

ms NoVent™ II

5 minute GC-MS Column Changeover



Save 6-12 hours column changeover time

- Easy and simple to use
- Fully utilize all your GC columns with a 5 minute changeover
- Faster troubleshooting
- Reduced GC-MS maintenance downtime
- Suitable for the most demanding applications
 - Inert flow path
 - No dead volume
- Eliminate re-tightening of ferrules after thermal cycling, using SilTite™ metal ferrules



Why use a column changeover system?



The ms NoVent™II interface is designed to allow column, liner or septum change-over, or column maintenance, to be carried out without the need to shut down the mass spectrometer.

The design of the interface ensures **NO** air or water enters the mass spectrometer while the column is disconnected, unlike some devices that restrict the amount of air that enters the MS during changeover. This ensures the ion source remains contamination free. As a result, a column can be changed and the instrument brought back on line in only 5 minutes.

The main challenge to venting an MS is water. Most systems require 6–12 hours to eliminate water due to critical downtime when critical auto-tuning is required, e.g. DFTPP. The ms NoVent II reduces downtime to a minimum and allows you to take full advantage of utilizing all your GC columns.

- **Easy and simple to use**

- Single switch operation.

- **Fully utilize all your GC columns**

- 5 minute changeover gives you the freedom to choose the most appropriate column in your lab, regardless of which column is currently in your GC-MS.
- Enables use of short columns on your GC-MS without column efficiency being affected.

- **Faster troubleshooting**

- Rapidly identify or eliminate your column as the source of problems in your analysis.
- Experiment with several different columns for difficult to resolve peaks.
- Disconnect the column for bake out.

- **Reduced maintenance downtime**

- Maintains the entire flow path from injector to detector free of air and water during:
 - MS maintenance operations.
 - Liner and septum changes.

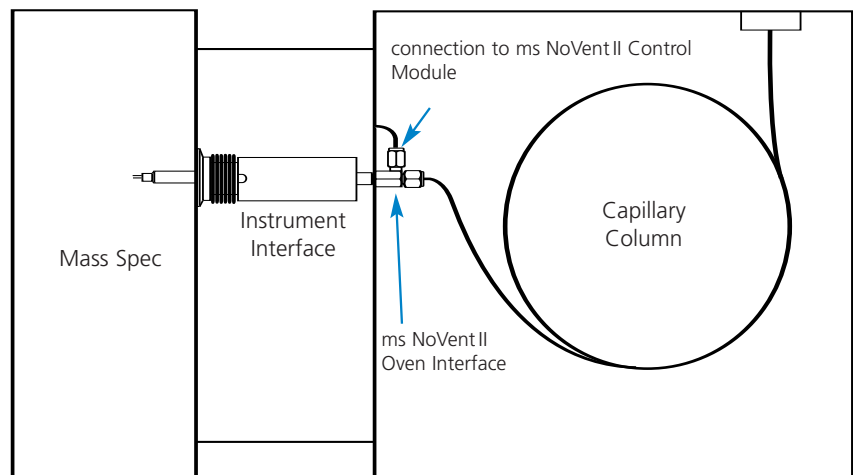
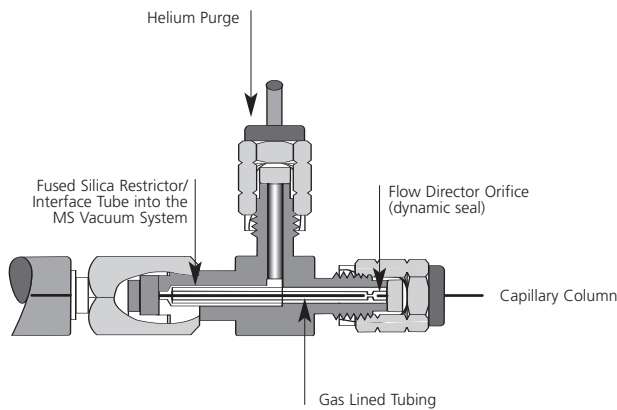


Figure 1. Diagram showing the configuration of the ms NoVent II in the oven

ms NoVent II - How it works

The ms NoVent II is a fluidic valve and prevents air and water from entering the MS during column change-over. The key to the ms NoVent II is the unique Flow Director Orifice and deactivated fused silica interface tube, which are located at the MS interface as part of the ms NoVent II Tee.

Before the column is removed from the interface, a helium purge is turned on. The fused silica restrictor / interface tube limits the flow of helium into the mass spectrometer. As shown in Figure 3, after the column has been removed from the GC, the Flow Director Orifice prevents air from entering the mass spectrometer. The flow of helium through the orifice acts as a dynamic seal preventing air being sucked back into the MS.



Normal Operation Mode

In normal operation mode the helium purge is turned off. The column flow is directed through to the MS via the fused silica transfer tube. (Note: the transfer tube and Tee in normal operation are under vacuum through the MS Interface vacuum).

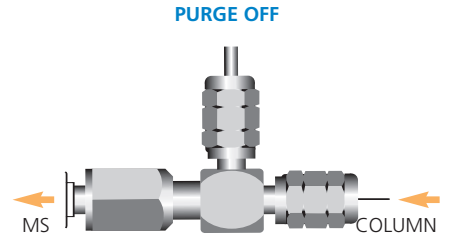


Figure 2: Normal Operation Mode

Column Change Mode

In the column change mode a helium purge is applied to the Interface Tee. The column can then be disconnected without shutting down or “venting” the MS. The existing column, or a new column, can then be connected and the ms NoVent II switched back to normal mode for standard operation. (Note: there is no time limit as to how long the MS system can be left in the column change mode, as long as helium is available).

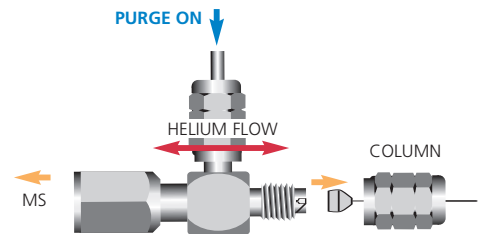


Figure 3: Column Change Mode

Proof of Chromatographic Integrity

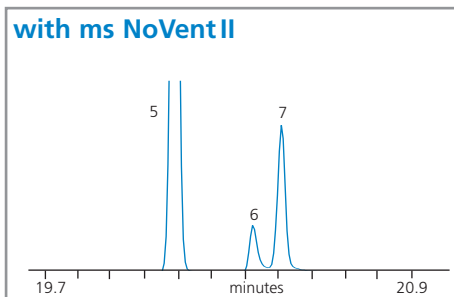
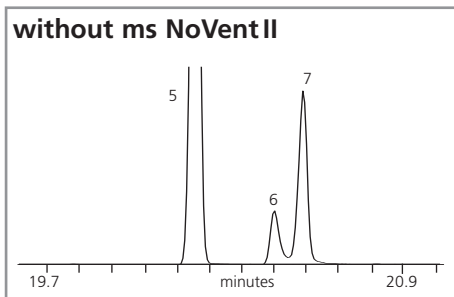
USEPA method 8270C is used to determine the concentration of semi-volatile organic compounds in extracts taken from many types of solid waste matrices, soils, air sampling media and water samples. This method is the basis of all routinely analyzed semi-volatile contaminants. It can be used to quantitate most neutral, acidic, and basic organic compounds that are soluble in methylene chloride, and capable of being eluted, without derivatization, from a gas chromatograph.

A system performance check must be routinely performed to ensure integrity is maintained. The estimated quantitation limit for the more difficult compounds is 10ng on-column. A relative response factor (RRF) of 0.05 must be maintained at this detection limit. An RRF below 0.05 indicates poor performance in the chromatographic system and corrective action must be taken before sample analysis begins. As performance improves, the response factor will increase.

To prove the chromatographic integrity of the ms NoVent II, a custom test mix containing the most difficult compounds from the 8270C method was used. Figure 4 shows this test mix chromatographed both with and without the ms NoVent II at a level of 5ng on-column, a factor of two lower than required.

One of the most difficult compounds in the 8270C method is 2,4-dinitrophenol (peak 6), routinely achieving a RRF of 0.05 to 0.10, at a level of 10ng on-column. Maintenance of the chromatographic integrity of this peak with the ms NoVent II connected is evident in Figure 4.

Phase: BPX5, 0.25µm film
Column: 30m x 0.25mm ID
 Initial Temp: 40°C, 4 min.
 Rate: 10°C/min
 Final Temp: 300°C, 6 min.
 Detector: HP5973 MS
 Scan Range: 35-450 amu
 Interface Temp: 280°C
 Source Temp: 230°C
 Quad Temp: 150°C
 Injection: Splitless, 1 min.
 1µL inj., 5ng on-column
 Injection Temp: 280°C
 Carrier Gas: He, 1 mL/min
Column Part No: 054101



- Components**
1. aniline
 2. 1,4-dichlorobenzene – d4
 3. benzoic acid
 4. naphthalene – d8
 5. acenaphthene – d10
 6. 2,4-dinitrophenol
 7. 4-nitrophenol
 8. 2-methyl-4,6-dinitrophenol
 9. pentachlorophenol
 10. 4-aminobiphenyl
 11. phenanthrene – d10
 12. benzidine
 13. 3,3'-dichlorobenzidine
 14. chrysene – d12
 15. benzo [b] fluoranthene
 16. benzo [k] fluoranthene
 17. perylene – d12

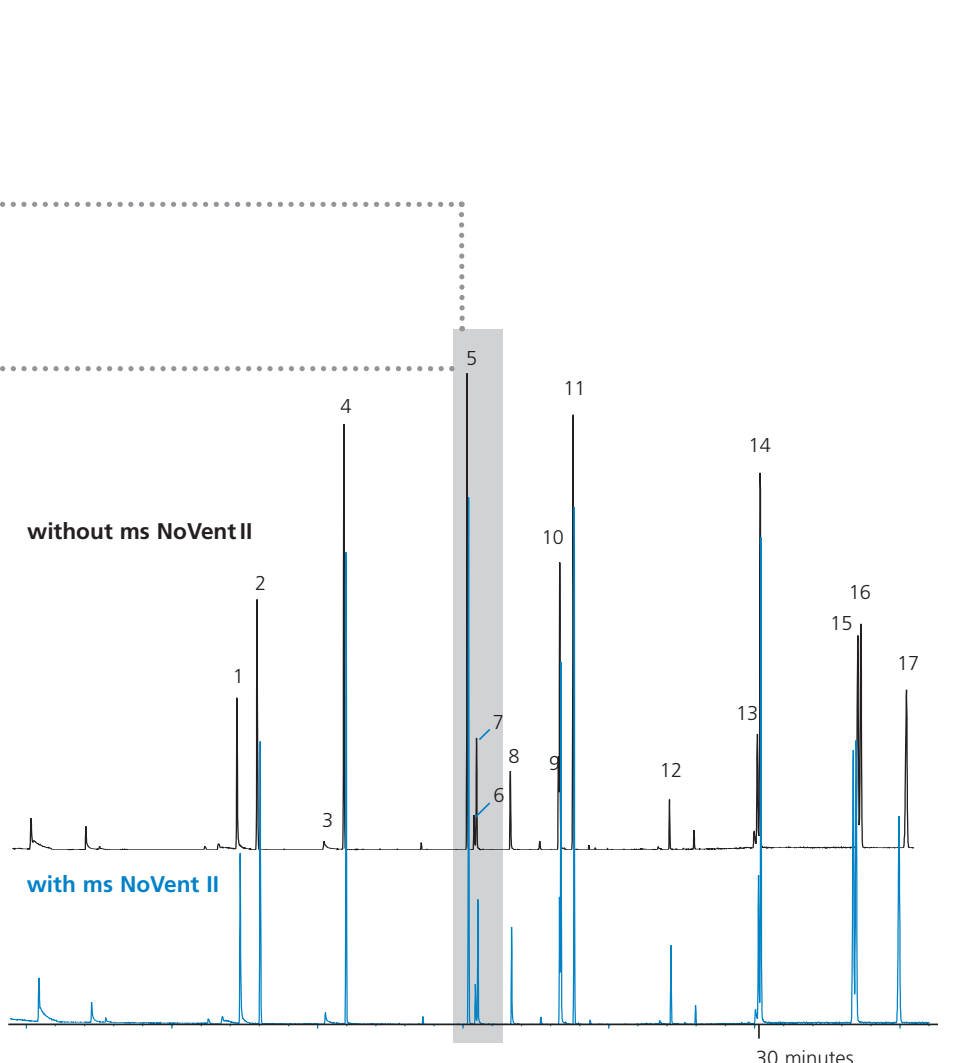


Figure 4.

Table 1 lists the relative response factors against the deuterated internal standards, and shows no change in system integrity within the limits of 15% standard deviation (as required by method 8270C). For example, 2,4-dinitrophenol has a RRF of 0.057 without the ms NoVent II, and 0.051 with the ms NoVent II at a level of 5ng on-column.

The ms NoVent II does not affect the relative response factors of these difficult to analyze compounds, stabilizing the chromatographic system while maintaining sensitivity and integrity.

Table 1: Relative Response Factors

Analyte	RRF Without ms NoVent II	RRF With ms NoVent II
aniline	2.120	1.942
1,4-dichlorobenzene	6.775	7.083
benzoic acid	0.192	0.187
2,4-dinitrophenol	0.057	0.051
4-nitrophenol	0.245	0.258
2-methyl-4,6-dinitrophenol	0.126	0.129
aminobiphenyl	3.037	3.035
pentachlorophenol	0.387	0.457
benzidine	1.695	1.682
3,3'-dichlorobenzidine	1.944	1.969
benzo(b)fluoranthene	5.459	5.681
benzo(k)fluoranthene	5.097	5.308

Table 2:

Table showing data demonstrating that no air or water enters the MS while the capillary column is disconnected and the purge gas is turned on.

Parameter	Column Connected	Column Disconnected for 1 minute	Column Disconnected for 60 minutes
H ₂ O	0.79	1.21	0.96
N ₂	3.57	3.54	3.75
O ₂	1.06	0.92	0.98
CO ₂	0.36	0.16	0.25

Units are in % height of the m/z = 69 ion signal

Note: There is no time limit as to how long the MS can be left in the column change mode, as long as the supply of helium is continuous.

Frequently Asked Questions

- Q I'm concerned about fitting the ms NoVent II to my MS Interface – what happens if it damages the interface?**
- A** To protect the integrity of the MS interface, the ms NoVent II tee is manufactured from stainless steel with a soft brass threaded insert for the connection to the MS interface. This will ensure that the MS interface is not damaged.
- Q Will the ms NoVent II affect my chromatography particularly peak elution order?**
- A** Once the system has been flow compensated, the ms NoVent II has little effect on chromatography retention.
- Q Will the ms NoVent II affect my difficult-to-analyze compounds (will system inertness be affected)?**
- A** The ms NoVent II has been designed and tested to ensure it does not affect system inertness. All of the flow surfaces are made from SGE's proprietary, high temperature, deactivated, neutral surfaces or fused silica. The internal geometry of the tee has been optimized to avoid dead volumes or unswept flow paths.
- The result of this attention to detail is unsurpassed chromatography INERTNESS. To prove this, the ms NoVent II has been tested using one of the most difficult MS analyses available, 5ng of USEPA 8270C with splitless injection. No measurable loss or interference was identified with difficult to analyze compounds (2,4-dinitrophenol, 4-nitrophenol, pentachlorophenol, 4-aminobiphenyl and benzidine) – see Figure 4.
- Q Will I need to change any of my carrier gas parameters when the ms NoVent II is installed?**
- A** Placing the ms NoVent II into the GC–MS system will decrease flow velocity for the same head pressure due to the restriction in the ms NoVent II. To compensate for this, the column head pressure or column length parameters in the GC will need to be adjusted. SGE has developed tables that provide original parameters (before ms NoVent II is installed) and new parameters (after the ms NoVent II is installed) for GC–MS combinations. Flow velocity should always be double checked using an unretained solute once the ms NoVent II is installed.
- Q Will connecting the ms NoVent II affect my instrument warranty?**
- A** The ms NoVent II does not interfere with the fit or function of the MS or GC. As a retrofit device, it can be likened to fitting a retention gap or column splitting device to the chromatography system. The MS and GC are not "opened" or modified in any way as to void the instrument warranty.
- Q Will the ms NoVent II affect "Retention Locking?"**
- A** After head pressure / column compensation programming, normal "Retention Locking" programming can be used.
- Q Is there a service engineer available to install the ms NoVent II?**
- A** Simply contact your local SGE office.

ms Novent II Ordering Information

Ordering your ms NoVent II is as easy as 1-2-3

- (1) Select the Control Unit (same for all GC's)
- (2) Select the correct tee for your GC
- (3) Select the correct restrictor for your GC (note that for some systems, an adaptor is also supplied with the restrictors)

All three items must be ordered to have a complete ms NoVent II system

Part No.

Control Unit

113440

GC - MS	Fused Silica Restrictor (Pkt 2)	ms NoVent II Tee
Agilent/HP5970	113451	113490
Agilent 5971/HP5972	113452	113490
Agilent/HP5973	113453	113490
Agilent/HP5989	113454	113490
HP-GCD	113455	113490
HP5988-A	113456	113490
PerkinElmer Turbomass/Gold	113460	113492
Shimadzu MS 5000/5050	113465	113491
Shimadzu MS 5000/5050 with Wide Bore Interface	113466	113490
Shimadzu 2010	113455	113490
Thermo Finnigan GCQ	113470	113490
Thermo Finnigan SSQ7000	113471	113490
Thermo Finnigan Voyager	113472	113490
Thermo Polaris Q	113474*	113490
Thermo Trace DSQ	113474*	113490
Thermo Focus DSQ	113474*	113490
Varian Saturn 2000, 2100, 2200	113480*	113490
Varian Saturn 1,2,3 and 4	113481*	113490

* includes adaptor. Replacement Restrictor only may be ordered as follows:

GC - MS	Replacement Restrictor only
Thermo Polaris Q	113473
Thermo Trace DSQ	113473
Thermo Focus DSQ	113473
Varian Saturn 2000, 2100, 2200	113482
Varian Saturn 1,2,3 and 4	113483



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ETP electron
multipliers