

Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

Pittcon 2016 2270-1

Clifford M. Taylor, Marketing Manager,
Gas Chromatography Products; Marty Smith,
GC Project Engineer; Zhuangzhi "Max" Wang,
Ph.D. GC Senior Product Specialist;
Shimadzu Scientific Instruments, Columbia, MD, USA

Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

Excellent Value

Cost-Effective Model Equipped with the Most Popular Features Used in Headspace Analysis

The HS-10 headspace sampler is highly cost effective. It comes equipped with heat-ahead, mixing, and other functions necessary for headspace analysis.

This instrument can provide highly reliable analysis, including but not limited to the analysis of residual solvents, blood alcohol, and trace VOCs in wastewater and beer.

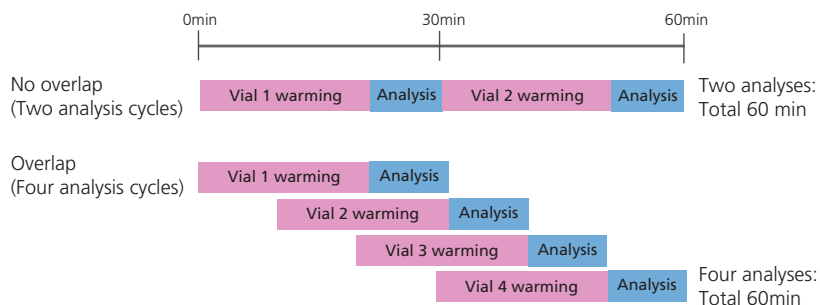


Heat-ahead Analysis

The HS-10 can perform heat-ahead analysis to shorten GC cycle times. This is achieved by initiating the incubating process for multiple vials at different time slots within the same analytical workflow. This drastically decreases the run times resulting in overall improvements in productivity.



Capable of new vial intake while other vials are being incubated.



Difference in analysis times with and without heat-ahead

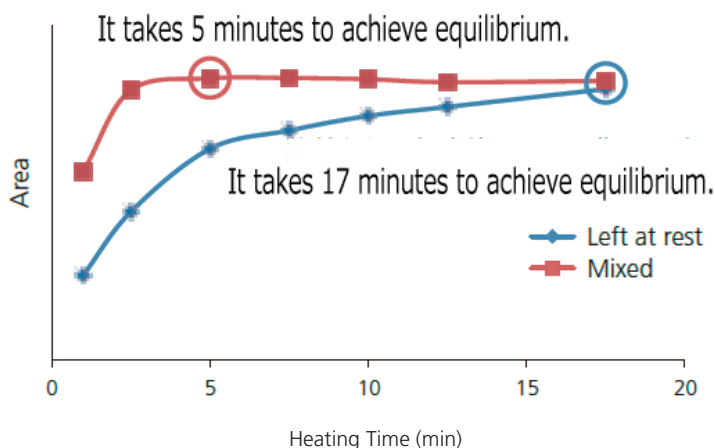
Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

Mixing Function

The HS-10 is equipped with a mixing function that allows equilibrium of samples to be reached in a short period of time. As a result, pretreatment times can be shortened, and the degradation of thermally labile compounds due to long incubation time can be prevented.



Mixing is achieved by moving the vials up and down

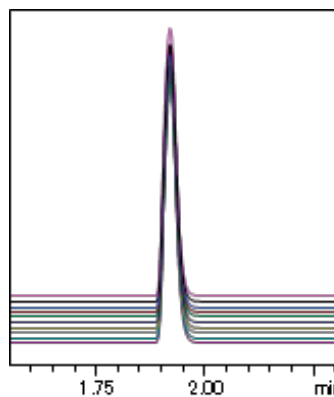


Favorable Peak Area Reproducibility

Thanks to the accurate electronic flow control, and a thermostatic vial chamber with a uniform temperature distribution, good peak area reproducibility can be easily obtained.



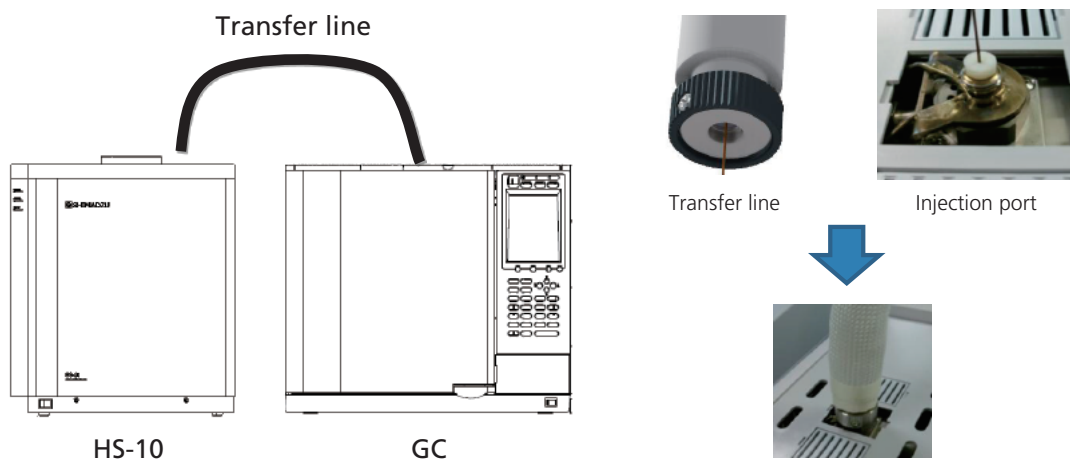
The temperature in the thermostatic vial chamber is uniform, so there is no variance in gas-liquid equilibrium regardless intake position.



Reproducibility for 0.4 % Ethanol in water
%RSD 2.0 % (n = 10)

Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

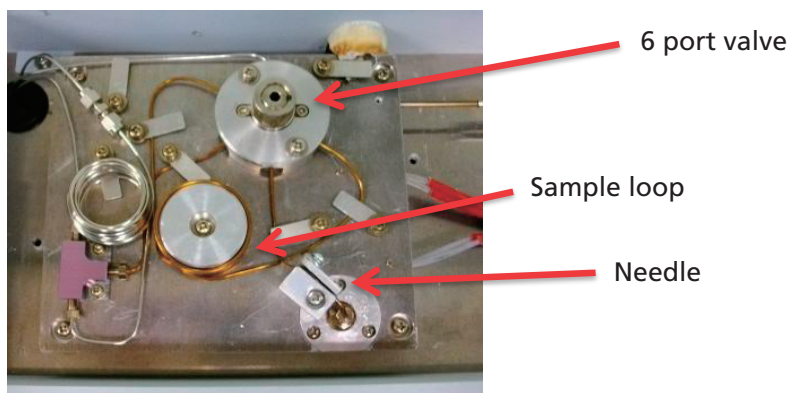
Easy Connection



An injection port is used to connect HS-10

Easy Maintenance

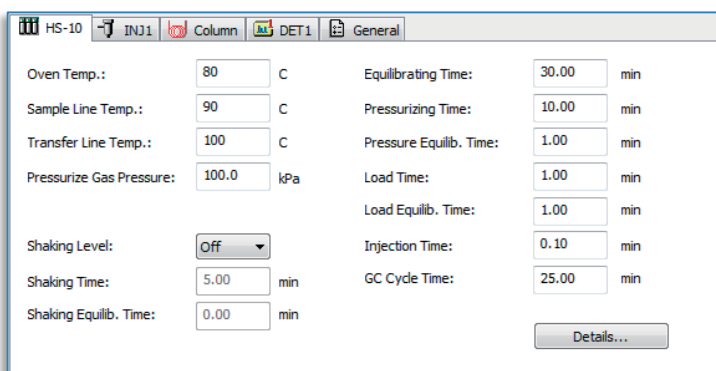
Operators can exchange valve parts easily.



Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

Control using LabSolutions Software

LabSolutions complies with a variety of regulations, including FDA 21 CFR Part 11, electronic records and electronic signatures. A typical requirement in the pharmaceuticals industry.



HS-10 Parameters Settings Window

Item	Value	Units	Ctrl
Vial# in Pretrea			
HSS Oven Te	80	C	
HSS Sample Li	90	C	
HSS Transfer L	100	C	
HSS Pressure	12.3	kPa	
INJ1 Temperat	30.0	C	
INJ1 Pressure	10.0	kPa	
Total Flow	30.0	mL/min	
Purge Flow	10.0	mL/min	<input checked="" type="radio"/> On <input type="radio"/> Off
Primary Pressur	0	kPa	
Column Temper	30.0	C	
DET1 Tempera	30.0	C	
DET1 Makeup	10.0	mL/min	<input checked="" type="radio"/> On <input type="radio"/> Off
DET1 H2 Flow	10.0	mL/min	<input checked="" type="radio"/> On <input type="radio"/> Off
DET1 Air Flow	320.0	mL/min	<input checked="" type="radio"/> On <input type="radio"/> Off

HS-10 Monitor Window

HS-10 Specifications

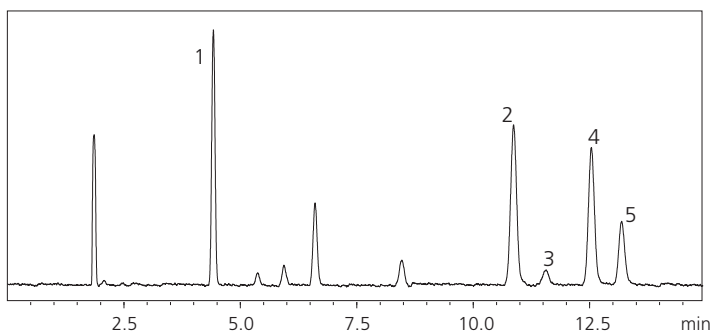
Specifications	
Vial capacity	: 20
Heated vials	: 6 (heat-ahead capable)
Sample loop	: 1.0mL(standard) 0.5 or 2.0 mL (option)
Transfer line	: 1.0 m or 1.6m
Vial oven temp	: 35 - 225 °C
Sample line temp	: 35 - 225 °C
Transfer line temp	: 35 - 225 °C
Vial shaking	: 3 stages
Size	: 407(w)X455(H)X527(D)mm
Weight	: 35kg
Applicable System	: GC-2010/Plus, GC-2014
Features	
Reproducibility	: Methanol 5ppm in water Peak Area %RSD less than 2 % USP467 Residual solvent analysis Peak Area %RSD around 3 %



HS-10 + GC-2010 Plus

Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

USP467 Class1 Procedure A

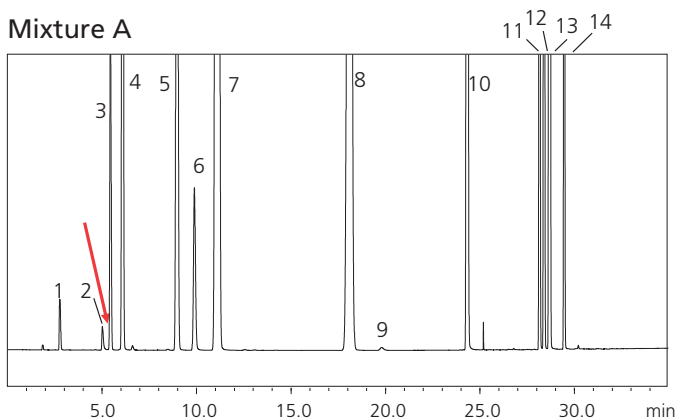


Column: Inertcap-624 (GLS)
30m×0.32mm I.D. df = 1.8µm
Carrier Gas: He 35cm/sec
Injection Temp.: 140°C,
Detector Temp.: 250°C
Column Temp.: 40°C(20min) –
10°C/min – 240°C(20min)
Sample Thermostatting: 80°C, 60min
Split Ratio: 1:5
1,1,1-trichloroethane S/N ≥ 5
All peaks ≥ 3

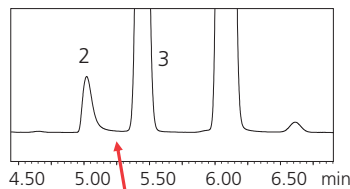
1 1,1-Dichloroethene; 2 1,1,1-Trichloroethane; 3 Carbontetrachloride;
4 Benzene; 5 1,2-Dichloroethane

USP467 Class2 Procedure A

Mixture A

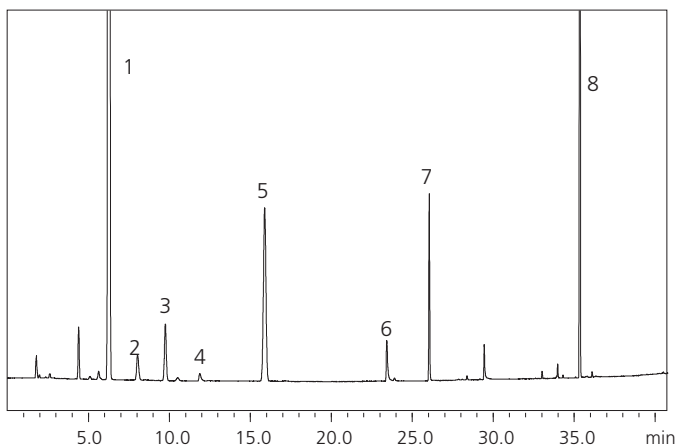


1 Methanol	8 Methylcyclohexane
2 Acetonitrile	9 1,4-Dioxane
3 Methylene chloride	10 Toluene
4 trans-1,2-Dichloroethene	11 Chlorobenzene
5 cis-1,2-Dichloroethene	12 Ethylbenzene
6 Tetrahydrofran	13 m+p-Xylene
7 Cyclohexane	14 o-Xylene



Mixture A Standard Solution:
Resolution of acetonitrile and
methylene chloride ≥ 1.0

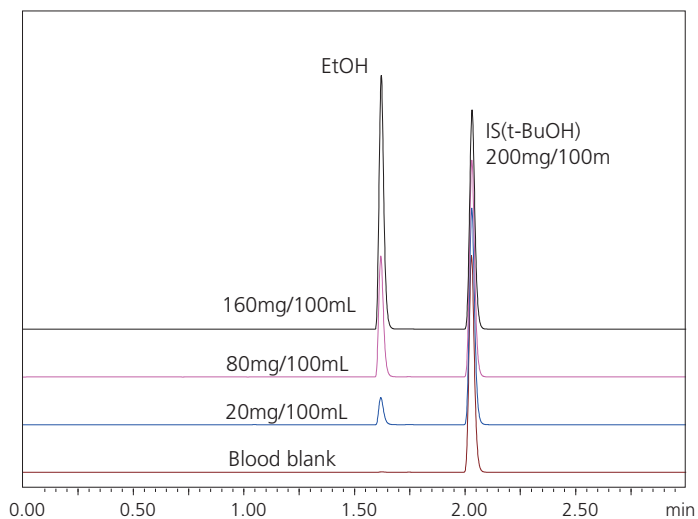
Mixture B



1 Hexane
2 Nitromethane
3 Chloroform
4 1,2-Dimethoxyethane
5 Trichloroethene
6 Pyridine
7 Methylbutylketone
8 Tetraline

Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

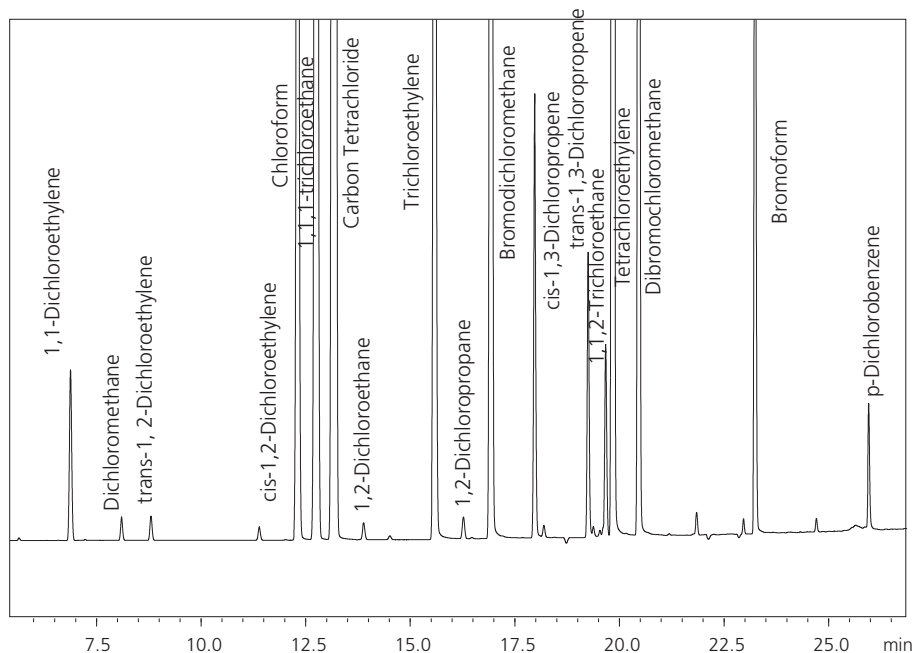
Blood Alcohol Concentration (BAC)



Repeatability: 2.1% (n=7)
(40mg/100mL EtOH)

Column: Rtx-BAC Plus2 30mX0.32mm
I.D. df = 0.6um
Carrier Gas: He 100kpa
Injection Temp.: 150°C,
Detector Temp.: 250°C
Column Temp.: 40°C
Split Ratio: 1:20
Vial oven: 85°C 15min Sample line: 150°C
Transfer line: 150°C
Vial Press 200kpa
Vial press time 1.0min
Load time 0.5min

VOCs in Water (ECD)



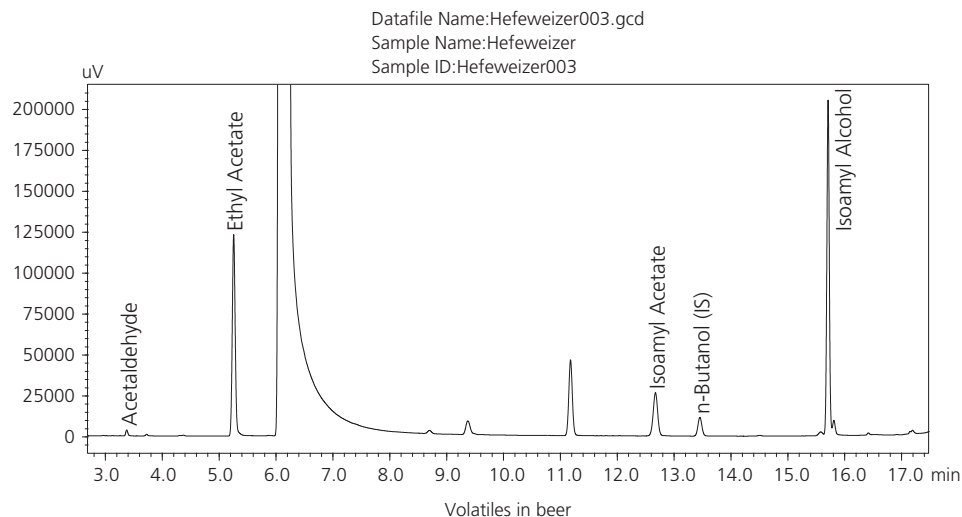
VOC 10ppb Repeatability RSD%(n=5)

1: 1,1-Dichloroethene	2.1
2: Dichloromethane	2.0
3: trans-1,2-Dichloroethene	2.6
4: cis-1,2-Dichloroethene	2.3
5: Chloroform	2.1
6: 1,1,1-Trichloroethane	2.6
7: Carbon tetrachloride	3.3
8: 1,2-Dichloroethane	1.9
9: Trichloroethene	2.7
10: 1,2-Dichloropropane	1.9
11: Bromodichloromethane	2.4
12: cis-1,3-Dichloropropane	1.6
13: trans-1,3-Dichloropropane	1.7
14: 1,1,2-Trichloroethane	2.2
15: Tetrachloroethene	3.4
16: Dibromochloromethane	2.1
17: Bromoform	1.6
18: 1,4-Dichlorobenzene	2.8

Example analysis of each 10 µg/L (10 ppb) VOC in water by HS-10

Introduction of a New, High-quality, Cost-efficient Headspace GC Autosampler, the HS-10

VOCs in Beer (FID)



Conclusions

The HS-10 is a transfer line, sample loop type, static headspace sampler. It has many of the same features of higher end models but is offered at a lower price. Example applications have been presented such as residual solvent, blood alcohol, VOCs in water and beer. HS-10 is the higher value option.



First Edition: March, 2016