



Prep and Load Platform

ITEX-2 Option

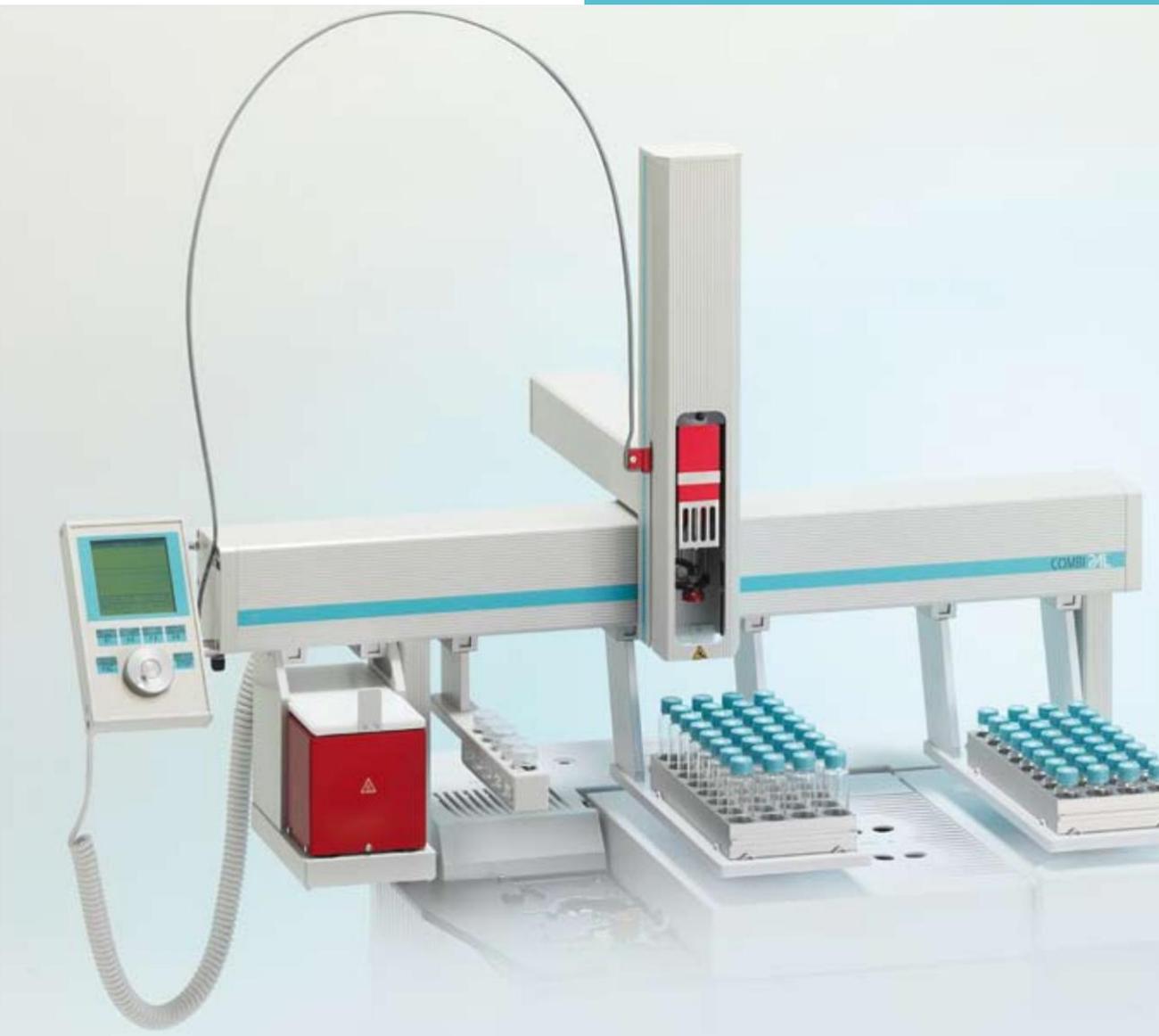
High Sensitivity
Enrichment Technique for
Gas Chromatography



Environmental / Drinking Water
Food / Flavor / Consumer Products
Forensics / Toxicology
Petrochemicals / Polymers
Pharmaceuticals / Residual Solvents



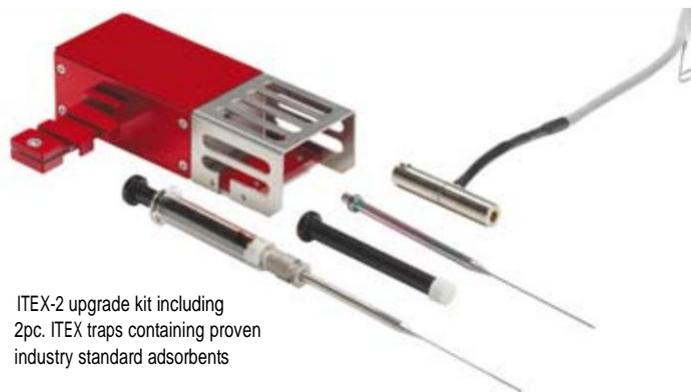
- Get P&T sensitivity without the cost of a P&T system
- Rapid & efficient sample enrichment of volatile & semi-volatile compounds in solid, liquid and gaseous samples
- In-tube extraction and direct thermal desorption using proven industry standard adsorbents
- Syringe only concept for transparent sample handling, no sample loops, no transfer lines, no switching valves
- No GC injector modifications, no cryo-focussing necessary
Top mounted on GC's, saves valuable bench space
- Interfaces with any CombiPAL System controlled by all major GC/GC-MS Systems



CombiPAL equipped with ITEX-2 Option



ITEX adsorption step out of a sample vial



ITEX-2 upgrade kit including
2pc. ITEX traps containing proven
industry standard adsorbents

Specifications ITEX-2 Option

Pumping Syringe Size: 1.3ml HD syringe with removable trap

ITEX-2 Trap: Stainless steel material, deactivated by Siltek®.
Needle: Injection Needle gauge 23, Point style 5 (side hole)
Standard Trap Material: 44mg Tenax TA 80/100 mesh

Extraction Speed: selectable from 10µL/s up to 1000µL/s

Extraction Strokes: Selectable from 1 - 999

Extraction Volume: Selectable from 130µL - 1300µL/stroke

Desorption Temperature:
+5°C above ambient - 350°C selectable in 1°C increments

Heating-up rate: up to 12°C/s

Desorption Speed: 1µL/sec. - 500µL/sec.

Pumping Syringe and Trap Cleaning:
Inert gas purging, 30sec. - 3600min.

Heated Pumping Syringe:
+5°C above ambient - 150°C selectable in 1°C increments

Incubator Oven:
6 heated vial positions for 2mL / 10mL / 20ml vials
+5°C above ambient - 200°C selectable in 1°C increments

Agitation:
Interval shaking 250rpm - 750rpm, selectable in 1rpm increments

Incubation Time: Up to 999 minutes selectable in 1 second increments

CTC Analytics' aim is to supply instruments to customers which make the operation of sample processing simple and transparent. In-line with today's lab requirements for productivity, CTC expanded the application range of its GC Injector System CombiPAL introducing the ITEX Option. The ITEX Option consists of an add-on module which can be used with any existing or new CombiPAL System. It performs enrichment of volatile or semi-volatile compounds during headspace analysis. A microtrap filled with adsorbent material, such as Tenax or activated charcoal is placed between the heated CombiPAL Headspace syringe and the syringe needle. Using the HS syringe as a pump, a part of the gaseous phase of the pre-conditioned sample vial is pumped repeatedly through the microtrap. This system setup allows rapid, simple and efficient extraction of volatile and semi-volatile sample compounds. To gain sensitivity simply the number of pumping strokes can be increased or several different vials containing the same sample can be extracted. During thermal desorption into the GC Injector the microtrap is rapidly flash heated and the analytes reach the GC column as a narrow band. No cryofocusing is needed to obtain sharp peaks. To prepare the next extraction, the hot trap is re-conditioned outside the injector with clean purge gas.

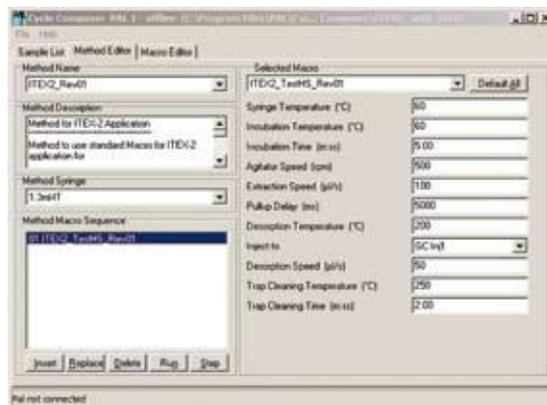
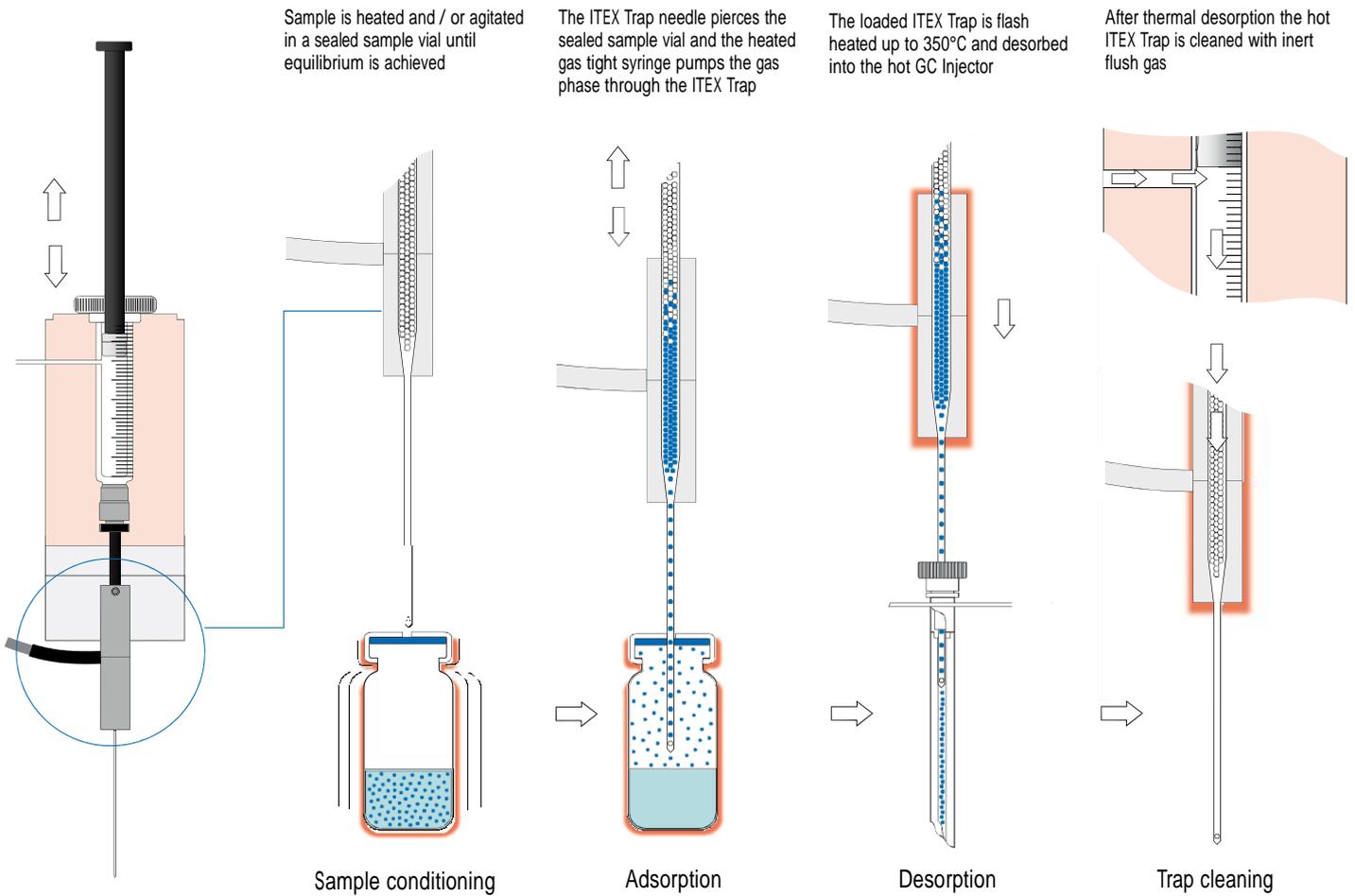
ITEX-2 trap material examples

Tenax TA
Volatile and semivolatile compounds, temperature limit of 350°C

Carbotrap/Carbopack
Non-porous graphitized carbon blacks (GCBs)
Hydrophobic properties minimized sample displacement by water

Carbosieve/Carboxen
For very volatile compounds, e.g. Vinylchloride, Freon compounds

ITEX-2 Sample Extraction Procedure



ITEX-2 parameter control by Cycle Composer

The screenshot shows the Cycle Composer software interface with a sample list table:

Method	Inj Vol	Trap	Flush Vol	Last Vol	Count
1 Sample GC Injection	1	200	1	20	1
2 P/W, Loose GC Injection	30	1300	17	24	3
3 Calibration 0	2	200	17	24	3
4 P/W, Loose GC Injection	30	1300	17	24	3
5 P/W, Loose GC Injection	30	1300	17	24	3
6 Calibration 13	2	200	1	16	1
7 Blank #11.2	2	200	1	14	1
8 Blank #11.2	1	200	20	43	1
9 Blank #11.2	1	200	52	70	1
10 Calibration 1.15	4.5	200	1	14	4
11 Sample GC Injection	4.5	200	1	5	4
12 Sample GC Injection	4.5	200	29	35	4
13 Sample GC Injection	4.5	200	51	56	4
14 Sample GC Injection	4.5	200	95	91	4
15 P/W, Loose GC Injection	2	200	44	55	4

Cycle Composer sample list

Flexible Software Control

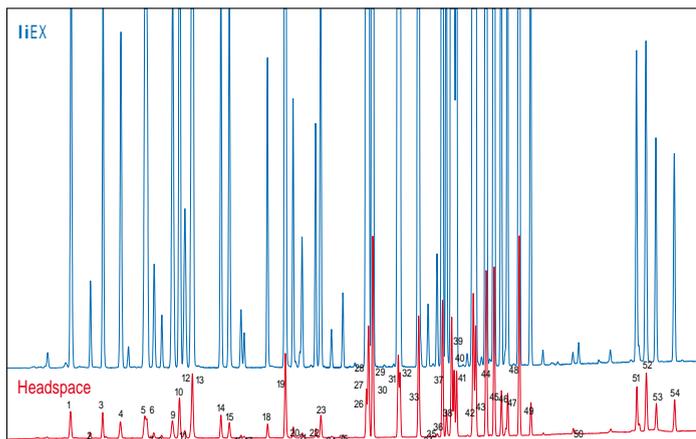
Choose between two options to control your CombiPAL ITEX Option. For individual application requirements the standalone PC based Windows XP / Vista software Cycle Composer is available.

For single keyboard operation of a whole GC/GC-MS system, the following third party CombiPAL drivers are available*.

Vendor	Software
Agilent	ChemStation
Agilent	EZChrom Elite
DataApex	Clarity
Dionex	Chromleon
Justice Software	Chromperfect
Leco	ChromaTOF
Shimadzu	GCMSsolution
Thermo Scientific	Xcalibur
Varian	Star
Varian	Galaxie
Waters	Masslynx
Waters	Empower

* certain drivers may not support the ITEX cycle

EPA 502.2 (Calibration Mix) with ITEX



Comparison of ITEX analysis versus Static Headspace
 Sample: Purge and Trap calibration mix
 (Restek Cat.No. 30431 502.2 CAL2000 Mega-Mix)

Static Headspace Parameter

60°C / 10min / 1mL sample volume

ITEX Parameter

Extraction Speed: 100 µL/sec.

Total Pumping Strokes: 50

Temperature Pumping Syringe / Sample Incubation: 60°C / 10min.

Desorption at 200°C, 15sec. splitless

Chromatography:

Injection: Splitless 15sec. at 250°C / Carrier gas: 0.2bar hydrogen

Column: Rtx-502.2 60m x 0.32mm ID, 1.8µm film

Temperature Program: 40°C - 1min. - 10°C / min to

220°C Detection: FID 250°C

- | | |
|--|---|
| 1 1,1-Dichloroethylene | 29 m-Xylene |
| 2 Methylene chloride (dichloromethane) | 30 p-Xylene |
| 3 trans 1,2-Dichloroethylene | 31 o-Xylene |
| 4 1,1-Dichloroethane | 32 Styrene |
| 5 2,2-Dichloropropane | 33 Isopropylbenzene |
| 6 cis-1,2-Dichloroethylene | 34 Bromoform |
| 7 Chloroform | 35 1,1,2,2-tetrachloroethane |
| 8 Bromochloromethane | 36 1,2,3-trichloropropane |
| 9 1,1,1-trichloroethane | 37 n-Propylbenzene |
| 10 1,1-Dichloropropene | 38 Bromobenzene |
| 11 Carbon tetrachloride | 39 1,3,5-trimethylbenzene |
| 12 1,2-Dichloroethane | 40 2-Chlorotoluene |
| 13 Benzene | 41 4-Chlorotoluene |
| 14 Trichloroethylene | 42 tert-Butylbenzene |
| 15 1,2-Dichloropropane | 43 1,2,4-trimethylbenzene |
| 16 Bromodichloromethane | 44 sec-Butylbenzene |
| 17 Dibromomethane | 45 4-Isopropyltoluene (p-Cymene) |
| 18 cis-1,3-Dichloropropylene | 46 1,3-Dichlorobenzene |
| 19 Toluene | 47 1,4-Dichlorobenzene |
| 20 trans-1,3-Dichloropropylene | 48 n-Butylbenzene |
| 21 1,1,1-trichloroethane | 49 1,2-Dichlorobenzene |
| 22 1,3-Dichloropropane | 50 1,2-Dibromo-3-chloropropane |
| 23 Tetrachloroethylene | 51 1,2,3-trichlorobenzene |
| 24 Dibromochloromethane | 52 Hexachloro-1,3-butadiene (Hexachlorobutadiene) |
| 25 1,2-Dibromoethane (EDB) | 53 Naphthalene |
| 26 Chlorobenzene | 54 1,2,3-trichlorobenzene |
| 27 1,1,1,2-tetrachloroethane | |
| 28 Ethylbenzene | |

Volatiles with ITEX

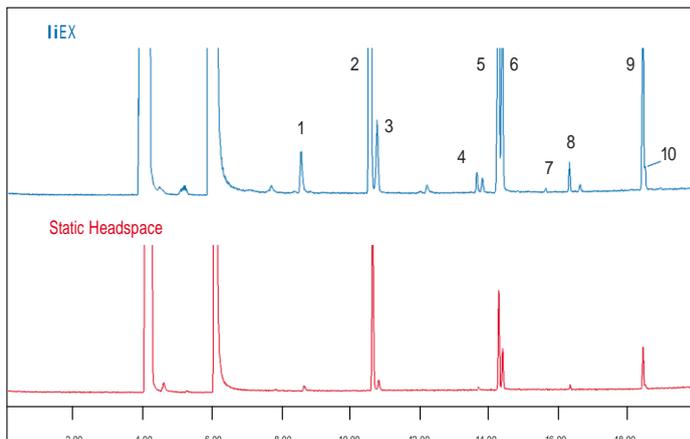


Figure 1: TIC (m/z 29-400) of Volatile Organic Compounds in Beer. Additional components could be identified due to 10 x higher sensitivity of ITEX compared to Static Headspace.

- | | | |
|-----------------------|---------------------------|---------------------------|
| 1 1-Propanol | 5 3-methyl-1-butanol | 9 3-methyl butyl acetate |
| 2 Ethylacetate | 6 2-methyl-1-butanol | 10 2-methyl butyl acetate |
| 3 2-methyl-1-propanol | 7 2-methyl propyl acetate | |
| 4 Ethyl propanoate | 8 Ethyl butyrate | |

Beer Ketones with ITEX

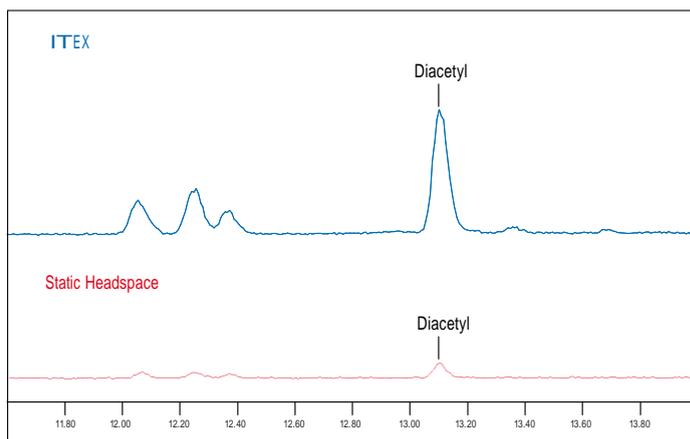


Figure 2: Extracted Ion chromatograms for m/z 86 obtained by GC/MS in SIM mode. The Diacetyl Peak can be detected with at least 6 times better S/N value using ITEX rather than Static Headspace. The concentration of diacetyl in this beer sample was in the order of less than 10ppb

Static Headspace Parameter

80°C / 15min / 1ml sample volume

ITEX Parameter

Extraction Speed: 50 µL/sec.

Total Pumping Strokes: 10 x 1mL

Temperature Pumping Syringe / Sample Incubation: 80°C / 15min.

Desorption at 250°C

Trap Material: Tenax TA 80/100 mesh

Chromatography:

Injection: Split 1:25 at 250°C

Carrier gas: 200 kPa He at constant pressure

Column: DB-VRX 20m x 0.18mm i.d. / 1µm film

Temperature Program: 40°C - 5min. - 10°C / min to 250°C - 10min.

MSD transfer line: 250°C (17 cm x 110µm i.d. restrictor, 28kPa)

Detection: MS in Scan/SIM Mode

Scan: 29-400 amu

SIM Ions monitored: 43, 57, 86, 100 (50ms dwell time)

CombiPAL General Specifications

System Type

XYZ robot with syringe only concept, no tubing in sample path

Local User Interface

Control panel with 4 function keys, graphical LCD display, unique scroll knob for teach functions

Remote Control

Cycle Composer control software Windows 2000 / XP
Third party instrument drivers for all major GC/GC-MS Systems

Maintenance

Accessibility to all maintenance parts from front
Preventative maintenance kits available

Electrical Control

1x RS232 / 1 x LAN (with optional PAL Upgrade Electronics)
3x TTL Input
2x Opto Coupler Input
2x Relay Output

Power Requirements

100-240V, 120W, 50/60Hz

Environment

4°C - 40°C constant temperature, < 80% humidity (non condensing)

Weight

~10kg (without accessories)

Dimension

Length 828mm Depth 385mm Height 575mm

Electrical Safety Standards

CAN/CSA C22.2 No. 61010-1 / ANSI/UL 61010-1 / EN 61010-1

Specifications are subject to change without notice

Sample Capacity*

up to 600	1ml micro vials (78 1ml vials standard)
294	2ml vials (98 2ml vials standard)
96	10ml or 20ml vials
4	deepwell microplates (96/384 wells)
8	standard microplates (96/384 wells)

(* depends on GC model)

GC Mounting Kits

Agilent Technologies 5890 / 6850 / 6890 | 7890
Thermo Scientific GC 8000Top / TRACE GC / Focus GC
Varian GC 3400 / 3600 / 3800 / 3900 / 430 / 450
Shimadzu GC 14 / 17A / 2010 / 2014
Perkin Elmer Autosystem XL / Clarus 400 / Clarus 500 / Clarus 600
GL Sciences GC 353 / 393 / 4000

Order details for ITEX Option (part no. PAL ITEX-2Option) Description

1pc	ITEX-2 Syringe 1.3mL with M7 x 0.5 Fitting
1pc	Replacement plunger 1.3ml
2pc	ITEX-2 trap TENAX TA 80/100 mesh
1pc	Trap heater incl. electrical connections
1pc	Endplate left side
1pc	Syringe heater side bracket
1pc	CD-ROM including ITEX Cycle (requires Cycle Composer)

Consumables

ITEX-2TrapTXTA	1pc ITEXTrap Tenax TA
ITEX-2TrapTXTA3	Set of 3pcs. ITEXTrap Tenax TA
SYRC ITEX-2.-1.3	1pc replacement ITEX Syringe 1.3mL
PLG ITEX-2.-1.3	Replacement plunger for 1.3mL syringe

Custom filled traps available on request
Please inquire with your local distribution partner

PAL GC Sample Systems

To learn more about the unique PAL Series of LC/LC-MS sample handling systems or any of our GC/GC-MS sample injection systems contact your CTC Analytics distributor – LEAP Technologies.



Static Headspace – Liquid Injection - SPME - ITEX Extraction combined in one single instrument

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