

Gas Chromatography



HS 2400 Headspace Sampler

The PerkinElmer HS 2400™ Headspace Sampler complements gas chromatography instruments to bring users increased

sensitivity while delivering outstanding precision in many applications. The HS 2400 Headspace Sampler features unique pressure balanced sampling technology that allows the precise introduction of samples into the column without the use of a gas syringe or valve and loop. The HS 2400 Headspace Sampler can be used in conjunction with the PerkinElmer GC 2400™ System, the Clarus® GC Systems and most third-party GCs.

Performance

Typical Area Repeatability	HS 2400 < 1.0% RSD*
Retention Time Repeatability	0.008% RSD* 0.0008 min Std Dev*

*Used in conjunction with PerkinElmer GC 2400 analyzing 0.4% Ethanol.

Sampling Capacity

The HS 2400 M (mid-capacity) Headspace Sampler model holds 40 vials in the sampling tray and has a 12 position oven with overlapping thermostating. The rack is resistant to common solvents used in gas chromatography.

Sampling Method

A key feature of pressure balanced sampling is it allows users to set volume parameters in the method (by time or by volume) without the need to physically change any hardware, like a loop.

- Volume is settable in a range from 10 µL to 99000 µL in increments of 10 µL
- Allowable volume range will automatically adjust based on flow rates set by the user
- Injection time is settable in a range from 0.01 min to 99.0 min in increments of 0.01 min
- Chemically inert sample flow path
- Fully automated purging of sample path between each analysis

Sampling is achieved by pressurizing sample vials with carrier gas. During injection period carrier gas flowing to the GC System is replaced by flow generated by the pressurized headspace volume. Rapid transfer of analytes is ensured without re-equilibration in a gas-sampling valve or syringe and prevents loss of analytes.

Sample Vials

Use PerkinElmer 20 and 22-mL sample vials with crimp top or screw caps. With vial adapters (included), the HS 2400 Headspace Sampler can also use 10-mL sample vials. See the consumables catalog for a full list of compatible HS vials.

Oven & Thermostatting

The HS 2400 Headspace Sampler air-bath oven recirculates heated air for more stable and even oven temperatures and more precise temperature control. The oven holds up to 12 vials where the software algorithms optimize vials' overlapping thermostating times.

Temperatures	
Oven Temperature	30 °C to 210 °C in 1 °C increments, controlled at 5 °C above ambient
Needle Temperature	35 °C to 210 °C in 1 °C increments, controlled at 5 °C above ambient
Transferline Temperature	35 °C to 250 °C in 1 °C increments controlled at 5 °C above ambient

Shaker

A vial shaker with 10 levels of shaking intensity is included on all models of the HS 2400 Headspace Sampler.

Transferline

Deactivated fused-silica capillary transferline (TL) or capillary column (0.32 mm i.d. or 0.25 mm i.d.; or 0.22 mm i.d. when using hydrogen carrier gas) shielded inside a heated transfer tube between the headspace sampler and GC injector. Metal capillaries of the same dimensions may also be used. Transferline length: 1 m (standard) or 1.65 m (long).

Column Compatability

Split/Injector Connection (TL is connected to GC injector) is compatible with all capillary column diameters.

On-Column Connection (GC column goes through injector and TL connects to HS sampling head) is compatible with 0.25 and 0.32 mm ID capillary columns.

Directly Coupled Connection (TL goes through injector and connects to GC column inside GC oven) is compatible with any column size depending on the TL/Column union used.

Analyte Compatability

Polar and non-polar organic compounds can be analyzed without any change of internal tubing. Low risk of sample-composition change during analyte transfer. Analysis of chemically active compounds such as free volatile organic acids, Sulfur compounds, amines and other nitrogen-containing organic compounds can be performed because of the inert flow path of the instrument and inert pressure balanced sampling path.

Pneumatic Control

Programmable Pneumatic Control (PPC) modules are used to control carrier gas and sample injection. PPC modules included in every HS 2400 Headspace Sampler model allow for both pressure control and flow control of the carrier gas.

When HS 2400 Headspace Sampler is connected to a GC either by On-column or Directly Coupled connection the column flow passing from the HS 2400 Headspace Sampler through the GC analytical column is controlled and supplied by the HS 2400 Headspace Sampler. Constant Flow or Programmed Column Flow control or Constant Pressure or Programmed Pressure control are permitted for all possible GC oven program settings.

When HS 2400 Headspace Sampler is connected to any GC via Split Connection the HS flow control optimizes the gas flowing in the HS and transferline. When the HS 2400 Headspace Sampler is connected to 3rd party GC systems via Split Connection flow settings are not available, instead gas is controlled by pressure.

- Carrier PPC zones compensate for variations in barometric pressure for maximum stability
- PPC provides direct setting in mL/min, psig, Bar or kPa
- Pressure sensors are used for both pressure and flow control

Pressure sensors:

- Accuracy +/- 2% of full scale
- Repeatability: <+/- 0.05 psi
- Temperature coefficient: <+/- 0.01 psi/°C
- Drift: <+/- 0.1 psi/6 months

Programmable Pneumatic Control

Carrier Pressure	0 – 60 psi, in increments of 0.001 psi
Column Flow (Alternatively to Carrier Pressure)	0 – 100 ml/min, in increments of 0.1 ml/min
High Pressure Injection	On/Off
High Pressure Injection Set	0 – 60 psi

Modes of Operation

Constant Mode – Routine analysis with constant, equal thermostating time for each sample. Includes intelligent, overlapping thermostating up to 12 vials to automatically optimize oven and tray movements.

MHE Mode – Multiple headspace extractions from each vial. Up to 100 extractions per vial with intermediate vial venting performed automatically.

Progressive Mode

Method-development tool used in determining optimal headspace extraction parameters by performing kinetic studies. User defines which parameters to automatically increment, i.e. oven thermostating time or temperature.

Operational Settings

Thermostating Time	0.1	999.0	min
Pressurization Time	0.1	999.0	min
Injection Time	0.01	99.0	min
Withdraw Time	0.1	99.0	min
Vent Time	0	60	sec
Injection Volume	10	99000	µL

System Control**Software Control**

HS 2400 Headspace Sampler control is completely integrated in the PerkinElmer SimplicityChrom™ Chromatography Data System (CDS) Software. Drivers are available to control the HS 2400 Headspace Sampler from Waters™ Empower CDS.

Instrument User Interface

When connected to the GC 2400 System, the HS 2400 Headspace Sampler functions are monitored by the PerkinElmer Simplicity Vision™ web-based app run on the detachable touchscreen mounted on the GC 2400 System.

Standalone Operation

When the HS 2400 Headspace Sampler is connected to any other GC its full control and monitoring is accomplished through its own dedicated, removable touchscreen tablet running Simplicity Vision browser interface. Includes set points and monitoring for all parameters.

Simplicity Vision control features

- Setpoints and actual monitoring for all parameters
- Unlimited sequences and methods may be stored on the HS 2400 Headspace Sampler



Figure 1: HS 2400 Headspace Sampler in a standalone configuration with its dedicated touchscreen tablet.

Data System Interfacing

HS output signal lines for READY, FAULT and RUN to start gas chromatograph (GC) data system and data-handling devices. HS Input signal lines for START, STOP and READY to interface and control the headspace unit externally. Six built-in events (four relays with contact closures, two 24-volt outputs).

System Integrity Checks

- **System Leak Checks** – Users are able to check the whole system for leaks prior to analysis.
- **Valve Leak Check** – Users are able to check the pneumatic manifold for leaks prior to analysis.

Physical Details

Ambient Operating Conditions	Temperature range: 10 °C to 35 °C Humidity: 20% to 80% RH without condensation Altitude range: -400 to 2,000 m (below sea level to 6,562ft)
Power Requirements	Full auto-ranging unit: 100-240 VAC ~ 50/60 Hz 1000 VA MAX

HS 2400 M Headspace Sampler

Width	Base 41 cm – with Tray 58 cm	(16 in – 23 in with tray)
Depth	53 cm	(21 in)
Height	64 cm	(25 in)
Weight	35 kg	(77 lb)

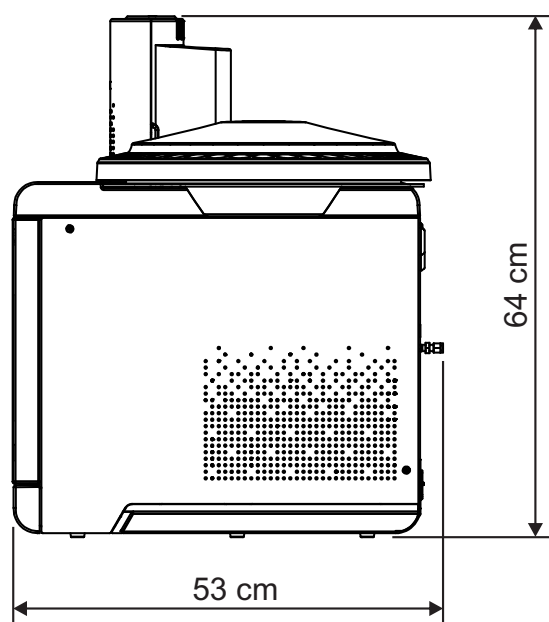
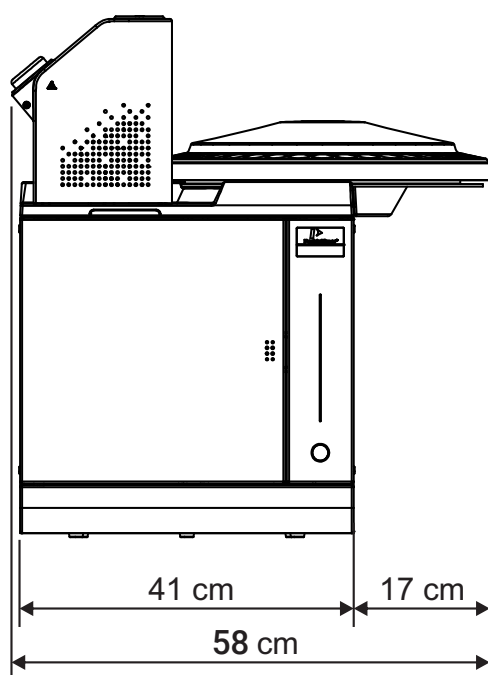


Figure 2: HS 2400 M Headspace Sampler dimensions without detachable touchscreen.