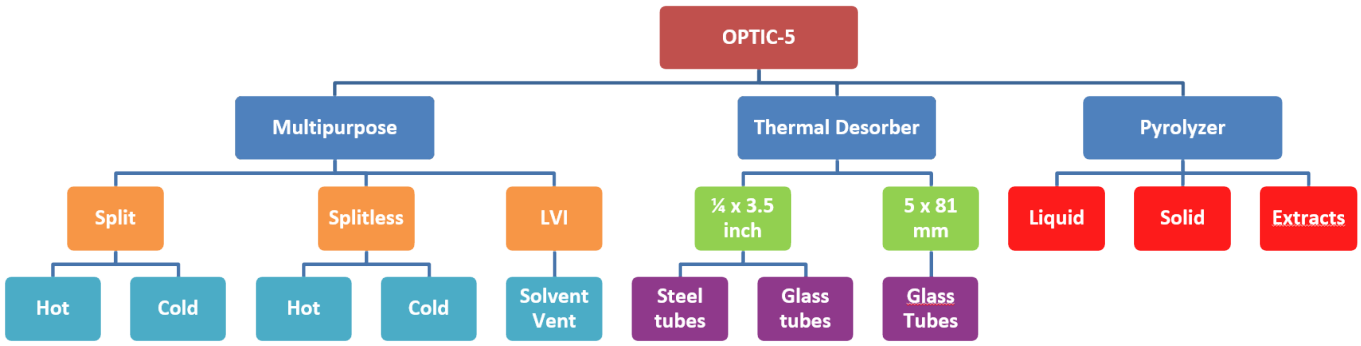
OPTIC-5 represents a groundbreaking advancement in GC Inlet technology, designed to deliver extreme performance. With cutting-edge features and innovative design, OPTIC-5 is set to revolutionize the way a sample is introduced onto a GC column.

OPTIC is a highly advanced Gas Chromatograph inlet system with sophisticated temperature and gas flow control that can be used for the most demanding Gas Chromatograph analyses. The OPTIC GC inlet has a long history starting from 1992. The current version OPTIC-5 can be used for hot injections, cold injections, large-volume injections, on-column injections, in-liner derivatization, thermal desorption, pyrolysis and more. There are three main versions available. All versions can be combined with advanced options.

OPTIC-5 Multipurpose 81 × 5 mm	OPTIC-5 Thermal Desorber 3.5 × 1/4 Inch	OPTIC-5 Pyrolizer 81 × 5 mm
Main applications are liquid injections. Pyrolysis applications till 800°C.	Main applications are Thermal Desorption Also used for liquid injections.	Main applications are Pyrolysis. Also used for liquid injections.
Liner size OD: 81 × 5 mm glass (T < 600°C) or quartz liners	Liner / TD tube size OD: 3.5 × 1/4 inch glass (T < 600°C) quartz or metal TD tube	Liner size OD: 81 × 5 mm quartz liners or glass (T < 600°C)
Maximum temperature is 800°C	Maximum temperature is 700°C	Maximum temperature is 1000°C
Large selection of liners available.	Standard TD tubes (glass and metal) can be used.	100% oxygen free pyrolysis
This version is the best choise for liquid injections. Biggest choice of liners.	The 3.5 x ¼ Inch versions can handle both glas and metal TD tubes. (Industry Standard)	Very popular for pyrolysis. Micro plastic work is done on this version.
Very popular for Large Volume Injections and different versions of cold injections.	Most popular with LINEX and CDC station for automated Thermal Desorption.	Most popular with LINEX for automated Pyrolysis. Both liquid and solid Pyrolysis.
Optional integrated Cold Trap.	Optional integrated Cold Trap.	Optional integrated Cold Trap.
Maximum Ramp Rate of 100°C/sec.	Maximum Ramp Rate of 60°C/sec.	Maximum Ramp Rate of 100°C/sec.

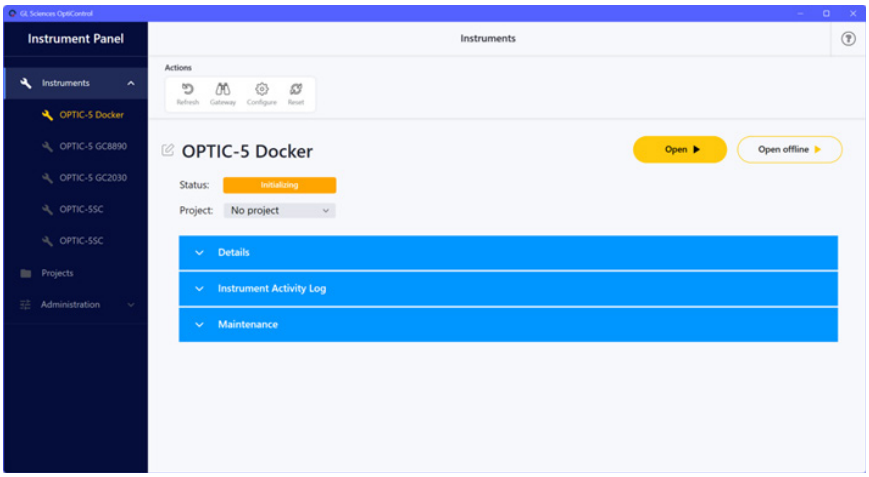
All versions can be supplied with options like: Cold Trap, Inlet backflush, Inlet cooling with LN2, CO2 or Peltier, Automatic Liner Exchanger or PAL3 System.

The patented design of the inlet body helps to have the best transfer of the compounds from the inlet onto the analytical column. This can be seen both for volatile and non-volatile compounds.
OPTIC-5 Inlet can cool very fast because of the low thermal mass. The GC inlet system can work from cryogenic temperatures (-150°C) up to very high temperatures of 1000°C with a ramp rate up to 100°C/sec.
Depending on solvent type, liner type and injection speed it is possible to inject from 0.1µl till 1000µl in the OPTIC inlet.
With the optional inlet peltier cooler, it is possible to cool faster and reach initial inlet temperatures of +7°C.



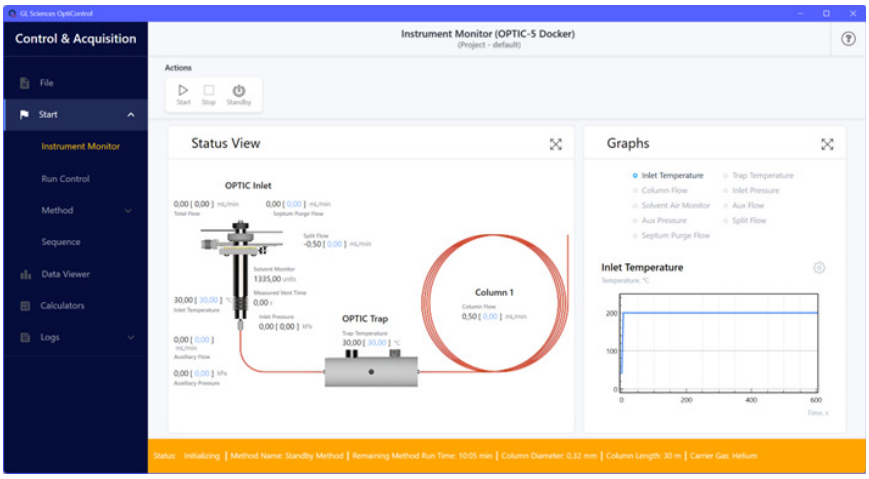
OptiControl Software

OptiControl is the software to control the OPTIC-5. It is composed of two primary components: the Instrument Panel and the Control & Acquisition application.



The Instrument Panel functions as the hub for managing instruments, users, and security settings, as well as conducting instrument diagnostics and maintenance.

The Control & Acquisition application offers an advanced editor to assist you in creating customized methods for specific analytical applications. Once finalized, the methods can be used for analyzing samples either individually (as a single run) or in a sequence of automated runs. The Run Control queue displays a comprehensive list of all runs, including completed, ongoing, and pending runs, allowing for efficient oversight and management of all initiated runs.
The Instrument Monitor window provides real-time updates on the instrument's status, indicating whether it is idle, ready, disconnected, running, initializing the method. Users can monitor actual temperatures, pressures, and flow rates, as well as viewing real-time signal graphs displaying data for each sample run.



- Standard supplied with every OPTIC-5
- Complete status information
- Graphical run-time parameters display
- Run-time data can be saved
- Multiple column configurations can be set
- 10 steps for pressure and flow programming
- System and method log files
- Build in column flow/pressure calculator
- Modulator control for GC×GC
- Deans' Switch control
- LAN interface to the instrument
- Windows 11 compatibility
- Free updates

Software integration

OptiControl can be integrated in Thermo Chromeleon™ Chromatography Data System, Axel Semrau CHRONOS software and LECO ChromaTOF software.
Pyrogram database software is available via OPENChrom.

Features

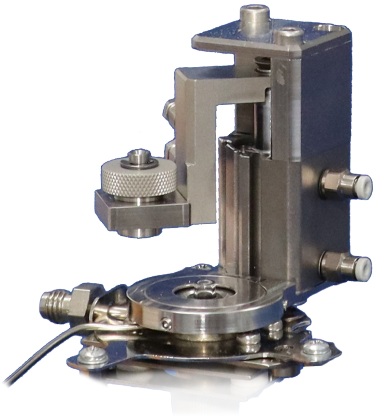
OPTIC-5 can be installed on any GC brand or model. Installation kits are available for the most common GC's.

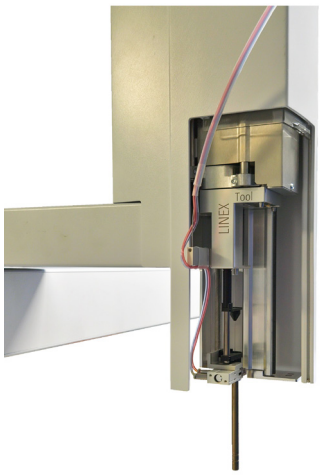
Options

LINEX automatic LINer EXchanger

LINEX stands for Automatic LINer EXchanger, a tool to automatically change liners in gas chromatography. Introduced in 2001. LINEX works with the OPTIC Inlet system and is compatible with CTC PAL3 systems.

Why Use LINEX?
LINEX allows for Direct Thermal Desorption (DTD), where liners containing samples are automatically moved between a tray and the injector using a robotic arm (PAL system with a gripper).





Key Benefits:

- Works with solid and liquid samples or sorbent-filled sample tubes for thermal desorption.
- Ideal for complex samples using DMI (Difficult Matrix Introduction), with minimal sample prep.
- Uses standard liners and tubes – no special adapters needed.
- Offers selective desorption without damaging the sample matrix.
- Compatible with any GC system.
- Uses standard 11 mm septa and supports the Merlin Microseal.
- No carryover or septum bleed, thanks to standard septum purging.
- Tray capacity: 54 open or 40 capped liners per PAL3 tray, for higher capacity multiple trays can be used.

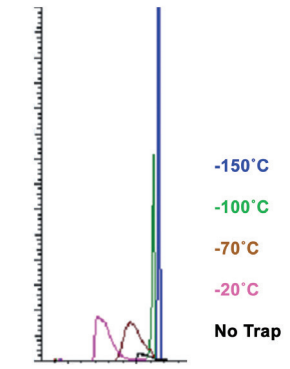
Capping / DeCapping Station for LINEX

In many cases the GC injector liner should be sealed (capped) from both sides to either protect the sample, placed or collected into the liner, from deteriorating influence of the environment or keep the liner clean after conditioning. The liner should than be de-capped just before it is placed into the GC injection port. The GL Sciences Capping DeCapping (CDC) Station is designed to automate this procedure.

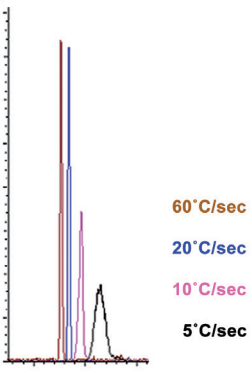
The CDC is an option of the automatic liner exchanger (LINEX) system.

Cryogenic Trap

Cryogenic cold trapping is frequently used for narrowing the chromatographic band and improving the detection limit in Gas Chromatography. The cryotrap uses LN2 or CO2 for cooling. Due to the low thermal mass, the cooling is really fast. The trap has direct heating of the cooling chamber, resulting in amazingly fast heating of the trap. After trapping, the analytes must be released from the cryotrap using a highly accurate and extremely 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 higher chromatographic resolution are seen. The LN2 valve is a special valve, this valve is without any noise.

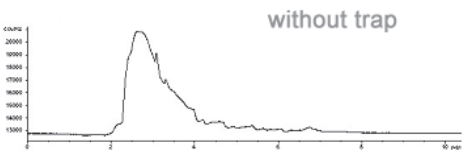


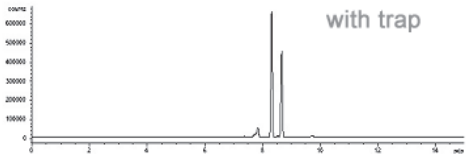
Influence of Cryotrap low temperature for Vinylchloride (M/Z = 62)
Headspace out of Water



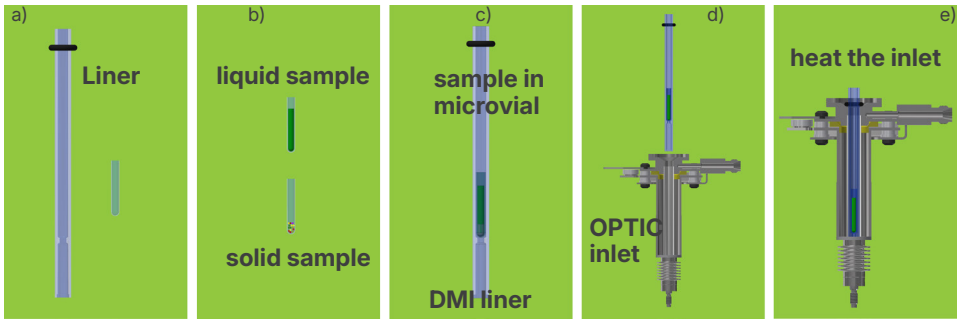
Influence of Cryotrap heating rate for Vinylchloride (M/Z = 62)
Headspace out of Water

THC in Hair



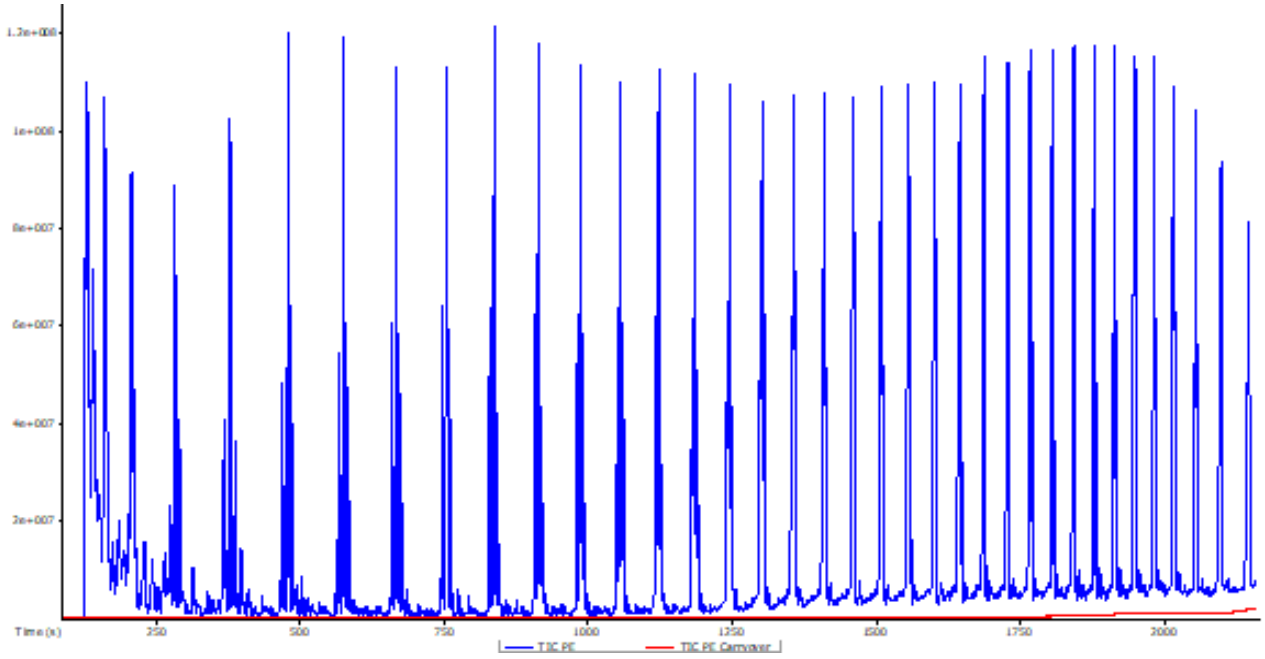


Pyrolysis of Polyethylene



Workflow

- 1 mg polyethylene in micro vial
- micro vial with sample into liner
- LINEX puts liner into inlet
- inlet goes to pyrolysis temperature



Pyrogram of Polyethylene

Blue, Pyrogram; Red, blank run after pyrolysis-run.

The combination of the OPTIC-5 pyrolyzer, and the LINEX provides an efficient and reliable method for analyzing PE microplastics and their pyrolysis products. The automated sample introduction system ensures reproducibility and eliminates the risk of contamination, while the OPTIC-5 system delivers high precision in controlling the pyrolysis process. This approach is highly suitable for the characterization of microplastic degradation products, aiding in environmental studies and advancing microplastic research.

- Precision and Control – The OPTIC-5 Pyrolyzer offers precise control over pyrolysis conditions, ensuring reproducibility and accuracy in the analysis of microplastics.
- Minimal Sample Preparation – This technique requires minimal sample preparation, allowing for the direct analysis of microplastics in environmental samples with high sensitivity.
- Small Sample Size – The OPTIC-5 can analyze small sample amounts (as low as a few milligrams), which is advantageous when working with limited microplastic samples.
- No Carryover – There is no need to run a blank between samples, since the OPTIC-5 Pyrolyzer is free of carryover, even after high sample load.
- No thermal oxidation – Since the sample is purged with carrier gas, all oxygen is vented prior to pyrolysis. This absolutely prevents for thermal oxidation of the sample.
- Comprehensive Polymer Characterization – Pyrolysis-GC-MS provides detailed molecular information, allowing for the identification of polyethylene even in complex environmental matrices.

Specifications

General

Controller dimensions	38 cm × 15 cm × 38 cm (h × w × d)
Controller weight	Approx. 9.5 kg
Operating temperature range	18 – 40°C
Operating humidity range	40 – 70%
Mains power	100 – 240 VAC, 50 – 60 Hz
Typical power consumption	200 VA
Maximum power consumption	900 VA
Communication interface	Ethernet
Auxiliary relay outputs	Four auxiliary relay outputs (30V/500 mA max.).
Remote interface	Remote Start/Stop and Ready (In and Out) to a host GC and autosampler.

Inlet

Operating temperature range	• OPTIC-5 GC Multipurpose Inlet: -150 – 800 °C • OPTIC-5 Pyrolyzer: -150 – 1000 °C • OPTIC-5 Thermal Desorber: -150 – 700 °C
Liner size compatibility	• OPTIC-5 GC Multipurpose Inlet: 5 × 81 mm, glass (T < 600°C) or quartz liners. • OPTIC-5 Pyrolyzer: 5 × 81 mm, glass (T < 600°C) or quartz liners. • OPTIC-5 Thermal Desorber: ¼ x 3.5 inch glass (T < 600°C) quartz or metal TD tube.
Cooling	Air (down to 30°C), CO2 (down to -50°C), LN2 (down to -150°C).
Temperature ramp rate range	0.1 – 100 °C/s.
Number of programmed steps	Up to 10 temperature programmed ramps, including negative (cooling).
Septum compatibility	Plug Type or 11 mm.
Septum less	Merlin MicroSeal™.
Cooling media	Moisture- and oil-free Air at a pressure of 500 kPa, liquid CO2, liquid LN2.

Electronic Flow/Pressure Control

Type	Main EFC module, with optional auxiliary EFC and/or EPC modules.
Carrier pressure/flow control	Full electronic control of column (pressure programmed), total and septum purge flows.
Pressure range	7 – 700 kPa
Total flow range	5 – 500 ml/min Helium
Septum purge flow	3 – 30 mL/min
Pressure sensors	Accuracy: ± 1% FS, repeatability: ± 0.2% FS
Flow sensors	Accuracy: ±1,5% RD plus ±0,5% FS, repeatability: ±0,5% RD
Carrier gas	Helium, Nitrogen or Hydrogen, maximum inlet pressure of 700 kPa
Sensors	Solvent and Air sensor in the inlet split line
Filters	Charcoal filter in the inlet split line

Cryogenic Trap Option

Cooling media	LN2 - from pressurized (100 – 150 kPa) vessel, CO2 - from high pressure cylinder with dipstick.
Operating temperature range	-150°C – 350°C (LN2), -50°C – 350°C (CO2)
Temperature ramp rate	1.0 – 60 °C/s
LN2 Valve	Silent valve
CO2 Valve	Not Silent

Ordering Information

Main instruments (installation kit included)

Part Number	Description
2416-3101	OPTIC-5 Multipurpose GC Inlet System for Shimadzu GC-20xx
2416-3102	OPTIC-5 Multipurpose GC Inlet System with Cryotrap, LN2 Cooling, for Shimadzu GC-20xx
2416-3103	OPTIC-5 Multipurpose GC Inlet System with Cryotrap, CO2 Cooling, for Shimadzu GC-20xx
2416-3104	OPTIC-5 Pyrolyzer System for Shimadzu GC-20xx
2416-3105	OPTIC-5 Pyrolyzer System with LN2 cooled Cryotrap, for Shimadzu GC-20xx
2416-3106	OPTIC-5 Pyrolyzer System with CO2 cooled Cryotrap, for Shimadzu GC-20xx
2416-3107	OPTIC-5 Thermal Desorption System for Shimadzu GC-20xx
2416-3108	OPTIC-5 Thermal Desorption System with LN2 cooled Cryotrap, for Shimadzu GC-20xx
2416-3109	OPTIC-5 Thermal Desorption System with CO2 Cooled Cryotrap, for Shimadzu GC-20xx
2416-3201	OPTIC-5 Multipurpose GC Inlet System for Agilent 88xx GC
2416-3202	OPTIC-5 Multipurpose GC Inlet System with LN2 cooled Cryotrap, for Agilent 88xx GC
2416-3203	OPTIC-5 Multipurpose GC Inlet System with CO2 cooled Cryotrap, for Agilent 88xx GC
2416-3204	OPTIC-5 Pyrolyzer System for Agilent 88xx GC
2416-3205	OPTIC-5 Pyrolyzer System with LN2 cooled Cryotrap, for Agilent 88xx GC
2416-3206	OPTIC-5 Pyrolyzer System with CO2 cooled Cryotrap, for Agilent 88xx GC
2416-3207	OPTIC-5 Thermal Desorption System for Agilent 88xx GC
2416-3208	OPTIC-5 Thermal Desorption System with LN2 cooled Cryotrap, for Agilent 88xx GC
2416-3209	OPTIC-5 Thermal Desorption System with CO2 cooled Cryotrap, for Agilent 88xx GC
2416-3301	OPTIC-5 Multipurpose GC Inlet System for Thermo TRACE 13/16xx
2416-3302	OPTIC-5 Multipurpose GC Inlet System with LN2 cooled Cryotrap, for Thermo TRACE 13/16xx
2416-3303	OPTIC-5 Multipurpose GC Inlet System with CO2 cooled Cryotrap, for Thermo TRACE 13/16xx
2416-3304	OPTIC-5 Pyrolyzer System for Thermo TRACE 13/16xx
2416-3305	OPTIC-5 Pyrolyzer System with LN2 cooled Cryotrap, for Thermo TRACE 13/16xx
2416-3306	OPTIC-5 Pyrolyzer System with CO2 cooled Cryotrap, for Thermo TRACE 13/16xx
2416-3307	OPTIC-5 Thermal Desorption System for Thermo TRACE 13/16xx
2416-3308	OPTIC-5 Thermal Desorption System with LN2 cooled Cryotrap, for Thermo TRACE 13/16xx
2416-3309	OPTIC-5 Thermal Desorption System with CO2 cooled Cryotrap, for Thermo TRACE 13/16xx

Part Number	Description
2416-3401	OPTIC-5 Multipurpose GC Inlet System for LECO BT/BTX
2416-3402	OPTIC-5 Multipurpose GC Inlet System with LN2 cooled Cryotrap, for LECO BT/BTX
2416-3403	OPTIC-5 Multipurpose GC Inlet System with CO2 cooled Cryotrap, for LECO BT/BTX
2416-3404	OPTIC-5 Pyrolyzer System for LECO BT/BTX
2416-3505	OPTIC-5 Pyrolyzer System with LN2 cooled Cryotrap, for LECO BT/BTX
2416-3406	OPTIC-5 Pyrolyzer System with CO2 cooled Cryotrap, for LECO BT/BTX
2416-3407	OPTIC-5 Thermal Desorption System for LECO BT/BTX
2416-3408	OPTIC-5 Thermal Desorption System with LN2 cooled Cryotrap, for LECO BT/BTX
2416-3109	OPTIC-5 Thermal Desorption System with CO2 cooled Cryotrap, for LECO BT/BTX
	contact us for other configurations

The Cryotrap can be supplied as a seperate instrument, CryoFocus

2416-3110	OPTIC-5 CryoFocus System, LN2 Cooling, for Shimadzu GC-20xx
2416-3111	OPTIC-5 CryoFocus System, CO2 Cooling, for Shimadzu GC-20xx
2416-3110	OPTIC-5 CryoFocus System, LN2 Cooling, for Agilent 88xx GC
2416-3211	OPTIC-5 CryoFocus System, CO2 Cooling, for Agilent 80xx GC
2416-3310	OPTIC-5 CryoFocus System, LN2 Cooling, for Thermo TRACE 13/16xx
2416-3311	OPTIC-5 CryoFocus System, CO2 Cooling, for Thermo TRACE 13/16xx
2416-3410	OPTIC-5 CryoFocus System, LN2 Cooling, for LECO BT/BTX
2416-3411	OPTIC-5 CryoFocus System, CO2 Cooling, for LECO BT/BTX

LINEX options

Part Number	Description
2411-3012	LINEX-2 Capping-De-Capping Station for OPTIC-4/5 and PAL3 (5mm version)
2411-3014	LINEX-2 Liner Exchanger for OPTIC-4/5 and PAL3 (5mm version)
2411-3019	LINEX-2 Liner Exchanger for OPTIC-4/5 and PAL3 (1/4 inch version)
2411-3020	LINEX-2 Capping-De-Capping Station for OPTIC-4/5 and PAL3 (1/4 inch version)

OPTIC Inlet cooling options

Part Number	Description
2406-4180	OPTIC-4/5 Inlet Peltier Cooler Kit
2406-4160	OPTIC-4/5 Inlet Cooling Kit, Direct CO2
2406-4159	OPTIC-4/5 Inlet Cooling Kit, Direct LN2

Other options

Part Number	Description
2406-4164	OPTIC Standard On-Column Kit. For 5mm and 1/4 inch OD liner.
2406-4167	OPTIC On-Column Kit for Shimadzu GC (plug type septa)

SPME Arrow options are available, please contact us.

Contact

GL Sciences B.V.
Dillenburgstraat 7c
5652AM Eindhoven
The Netherlands
Tel.: +31 (0)40 2549531
info@glsciences.eu
www.glsciences.eu