Agilent 7697A Headspace Sampler Versus an Agilent G1888A Headspace Sampler

Technical Overview

The Agilent 7697A Headspace Sampler has onboard electronics pneumatics control which was added to improve the overall instrument performance. With this addition, several significant differences can be noted between the Agilent G1888A Headspace Sampler and the 7697A Headspace Sampler. One benefit of incorporating the onboard pneumatics control is that a GC AUX module is no longer needed to control the vial pressurization pressure. Only a supply of gas is required to be plumbed into the vial pressurization bulkhead on the back of the instrument. Figure 1 shows the flow path of the 7697A Headspace Sampler and Figure 2 shows the flow path of the G1888A Headspace Sampler.

Agilent Technologies

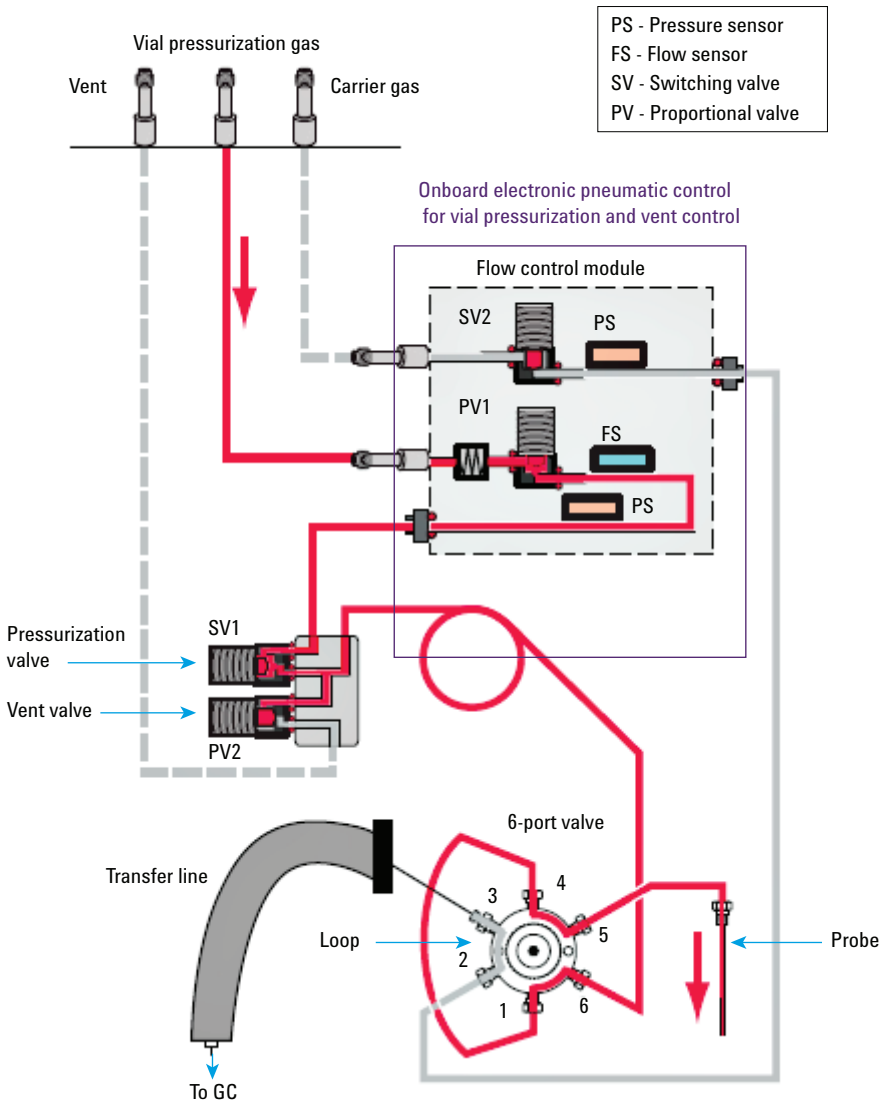

Figure 1. Agilent 7697A Headspace Sampler flow path in standby mode (standard installation, without optional carrier PCM).

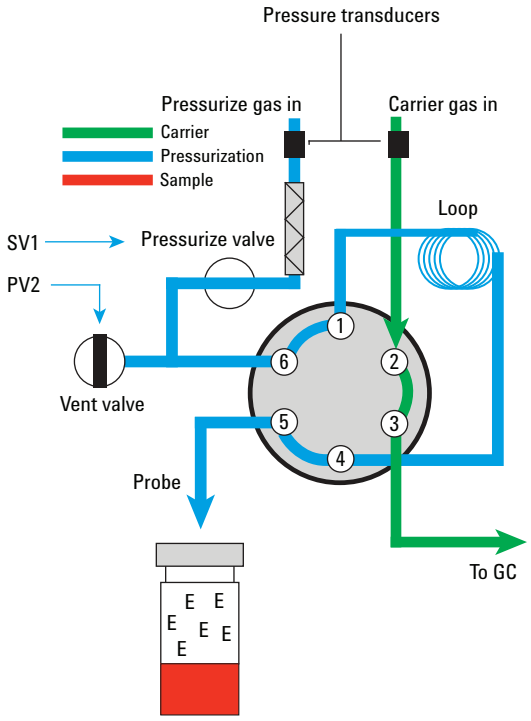

Figure 2. Agilent G188A Headspace Sampler flow path in standby mode.

Loop Fill Behavior

The onboard pneumatics control allows the 7697A Headspace Sampler to achieve active or passive backpressure control. The G1888A Headspace Sampler uses passive backpressure control to vent the vial contents through the sample loop down to ambient pressure. The default loop fill mode on the 7697A Headspace Sampler uses active pressure control. In this control mode, the final loop pressure is dropped to sweep sample from the headspace vial through the sample loop and out the vent before injection. The final pressure setpoint of the 7697A Headspace Sampler is dependent on the initial vial pressure. Using the active backpressure control allows the 7697A Headspace Sampler to achieve higher responses than using passive control. See Figure 3 and Table 1 for results which compare active and passive backpressure control.

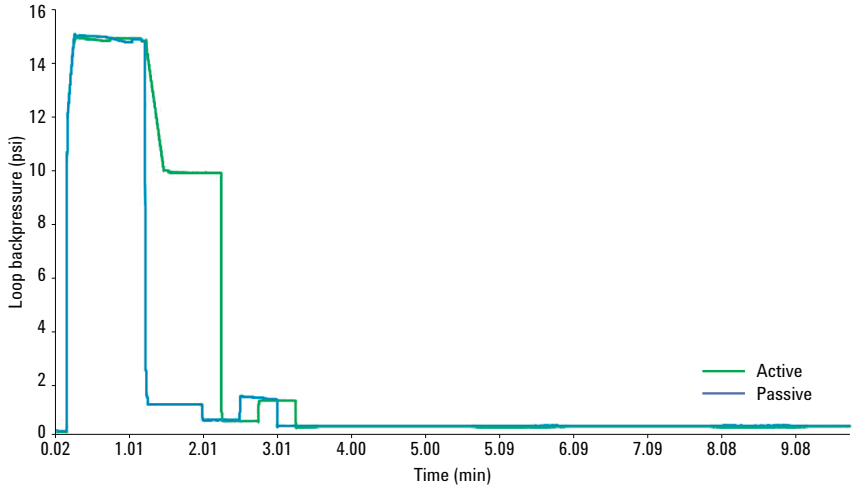

Figure 3. Active versus passive backpressure control.

Table 1. Comparison of Active Versus Passive Backpressure Control

Analyte	Active area (pA*s)	Passive area (pA*s)	Passive area as % of active area
Ethanol	357.98	251.93	70.38
n-Propanol	701.04	458.82	65.45

Impact of Active Backpressure and Modifications

Operating the 7697A Headspace Sampler in the active backpressure control causes the system to retain more sample on the column during injection. This can overload the column and lead to poor peak shape. If this happens, one modification is to reduce the final backpressure to a lower value by changing the loop fill mode from Default to Custom. Entering 0 psig allows the final vial pressure to be subject to fluctuations in ambient pressure. Entering a low pressure, for example 2 psig, could be used where a lower response is expected than under default conditions but the atmospheric pressure compensation of the 7697A Headspace Sampler would still be active.

Agilent 7697A Headspace Sampler Method Development Viewer

Using the Agilent 7697A Headspace Sampler Method Development Viewer, the user will notice some differences in parameters available for the G1888A Headspace Sampler and the 7697A Headspace Sampler.

Original Method

Temperature Settings:	
Oven Temperature (°C):	50
Loop Temperature (°C):	60
Transfer Line Temperature (°C):	70
Timing Settings:	
GC Cycle Time (min):	25.00
Vial Equilibration (min):	15.00
Vial Pressurization (min):	0.00
Loop Fill Time (min):	0.00
Loop Equilibration Time (min):	0.05
Injection Duration (min):	0.50
Pressure Settings:	
Carrier (psi):	10
Vial (psi):	15
Advanced Settings:	
Carrier (psi):	10
Vial (psi):	15
Vial Shaking:	Low
Extraction Mode:	OFF

Modified Method

Temperature Settings:	
Oven Temperature (°C):	50
Loop Temperature (°C):	60
Transfer Line Temperature (°C):	70
Cooling Plate (°C):	OFF
Timing Settings:	
Vial Equilibration (min):	15.00
Injection Duration (min):	0.50
GC Cycle Time (min):	25.00
Vial and Loop Settings:	
Vial Size:	20
Vial Shaking:	Level 3, 36 shakes/min
with acceleration of 125 cm/s²	
Fill Mode:	Default
Fill Pressure (psi):	15
Loop Fill Mode:	Default
Carrier Settings:	
Carrier Control Mode:	GC controls Carrier
Advanced Settings:	
Extraction Mode:	Single Extraction
Vent After Extraction:	ON
Post Injection Purge:	Default, 100 mL/min for
1 min	
Acceptable Leak Check:	Default, 0.2mL/min
Barcode Symbology:	Enable All
Barcode Checksum:	OFF
Sequence Actions:	
Vial Missing::	Skip
Wrong Vial Size:	Continue
Leak Detected:	Continue
System Not Ready:	Abort

Temperature settings

Both systems require acceptable oven, loop, and transferline temperatures. The user should take into consideration the recommendations in the white paper, *Thermal Zone Considerations for the Agilent 7697A Headspace Sampler* when determining the appropriate temperature zone setpoints.

Timing Settings

When converting from a G1888A Headspace Sampler to a 7697A Headspace Sampler, timing settings such as vial equilibration, injection duration, and GC Cycle Time should not be affected. On the 7697A Headspace Sampler there is an additional parameter on the headspace front panel, pressure equilibration. Pressure equilibration is the time allotted for the vial to equilibrate at pressure during vial pressurization. The default value that can be used is 0.10 minutes. The equivalent parameter can be set in the software as hold time. The user will notice that there are no longer timing settings for vial pressurization, loop fill, or loop equilibration.

Vial and Loop Settings

The 7697A Headspace Sampler requires specific vial and loop settings such as Vial Size, Fill Mode, Fill Pressure, and Loop Fill Mode. These are necessary to achieve the active backpressure control discussed earlier.

The default fill mode is Fill at flow to pressure. The headspace uses a fixed flow rate to pressurize the vial to a specified level. In the default Loop Fill Mode, the headspace uses the initial vial pressure to calculate an optimum flow rate and final vial pressure for filling the sample loop. The user can learn more about the different modes available for each of these parameters in the operation manual for the 7697A Headspace Sampler.

The shaking speeds on the 7697A Headspace Sampler takes into account both acceleration and frequency. In terms of acceleration, the 7697A Headspace Sampler shaking level 4 is equivalent to the G1888A Headspace Sampler high, and the 7697A Headspace Sampler shaking level 3 is equivalent to the G1888A Headspace Sampler low. In terms of frequency, the 7697A Headspace Sampler shaking level 5 is either high or low on the G1888A Headspace Sampler (100 shakes per minute).

Carrier Settings

The GC Control is the default installation mode. For users with the optional EPC Module, HS or GC+ HS Control is available as well. Refer to the 7697A Headspace Sampler Advanced Operation Manual for more information regarding additional information that is necessary to set up the system for HS or GC + HS control.

Advanced Settings

There are three extraction modes available: single, multiple, and concentrated. Vent After Extraction provides the option to vent the residual pressure from the used sample vial after the extraction is performed. Between sample vials, the headspace sampler will purge the sample probe, sample loop, and vent. If experiencing carryover, the user could increase the purge flow or purge time by editing the post injection purge settings to sweep any residual sample vapors from the system. Using the onboard electronic pneumatic control, the instrument is able to detect leaks. The user can select the default value for Acceptable Leak Check or adjust accordingly to their preference. The 7697A Headspace Sampler has an optional barcode reader accessory. The user can set the Barcode Symbology and Barcode Checksum. Reference the 7697A Headspace Sampler Advanced Operation Manual for more information on these advanced settings.

Sequence Actions

Sequence actions allow the user to provide control over certain types of HS or GC errors (for example, Vial Missing, Wrong Vial Size, Leak Detected, or System Not Ready) that can occur when handling sample vials for a run or a sequence of runs. If one of these errors are detected, the user can control the headspace by setting the following actions: Continue, Skip, Pause, or Abort.

For example, System Not Ready: when the HS becomes Ready, it checks if the GC is Ready. If the GC is not ready for a new injection, the HS follows the specified action. The default setting is Abort. For example, System Not Ready: when the HS becomes Ready, it checks if the GC is Ready. If the GC is not ready for a new injection, the HS follows the specified action. The default setting is Abort.

www.agilent.com/chem

Printed in the USA
July 18, 2013
5990-1542EN

Agilent Technologies