

MONO TORR®

Point-Of-Use Purifiers



saes
getters

SAES Pure Gas, Inc.
San Luis Obispo, California
The Technology of Pure Gas

MONO TORR®

Point-Of-Use Purifiers

The Need for Purification

Research has shown that gas purification can ensure consistent and repeatable process performance for semiconductor device manufacturing.

Purification isolates critical process areas from house gas distribution systems and protects against gas purity upsets and cross-contamination. As manufacturing processes grow more demanding, gas system impurities must be reduced below one part per billion.

The Getter Technology Approach

Since 1950, SAES Getters has developed evaporable and non-evaporable getter technologies for ultrahigh-vacuum applications. Non-evaporable getter materials, based on zirconium and its alloys, can also be used in ultrahigh purification capable of sub-ppb performance.

Getter materials irreversibly trap gaseous impurity molecules. Gaseous impurities are captured on the surface. When heated, the impurities diffuse into the bulk of the getter. Unlike ambient technologies that rely on surface adsorption only, getter technology utilizes the entire volume of material. This results in superior capacities and longer lifetimes for all impurities.

MonoTorr gas purification products were developed specifically for sub-ppb performance. These getter-based purifiers are preconditioned (activated) at our factory to allow immediate use. Its all-metal technology ensures that no impurities are added.

High Purity Manufacturing

MonoTorr purifiers are engineered for high-purity applications. All piping system wetted surface areas are electropolished 316L stainless steel construction with 10- μ -inch Ra surface finish or less.

Welding and assembly are performed in our Class 100 cleanroom. Stainless steel diaphragm valves and a 0.003 μ m stainless steel particle filter are standard on all MonoTorr products.

APIMS Measures Performance

Atmospheric pressure ionization mass spectrometry (APIMS) demonstrates capabilities of the MonoTorr approach to purification. Upstream impurities fluctuating in the low-ppm range are quickly controlled to ppt levels (see figs. 1 and 2 below).

Figure 1 - Argon

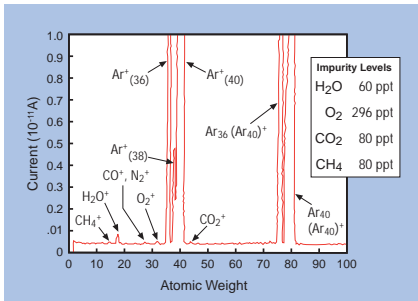
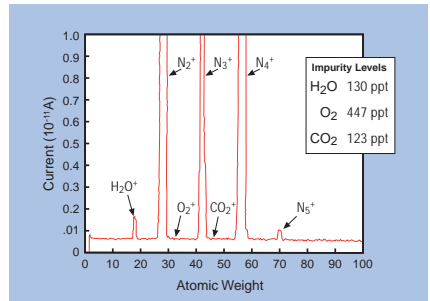


Figure 2 - Nitrogen

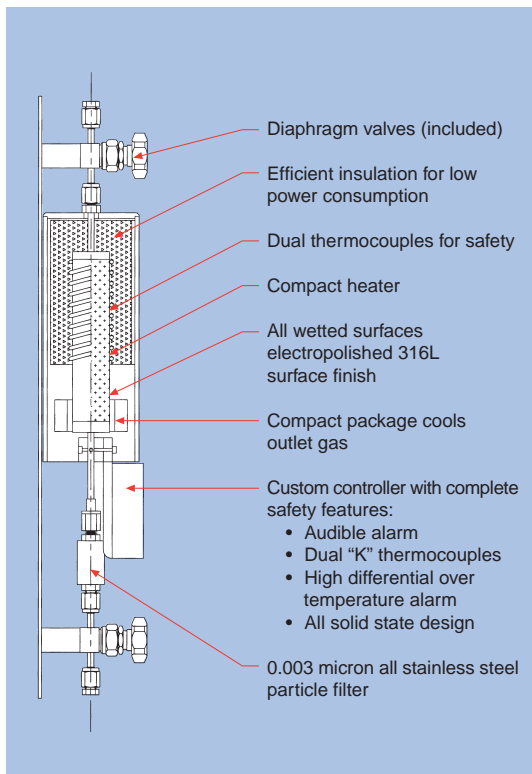




Gases Purified and Impurities Removed

Gas	Product	Impurities Removed
Argon - Ar Helium - He Other Rare Gases	MT-R	H ₂ O, O ₂ , H ₂ , CO, CO ₂ , N ₂ , THC and particles
Nitrogen - N ₂	MT-N	H ₂ O, O ₂ , H ₂ , CO, CO ₂ , THC and particles
Hydrogen - H ₂	MT-H	H ₂ O, O ₂ , CO, CO ₂ , N ₂ and particles

Figure 3 - Side View Cutaway of MonoTorr Phase I 3000



NITROGEN Performance Guarantee

Phase II 3000			Phase II 15000		
Inlet Impurity	0 - 20 slpm	20 - 50 slpm	Inlet Impurity	0 - 30 slpm	30 - 75 slpm
O ₂	< 1 ppb	< 1 ppb	O ₂	< 1 ppb	< 1 ppb
H ₂ O	< 1 ppb	< 1 ppb	H ₂ O	< 1 ppb	< 1 ppb
CO	< 1 ppb	< 1 ppb	CO	< 1 ppb	< 1 ppb
CO ₂	< 1 ppb	< 1 ppb	CO ₂	< 1 ppb	< 1 ppb
H ₂	< 1 ppb	< 10 ppb	H ₂	< 1 ppb	< 10 ppb
CH ₄	< 1 ppb	< 10 ppb	CH ₄	< 1 ppb	< 10 ppb

RARE GAS Ar, He, Xe, Ne, Kr and Rn Performance Guarantee

Phase II 3000			Phase II 15000		
Inlet Impurity	0 - 20 slpm	20 - 50 slpm	Inlet Impurity	0 - 30 slpm	30 - 75 slpm
O ₂	< 1 ppb	< 1 ppb	O ₂	< 1 ppb	< 1 ppb
H ₂ O	< 1 ppb	< 1 ppb	H ₂ O	< 1 ppb	< 1 ppb
CO	< 1 ppb	< 1 ppb	CO	< 1 ppb	< 1 ppb
CO ₂	< 1 ppb	< 1 ppb	CO ₂	< 1 ppb	< 1 ppb
N ₂	< 1 ppb	< 10 ppb	N ₂	< 1 ppb	< 10 ppb
H ₂	< 1 ppb	< 10 ppb	H ₂	< 1 ppb	< 10 ppb
CH ₄	< 1 ppb	< 10 ppb	CH ₄	< 1 ppb	< 10 ppb

HYDROGEN Performance Guarantee

Phase II 3000			Phase II 15000		
Inlet Impurity	0 - 20 slpm	20 - 30 slpm	Inlet Impurity	0 - 30 slpm	30 - 50 slpm
O ₂	< 1 ppb	< 1 ppb	O ₂	< 1 ppb	< 1 ppb
H ₂ O	< 1 ppb	< 1 ppb	H ₂ O	< 1 ppb	< 1 ppb
CO	< 1 ppb	< 1 ppb	CO	< 1 ppb	< 1 ppb
CO ₂	< 1 ppb	< 1 ppb	CO ₂	< 1 ppb	< 1 ppb
N ₂	< 1 ppb	< 10 ppb	N ₂	< 1 ppb	< 10 ppb

Note: Getter lifetime is dependent on purifier size, inlet impurities and average flow rate. Consult the factory for lifetime calculations. Specifications subject to change without notice.

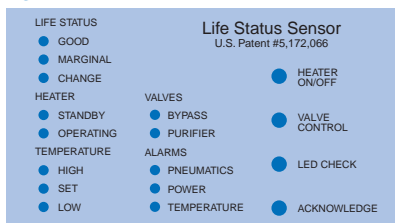
Phase II Controller Features

Life Status - Indicates the life status of the purifier. *Good* is normal, *Marginal* indicates approaching depletion and *Change* includes audible alarm to notify the operator that end-point is approaching and replacement will soon be required (available for rare gases and nitrogen only).

Heater - Indicates status of heater.

Temperature - Displays heater mode while maintaining getter material at preset operating temperature.

Figure 4 - MonoTorr Phase II Control Panel



Valves - Indicates status of purifier as controlled by pneumatic valves.

Alarms - *Pneumatic* alarm caused by loss of adequate pressure for valves. *Power* alarm indicates that extended power failure has caused purifier to go into *Standby* condition. *Temperature* alarm indicates a high or low temperature condition in the purifier cartridge. The high temperature alarm could be caused by high impurity levels (air) in the gas stream. Alarm causes the purifier to go to *Bypass* mode. Additional error codes provide alarms for exhaust fan, heater or solid state relay failure.

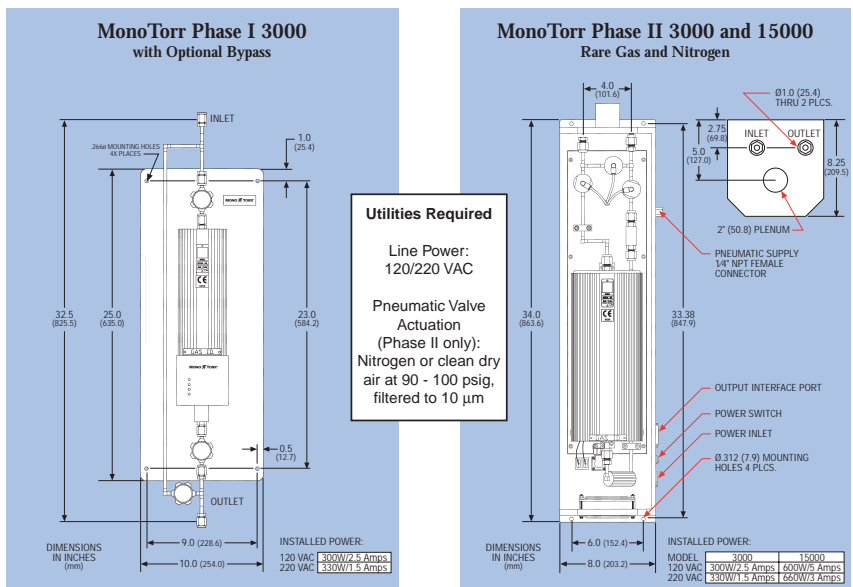
Heater On/Off - Activates heater only when no alarms exist.

Valve Control - Positions valves to *Purifier* or *Bypass* mode.

LED Check - Assures proper functioning of all LEDs and alarm buzzer.

Acknowledge - Silence audible alarm and restores operation if certain alarm conditions have been corrected.

Figure 5



Phase I



Phase II



Designs For All Applications

Two basic designs are available. The Phase I 3000 provides the essential requirements for nitrogen and rare gases at flows up to 5 slpm.

Phase II purifiers are available for rare gases, nitrogen and hydrogen. These purifiers provide added safety, automation and life status monitoring (rare gases and nitrogen only) in a sturdy surface-mountable enclosure. The Phase II 3000 is designed for maximum flows of 50 slpm (rare and nitrogen gases), and 30 slpm for hydrogen. The maximum flow of the Phase II 15000 is 75 slpm (rare and nitrogen gases) and 50 slpm for hydrogen. Refer to the system features matrix on back panel for additional information.

Protection From Operator Error

It is vital to protect any purifier from prolonged exposure to air. MonoTorr purifiers can offer that protection. The Phase II design includes a sensor to continuously monitor and isolate the purifier cartridge in the event of an upstream air leak.

Life Status Sensor

The patented life status sensor (LSS), developed by SAES Pure Gas, provides early warning for impending breakthrough of impurities (see fig.4). The technique measures resistivity change occurring in the getter alloy as impurities are diffused into the bulk of the purification media.



System Features and Specifications Matrix

	MonoTorr Phase I 3000		MonoTorr Phase II 3000 & 15000		
Gas Product Code	N	R	N	R	H
Additional Specifications and Features					
Operating Temperature (°C)	350	400	350	400	400
Pressure Rating (psig)	150	150	150	150	120
Heater Power Consumption (watts) Nominal/Maximum	50 < 260	50 < 260	125/< 260 (3000) 187/< 600 (15000)	125/< 260 (3000) 187/< 600 (15000)	125/< 260 (3000) 187/< 600 (15000)
Pressure Drop (psi)	<10	<10	<10	<10	<15
0.003 µm Metal Filter	STANDARD	STANDARD	STANDARD	STANDARD	STANDARD
Bypass Assembly	OPTIONAL	OPTIONAL	STANDARD	STANDARD	STANDARD
Surface Mountable Enclosure (w/ Cooling Fan)	N/A	N/A	STANDARD	STANDARD	STANDARD
Surface Mounting Plate	STANDARD	STANDARD	N/A	N/A	N/A
Life Status Sensor (LSS)	N/A	N/A	STANDARD	STANDARD	N/A
1/4" VCR® Fittings (MCG Fittings Optional)	STANDARD	STANDARD	STANDARD	STANDARD	STANDARD
10 µ Ra Piping Surface Finish	STANDARD	STANDARD	STANDARD	STANDARD	STANDARD
1/4" SS Diaphragm Valves	MANUAL	MANUAL	PNEUMATIC	PNEUMATIC	PNEUMATIC

Gas Type Key: N = Nitrogen R = Rare Gas (Ar, He, etc.) H = Hydrogen
**All MonoTorr purifiers are CE compliant*

Products and Services

Point-Of-Use Purifiers
House Gas and Area Purifiers

Certification and Analytical Services
InsiTorr™ FastPump

Analytical Systems
Analytical Instruments

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