CTC automated sample injectors for gas chromatography, distributed by Agilent Technologies

CombiPAL and GC PAL front-end injectors: Proven reliability that complements Agilent instruments, the most reliable in the industry

Agilent Technologies is pleased to distribute and support CTC Analytics' CombiPAL and GC PAL sample injectors. These injectors expand the capabilities of Agilent GC and GC/MS systems to make your laboratory more productive.

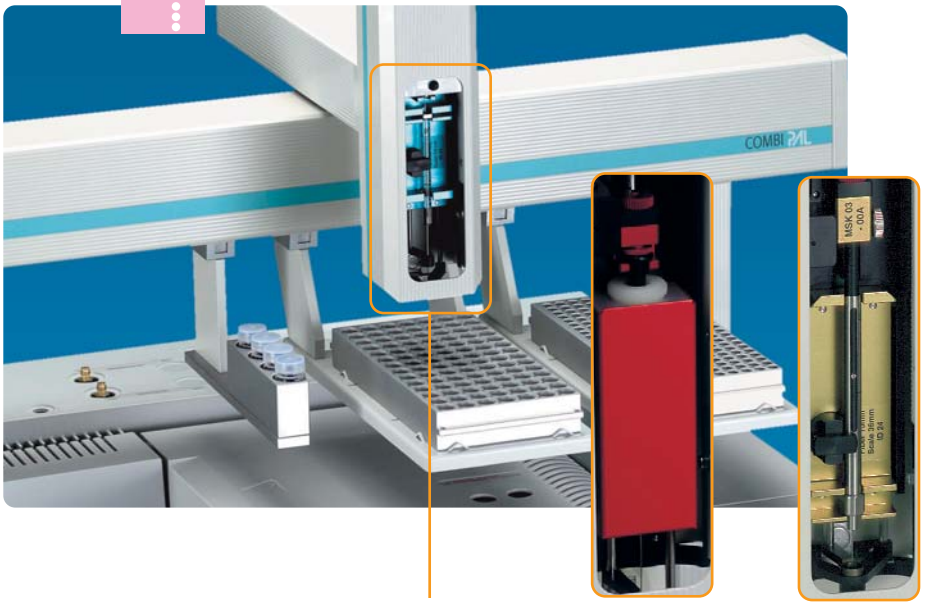
CTC sample injectors: Expanded capabilities, high reliability

- Automated sample preparation
- Larger large-volume injection for increased productivity
- Greater tray capacity for higher sample throughput and increased unattended operation
- Temperature-controlled Peltier cooling to prevent sample degradation
- More flexibility, enabling liquid, headspace and SPME injections with the same autosampler
- Seamless integration with Agilent GC and GC/MS ChemStation software and EZ Chrom Elite
- Convenience, with a single vendor for instruments, supplies and services.

Front-end automation that grows with your needs

Unique CombiPAL and GC PAL automated samplers from CTC integrate totally with Agilent GC and GC/MS systems to create the fastest, most efficient and most flexible GC systems in the world.

COMBI PAL



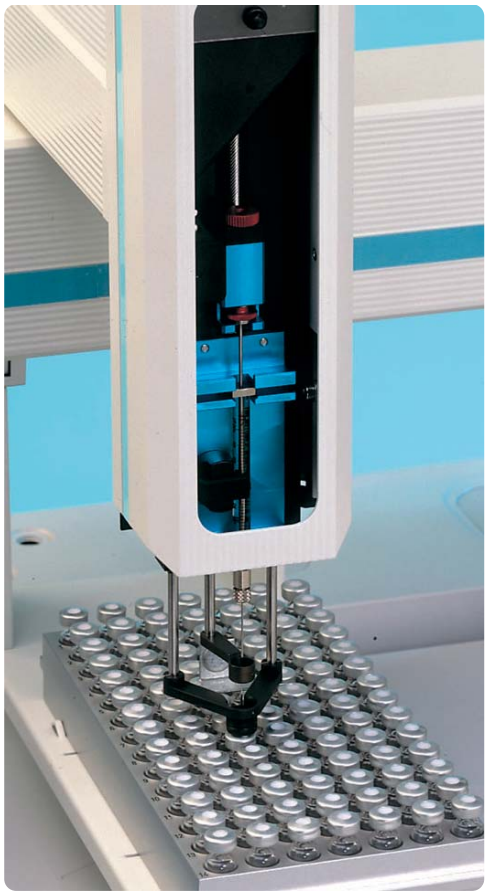
CombiPAL GC and GC/MS sample injector: seamless integration

This highly reliable and flexible sample injector grows with your needs. Start with the liquid injector, then add a static headspace injector, then upgrade to solid phase micro extraction (SPME)—simply by switching one injector with another.

- This top-mounted system fits neatly on Agilent GC systems, saving valuable bench space. There are no cumbersome sample loops, transfer lines, or switching valves.
- This system interfaces seamlessly with any Agilent 6890 or 6850 GC or GC/MS system.
- Specially designed software is added to the Agilent ChemStation for CTC injectors for easy autosampler setup, control, and sample sequencing.
- Customized sample preparation and load cycles to meet your special needs available from Agilent.
- A variety of CTC-compatible consumables supports your application needs.

Agilent Technologies

Start with liquid mode

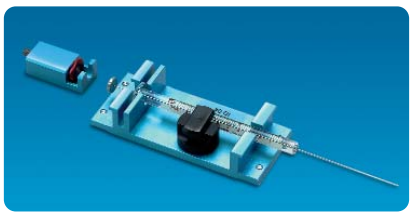


Magnetic caps available for liquid injector

The CombiPAL autosampler makes sample processing simple and transparent. This autosampler meets today's laboratory equipment requirements for speed, flexibility and precision. The CombiPAL GC sample injection system combines liquid, headspace and SPME injection in one single instrument. This capability allows quick switching from one application to another on the same GC workstation. Regardless if your samples are processed in headspace, liquid or SPME mode, or if your method requires split/splitless or on column injection, your new instrument setup is ready in a few minutes. The CombiPAL provides powerful working capabilities, an investment that grows with your expanding needs.

In liquid injection mode, every injection step (fill/inject speed, pre- and post-injection delay times, pre- and post-injection cleaning, variable needle penetration depths, or standard addition) is individually controlled through your choice of Agilent ChemStation software for GC and GC/MS systems.

Large-volume injection allows you to inject samples up to 500 µL without the usual degradation in chromatographic performance. Using the capability to inject larger volumes, you can eliminate the need to concentrate a sample through evaporation. This can translate into substantial time savings. For low-volume samples, the fast injection speed minimizes needle discrimination and reduces background interference, which means better results with less work. The fast injection cycle time, together with the nanoliter injection mode, fits perfectly into the field of fast GC applications.



CTC-approved syringe for liquid injection

Be prepared for the next generation of sample format.

Injector and heater module for headspace sampling

Add the headspace mode

Add the PAL Headspace option to your CombiPAL basic.

Robotic vial processing allows straightforward and simple sample analysis. Sample vials are transported into a heated six-position incubator for preconditioning. After they reach equilibrium, a heated gas-tight syringe moves over the incubator and withdraws the headspace sample. After sample injection, the hot syringe is automatically cleaned by purging with inert gas. For maximum throughput, intelligently controlled vial transfer into the incubator oven ensures that a sample is always ready to be injected when the previous run is completed.

In addition to simple and transparent sample operation, the CombiPAL offers even more advantages:

- No dead volume and adsorption effect in sample loops and transfer lines
- Adjustable sample volumes without sample loop changes
- No sample dilution needed, because of vial pressurization

Magnetic screw-top vials and caps provide the highest reproducibility.

Upgrade to SPME mode

SPME mode

Solid Phase Micro Extraction (SPME) has become a practical alternative for GC sample preparation. This mode reduces sample preparation time and eliminates the need for large volumes of extraction solvents.

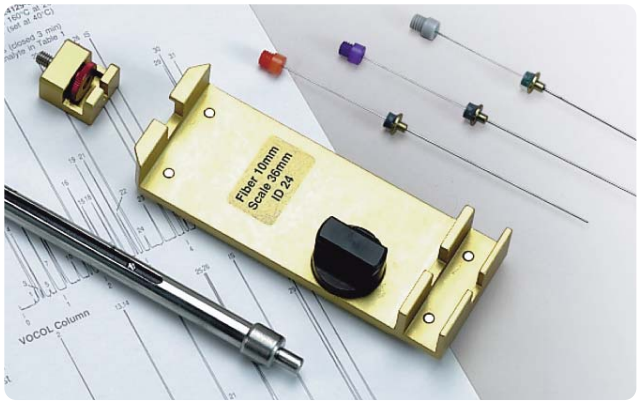
With SPME, analytes establish equilibria among the sample matrices. Analytes are adsorbed onto the stationary phases coated on either fused silica or metal fibers then are thermally desorbed from the fiber to a GC inlet onto a capillary column. No solvent injection and analytes rapidly desorbed onto the column improve minimum detection limits and maintain resolution.

SPME is useful in many different analyses, including characterization of environmental, forensic, food/flavor and pharmaceutical compounds.

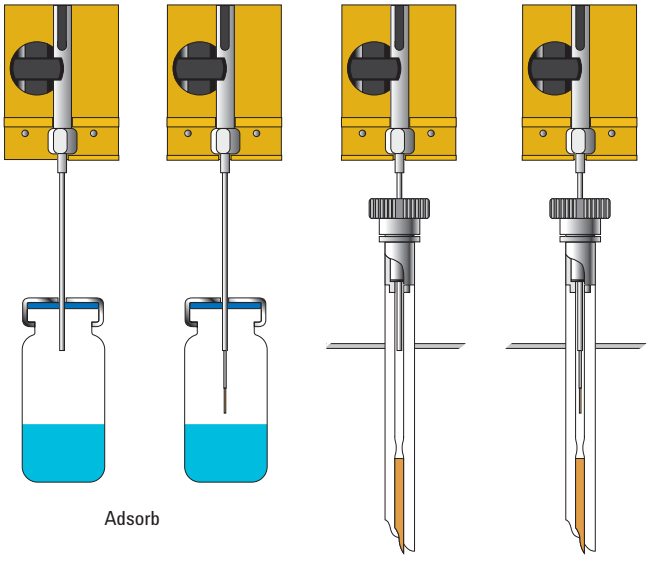
The CombiPAL provides a fully automated SPME sample preparation process (SPME technology licensed exclusively to Supelco Inc., U.S. Patent 5,691,206; European Patent 0523092).

SPME Fiber Cleaning and Conditioning Station

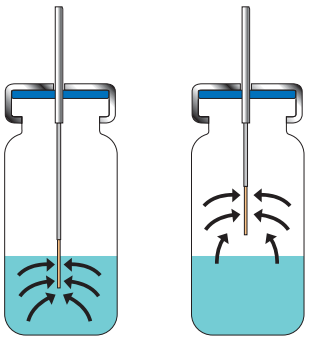
All movements of the SPME fiber from precondition to adsorption and desorption are precisely controlled for optimum performance. Prior and during extraction, the samples can be shaken and heated, which dramatically reduces analysis time for semivolatile compounds. Variable vial penetration depth lets analysts extract the compounds in liquid samples or in the headspace area above liquid/solid samples. After the compounds are thermally desorbed in the hot GC injector, the fiber may be fully cleaned again in a special heated and purged Fiber Cleaning and Conditioning Station



SPME injector parts

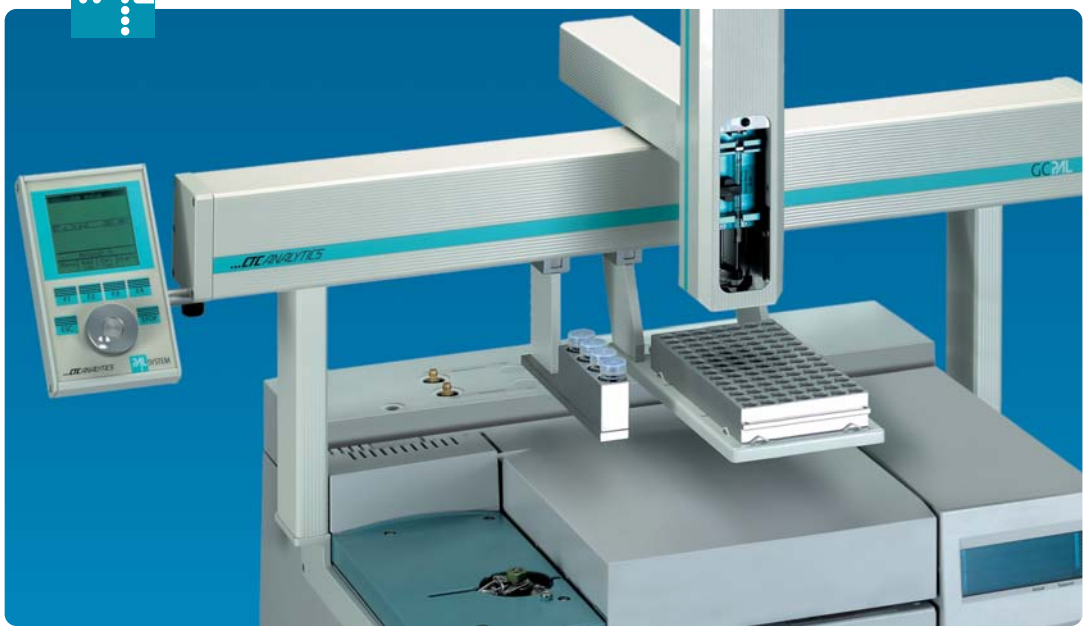


Fiber adsorption/desorption process



Variable vial penetration for different types of sample extractions

GC PAL: High throughput and large-volume injection in one reliable, economical instrument

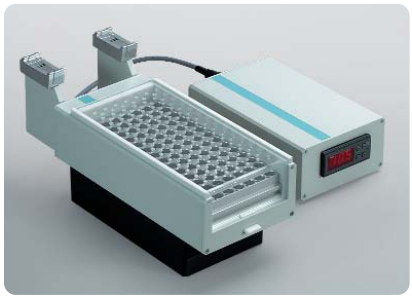


This system—for liquid injection only—is a good choice for laboratories with high throughput.

- GC PAL interfaces with any Agilent 6890 or 6850 GC, with or without a mass spectrometer.
- This system has the same vial capacity and vial size as the CombiPAL.
- This system has the large-volume injection capability as the CombiPAL.
- Control software allows customized preparation and load cycles.
- The modular GC PAL design provides worry-free operation and low maintenance costs. Open architecture gives easy access to the syringe, sample trays and GC injection ports, allowing quick exchange of septa, sample tray formats and syringes.

Flexible sample handling

Every injection setting (fill/inject speed, pre- and post-injection delay times, pre- and post-syringe cleaning, variable needle penetration depths, or internal standard addition) is individually controlled through the Agilent ChemStation. Large-volume injection mode allows you to inject samples up to 500 µL in one stroke, without the usual degradation in chromatographic performance. With the capability to inject larger volumes, you can eliminate the need for evaporation to concentrate a sample. This translates into substantial time and cost savings.



Peltier-cooled trayholder for thermally labile samples

Next generation microplate sample format

Gradual expansion as needs change

Additional instrument capabilities can be added anytime by using one of the various GC PAL options:

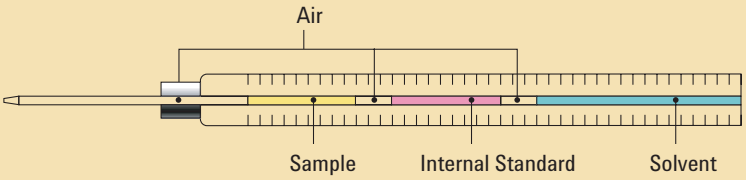
- Beside micro- or standard sample vials, the GC PAL can inject directly from 96/384 well micro- or deep-well plates.
- Temperature-controlled sample storage makes it easy to cool down samples to prevent degradation or heat samples for derivatizations or kinetic studies.

Sampling flexibility

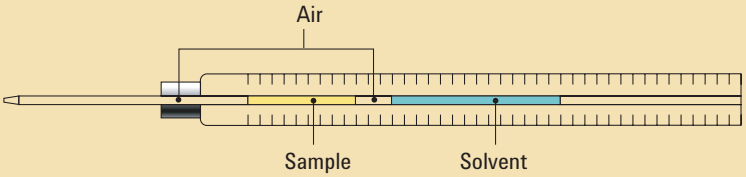
Beside liquid injections, the GC PAL can sample up to 500 µL of the ambient headspace in 2 mL/10 mL vial. This straightforward and inexpensive procedure serves as a quick screening tool for unknown volatile samples. Variable syringe needle depths enable sample aspiration anywhere within a sample vial. Two layers of small-volume samples are processed exactly with the GC PAL's built-in vial height monitoring system.

Features Shared by CombiPAL and GC PAL

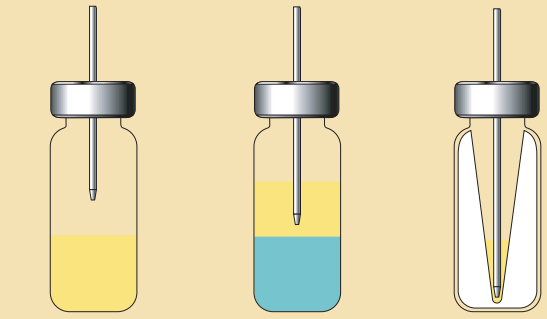
- Top-mounted, saving valuable bench space.
- Two options to control these instruments: A handheld controller provides easy-to-learn, easy-to-use operation or the separate, optional Agilent ChemStation control module.
- Seven different syringe sizes, which cover an injection volume range of 0.1 µL to 500 µL. Different injection modes include the traditional, the hot empty needle, sandwich (which prevents the effects of boiling point discrimination in low-volume applications) or internal standard addition techniques (used for quantitative calculations, retention index studies or matrix spiking).
- Flash EPROM technology, for problem-free updates of enhancements.
- Optional add-on features: Micro- and deep well plate capabilities.



Internal standard injection mode



Sandwich Injection mode



Ambient Headspace | Two layer sampling | Microvial sampling

The same software control for CombiPAL and GC PAL

Specially designed software that can be added to the Agilent ChemStation controls autosampler setup, control and sample sequencing for both CombiPAL and GC PAL. These software additions include:

- CTC Control for GC ChemStation
- CTC Control for MSD Productivity ChemStation
- CTC Control integrated into Agilent's EZChrom Elite

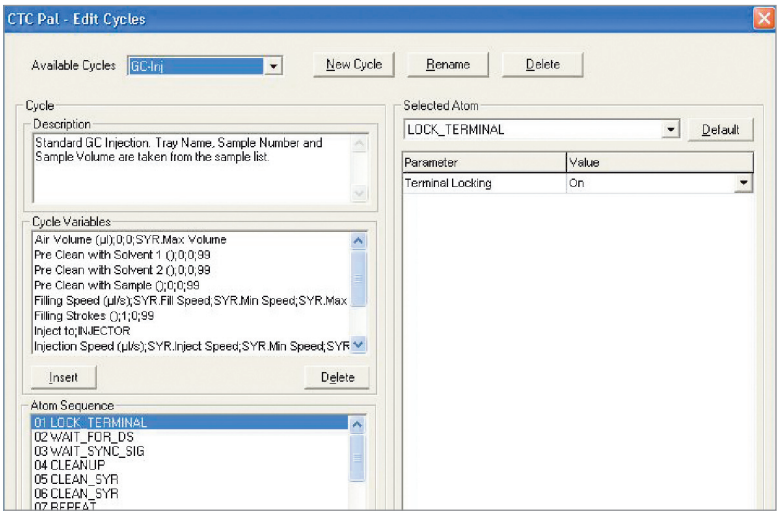
Intelligent Automation

Microsoft Windows XP/Windows 2000 software self-installs CTC Control for the Agilent GC ChemStation and Agilent MSD Productivity ChemStation, providing remote control for the PAL chromatography family. This software enables easy setup, editing, and run methods for simple to complex applications.

Simple-to-use automation software for GC ChemStation and MSD Productivity ChemStation

CTC Control for GC ChemStation and MSD Productivity ChemStation is easy to use.

- Point-and-click operation walks users through simple steps for configuring instrument setup, methods and sample lists.
- The software controls liquid handling procedures for sample transfer, reagent or standard addition, mixing and dilution steps.



ChemStation method editor

Line	Location	Sample Name	Method Name	Inj/Location	Sample Type	Cal Level	Update RF	Update RT
1	P1-A-05	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			
2	P1-A-06	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			
3	P1-A-07	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			
4	P2-A-01	PAL Local GC	PAL LOCAL GC INJECTION	1	Sample			
5	P2-A-02	PAL Local GC	PAL LOCAL GC INJECTION	1	Sample			
6	P1-B-03	Calibration36	CALIBRATION1-5	1	Calibration	1	Average	Average
7	P1-B-04	Calibration36	CALIBRATION1-5	1	Calibration	1	Average	Average
8	P1-B-05	Calibration36	CALIBRATION1-5	1	Calibration	1	Average	Average
9	P1-B-06	Calibration36	CALIBRATION1-5	1	Calibration	1	Average	Average
10	P2-A-03	PAL Local GC	PAL LOCAL GC INJECTION	1	Sample			
11	P2-A-04	PAL Local GC	PAL LOCAL GC INJECTION	1	Sample			
12	P2-A-05	PAL Local GC	PAL LOCAL GC INJECTION	1	Sample			
13	P2-A-06	PAL Local GC	PAL LOCAL GC INJECTION	1	Sample			
14	P2-A-07	PAL Local GC	PAL LOCAL GC INJECTION	1	Sample			
15	P1-C-01	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			
16	P1-C-02	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			
17	P1-C-03	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			
18	P1-C-04	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			
19	P1-C-05	Simple GC Injector	SIMPLE GC INJECTION	1	Sample			

GC sample sequencing list

	Type	Vial	Tray Name	Sample	Injection Volume	Method / Keyword
1	Sample	1	Tray1	Simple GC Injector	1	SIMPLEGC
2	Sample	2	Tray1	Simple GC Injector	1	SIMPLEGC
3	Sample	3	Tray1	Simple GC Injector	1	SIMPLEGC
4	Sample	5	Tray2	PAL Local GC	10	PAL LOCAL GC
5	Sample	6	Tray2	PAL Local GC	10	PAL LOCAL GC
6	Sample	7	Tray2	PAL Local GC	10	PAL LOCAL GC
7	Calibration	25	Tray1	Calibration 25-28	7	CALIBRATION
8	Calibration	26	Tray1	Calibration 25-29	7	CALIBRATION
9	Calibration	27	Tray1	Calibration 25-30	7	CALIBRATION
10	Calibration	28	Tray1	Calibration 25-31	7	CALIBRATION
11	Blank	10	Tray2	PAL Local GC	2	PAL LOCAL GC
12	Sample	1	Agitator	Simple GC	4.5	SIMPLEGC
13	Sample	2	Agitator	Simple GC	4.5	SIMPLEGC
14	Sample	3	Agitator	Simple GC	4.5	SIMPLEGC

Sheet1

GC/MS sequencing list

CTC PAL Autosampler Control Software for Agilent EZChrom Elite and Agilent OL laboratory software

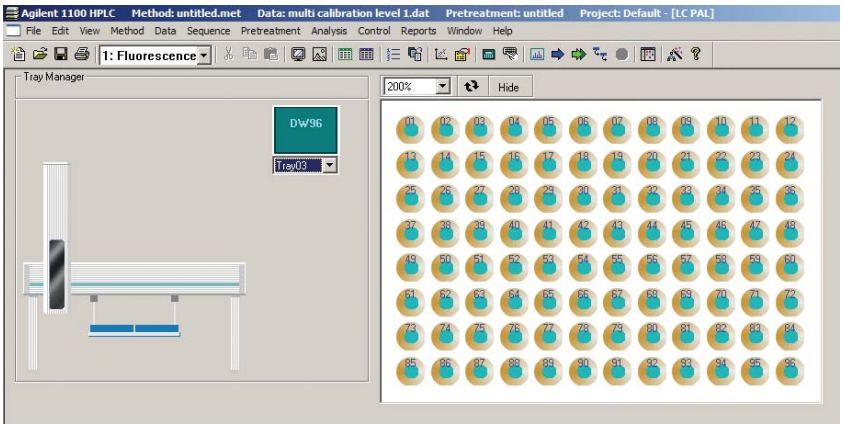
Regardless of the model of CTC PAL autosampler and associated GC or LC system, Agilent's EZChrom Elite and Agilent OL provide the same software interface, simplifying laboratory operation.

Users can create software methods for each type of CTC PAL autosampler, create sequences for multiple runs and specify data analysis treatments for all injections.

A special graphical tray interface makes operation easy. The interface provides a visual representation of the installed trays for the CTC PAL autosampler, making it easy for users to select locations for a sequence of injections and view sample status during runs.

CombiPAL and GC PAL injection parameter control

- Pre-injection syringe wash strokes for two different solvents
- Post-injection syringe wash strokes for two different solvents
- Pre-injection syringe wash strokes with sample
- Plunger speed used to aspirate/eject sample
- Air gap after sample aspiration
- Number of filling strokes to aspirate sample
- Delay time between sample pull-up and ejection
- Injector selection
- Plunger speed used during sample injection
- Delay time prior and after sample injection



Tray interface

Detail on this software is available in Agilent publication 5989-4292EN, which you can download from www.agilent.com/chem by typing the publication number in the search field.

World-class single-vendor solution and services

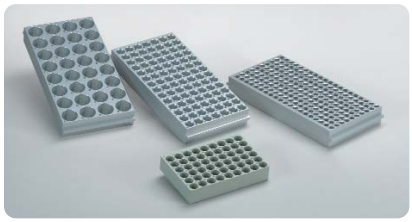
Single-vendor solution includes CTC-recommended consumables

When you buy columns and supplies from Agilent, you're buying more than just products. Agilent has GC, LC and MS instrument design experience that extends to consumables as well. On the Web, on the phone or in person, we have the consumables and technical information to help you achieve your goals.

We offer essential consumables for CTC's CombiPAL and GC PAL systems, including:

- Headspace vials and magnetic caps
- Autosampler syringes, 1.2 µL to 500 µL
- Vials and caps, screw-, crimp- and snap-top 2 µL and micro vials
- Well plate sample trays and closing mats

These are all CTC-recommended consumables.



CombiPAL accepts virtually any sample format.

Agilent service and support keep your laboratory productive

For more than 40 years, Agilent has been the recognized leader in providing the industry's most reliable instrumentation and service. We are so confident in the quality of our instruments and services that we offer the Agilent Service Guarantee.

Should your Agilent instrument require service while covered by an Agilent service agreement, we guarantee repair or we will replace your instrument for free.

Contact us to maximize your laboratory's productivity with CTC's CombiPAL or GC PAL systems

- Call your local Agilent sales office or call 800-227-9770 option 3, then option 3 again (in the U.S. and Canada)
- Check **www.agilent.com/chem/ctc** for details about these fast-injection systems.

Have liquid chromatographs in your laboratory?
Agilent also distributes CTC's HTC PAL for LC users who want high throughput.

See Agilent publication 5989-5035EN or visit **www.agilent.com/chem/1200**

Agilent offers a wide range of CTC-recommended consumables to support the flexibility and productivity of CTC automatic samplers.

Selection guides for CTC autosampler consumables

GC: Agilent publication 5989-5120EN

LC: Agilent publication 5989-5121EN

Specifications at a Glance

General CombiPAL Specifications in Liquid Mode

System type:	XYZ robot with syringe-only concept
Local user interface:	Control panel with 4 function keys, graphical LCD display, unique scroll knob for teach functions
Electrical control:	• 2 RS232C ports • 3 TTL input/3 TTL output • 2 Opto Coupler input • 2 Relay output
Dimensions:	Length 828 mm, depth 385 mm, height: 648 mm
Weight:	10 kg (without accessories)
GC mounting kits:	Agilent 6850 and 6890
Syringe sizes:	1.2 µl, 5 µl, 10 µl (standard), 25 µl, 100 µl, 250 µl, and 500 µl
Injection speed:	Selectable from 0.01 µl/sec. up to 500 µl/sec.
Sample capacity*:	• Up to 600 1 ml micro vials (78 1 ml vials standard) • Up to 294 2 ml standard vials (98 2 ml vials standard) • Up to 96 10 ml or 20 ml vials • Up to 4 deepwell microplates (96/384 wells) • Up to 8 standard microplates (96/384 wells)
Syringe cleaning:	Wash Station for 2 different solvents (standard)
Options:	• PAL Headspace option (requires CombiPAL basic liquid version) • PAL SPME option (requires CombiPAL basic including headspace option) • Cooled trayholders for 1 ml, 2 ml, 10 ml and 20 ml vials • SPME Fiber Cleaning Station • Stacks for 96/384 well micro- or deepwell plates • Solvent/reagent reservoir • Large Volume Wash Station
Power requirements:	100-240V, 120W, 50/60Hz
Environment:	4°C - 40°C constant temperature, < 80% humidity (non condensing)

Specifications in Headspace Mode (CombiPAL Only)

Syringe sizes:	• 1.0 ml (0.1-1.0 ml) • 2.5 ml (0.25 ml-2.5 ml) • 5.0 ml (0.5 ml-5.0 ml)
Injection speed:	Selectable from 0.01 µl/sec. up to 5 ml/sec.
Sample capacity:	• Up to 294 2 ml standard vials • Up to 96 10 ml or 20 ml vials
Syringe cleaning:	Inert gas purging of heated syringe
Heated syringe:	30°C-150°C selectable in 1°C increments
Incubator oven:	6 heated vial positions for 2 ml/10 ml/20 ml vials
Incubation temperature:	30°C-200°C in 1°C increments
Agitation:	Interval shaking 250 rpm-750 rpm selectable in 1 rpm increments
Incubation time:	Up to 999 minutes selectable in 1 second increments
Option:	PAL SPME

GC PAL Specifications

System type:	XYZ robot with syringe-only concept
Local user interface:	Control panel with 4 function keys, graphical LCD display, unique scroll knob for teach functions
Electrical control:	• 2 RS232C ports • 3 TTL input/3 TTL output • 2 Opto Coupler input • 2 Relay output
Dimensions:	Length 828 mm, depth 385 mm, height 575 mm
Weight:	10 kg (without accessories)
GC mounting kits:	Agilent 6850 and 6890
Syringe sizes:	1.2 µl, 5 µl, 10 µl (standard), 25 µl, 100 µl, 250 µl, and 500 µl
Injection speed:	Selectable from 0.01 µl/sec. up to 500 µl/sec.
Sample capacity*:	• Up to 600 1 ml micro vials (78 1 ml vials standard) • Up to 294 2 ml standard vials (98 2 ml vials standard) • Up to 96 10 ml or 20 ml vials • Up to 4 deepwell microplates (96/384 wells) • Up to 8 standard microplates (96/384 wells)
Syringe cleaning:	Wash Station for 2 different solvents (standard)
Options:	• Thermostatted trayholders (4°C – 70°C) • Stack for 96/384 well micro- or deepwell plates • Solvent/reagent reservoir • Large Volume Wash Station
Power requirements:	100-240V, 120W, 50/60Hz
Environment:	4°C - 40°C constant temperature, < 80% humidity (non condensing)

** Depends on GC model*

www.agilent.com/chem/ctc

Printed in USA June 5, 2006
5989-5127EN

Agilent Technologies