MegaTorr®

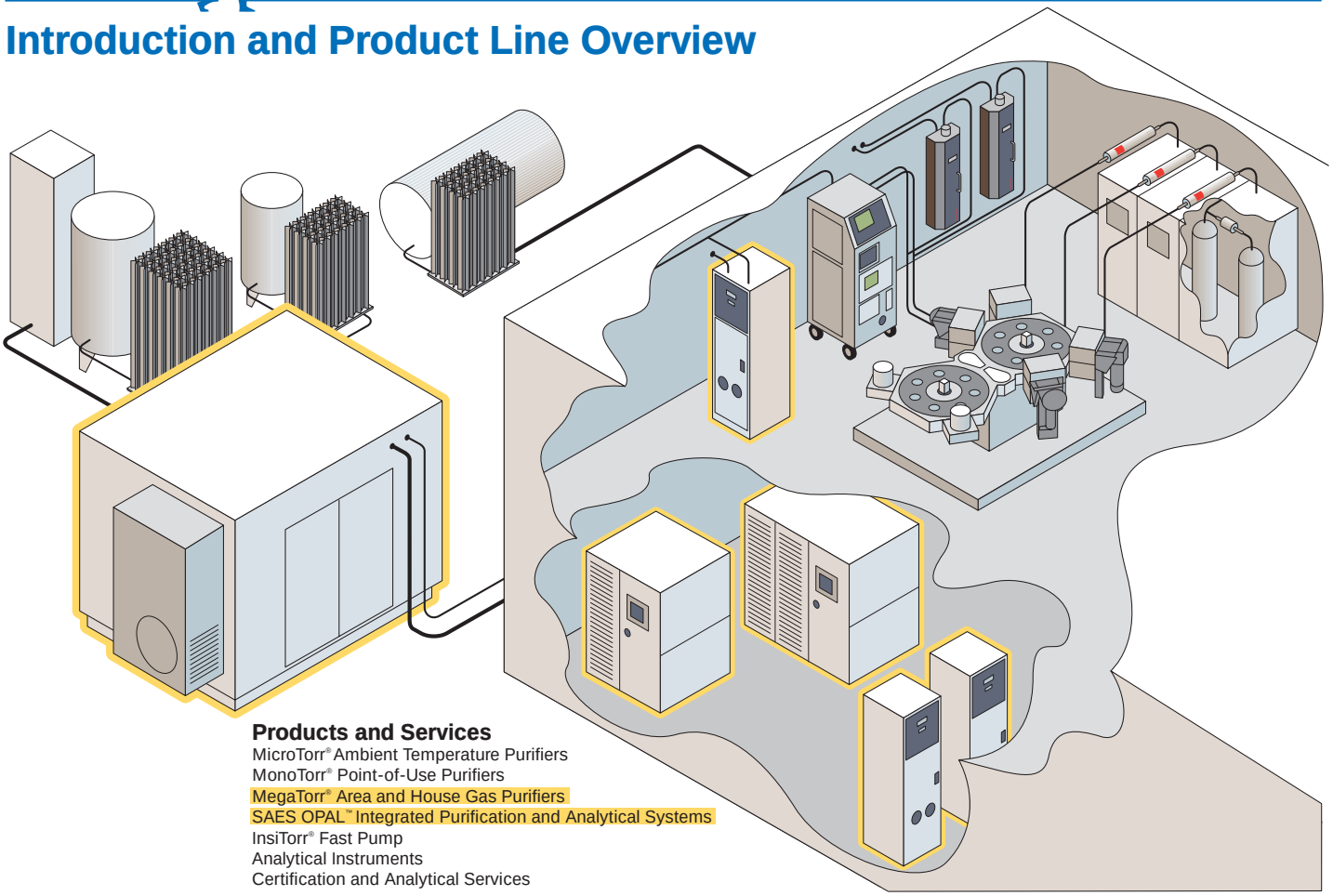
Area and House Gas Purification

Worldwide Innovation…
Pure Gas Technologies

saes® getters

Pure Gas Technologies

Introduction and Product Line Overview



Products and Services
MicroTorr® Ambient Temperature Purifiers
MonoTorr® Point-of-Use Purifiers
MegaTorr® Area and House Gas Purifiers
SAES OPAL™ Integrated Purification and Analytical Systems
InsiTorr® Fast Pump
Analytical Instruments
Certification and Analytical Services

The SAES Getters Group

The SAES Getters Group, established in 1949, is a Milan, Italy-based international company with ten manufacturing plants located in Italy, the U.S., Korea and China. The parent company, SAES Getters S.p.A., is listed on both the Italian Stock Exchange and the NASDAQ Stock Market in the United States (SAESY).

As the world leader in getter technology, the Group produces getters which improve and maintain vacuum and purify gas environments. High vacuum and purified gas environments are required in the production of a wide range of products in several medium to high-technology industries such as traditional electronics, appliances, cathode ray tubes, lighting, semiconductors and aerospace.

Group strategy is based on three foundations: loyalty to and application of SAES Getters core competencies, constant investment in research and development, and continuous attention to international customer needs. The core competencies of the group are the science and technology of gas reactions with metals, sophisticated metal alloy metallurgy, vacuum and ultra-high vacuum technology, pure gas handling and impurity monitoring.

The Group is made up of six business areas. The five business areas headquartered in Milan, Italy include: Display Devices, Electron Devices & Flat Displays, Light Sources & Vacuum Insulation, Vacuum Insulated Panels, and Vacuum Systems. The sixth business area, Pure Gas Technologies, is headquartered in San Luis Obispo, California.

Pure Gas Technologies Business Area

The Pure Gas Technologies business area of the SAES Getters Group began production in 1989 with the introduction of the MonoTorr® gas purifier. Since then, the product line has expanded to include a wide range of purifiers from point-of-use to area and house gas purifiers, as well as analyzers and analytical services. With state-of-the-art, class 100 cleanroom manufacturing facilities, a machine shop, an analytical lab, and a complete gas pad, SAES is able to offer quality products and fast response to customer needs. Worldwide resources of the Pure Gas Technologies Business Area include R&D and analytical labs with a full time staff of qualified researchers, technicians, and analytical project management dedicated to solving customer problems and exploring the future of gas purification and analysis.

This brochure provides an introduction to the Area, Weld and Bulk Gas MegaTorr® purifiers manufactured by SAES Pure Gas for indoor or fully self-contained outdoor installations.

The SAES Advantage - Ultra-high purity gas delivery is a critical parameter in semiconductor processes. SAES Pure Gas equipment offers the latest in purification technologies while assuring reliability and consistency.

The right materials: SAES Pure Gas is the only purifier supplier that manufactures purification materials. The SAES Getters Group has more than 45 years experience in R&D of reactive metals. In addition to being experts in the production of getters and alloys, SAES specializes in the evaluation and applications of commercial materials, providing vertical integration from the purification media to the finished product.

The right system design: The SAES approach to UHP design is derived from decades of experience in ultra-high vacuum systems and UHP gas analysis. Purifier systems are optimized to maintain gas quality at low flow, high flow and transients - all operating points within the specification.

The right controls approach: SAES focuses on keeping purified gas flowing, or alerting the customer immediately of a purifier issue. SAES uses the right instrumentation to measure the right parameters. Our customers can have confidence that the gas is within specification, and can rely on the purifier controls to help identify any potential problems and take action.

The right manufacturing methods: SAES Pure Gas is an ISO 9001 registered company assuring the highest standards in quality, manufacturing and testing. All MegaTorr purifiers are certified using APIMS gas analysis.

Standard Features:

All MegaTorr process gas purifiers come standard with:

- Fully automatic operation using microprocessor-based controls
- Accurate process management with all closed loop feedback control
- Maximum uptime and safety through multi-tiered fault response
- Optimized process media performance by process gas preheating
- Enhanced facility fault tolerance via battery and pneumatic backups
- System communication through digital and analog outputs
- Code compliance available, such as CE, ASME, TUV, NFPA and others

MegaTorr® Gas Purifier Product Family

For detailed product information, please refer to the page numbers indicated below

	Weld Gas Page 4	Weld Gas Page 5	Rare Gas Page 6	Oxygen Page 10	Hydrogen Page 12	Nitrogen Page 14	Nitrogen Page 16
SAES Purifier	PS5 Series	PS14 Series	PS5 Series	PS6 Series	PS7 Series	PS8 Series	PS9 Series
Flow Rates (Nm^3/hr)	40	40, 80, 160*	10, 20, 50, 100, 150, 200*	15, 30, 60, 100, 200*	20, 40, 100*	100, 200, 400, 600, 800, 1000, 1200, 1500, 3000*	100, 200, 400, 600, 800, 1000, 1200, 1500, 3000*
Impurities Removed	O_2, H_2O, CO, CO_2	O_2, H_2O	O_2, H_2, H_2O, CO, CO_2, CH_4, N_2	H_2, H_2O, CO, CO_2, CH_4	O_2, H_2O, CO, CO_2, CH_4, N_2	O_2, H_2, H_2O, CO, CO_2	O_2, H_2, H_2O, CO, CO_2, CH_4
Process Material	Getter†	Adsorber	Getter†	Catalyst and Adsorber	Adsorber and Getter†	Adsorber	Catalyst and Adsorber

*Consult factory for higher flow rates
†SAES patented technology

SAES OPAL - Outdoor Purification Analytical Link (Page 18)

All SAES MegaTorr purifiers can be integrated with analyzers, data acquisition, control valving, filtration and other optional equipment and mounted into a skid-mounted system for indoor installations or into a weather tight, thermally conditioned enclosure for outdoor installations.

PS5 Getter Weld Gas Purifier

Argon

SAES Pure Gas developed the MegaTorr weld gas purifier to meet the needs of the semiconductor industry for UHP grade weld argon. Using the SAES-patented getter technology, gaseous impurities are irreversibly trapped and removed by the getter material in a single, simple operation.

The PS5 MegaTorr weld gas purifier is ideal for handling the high flows needed during fab construction. A small footprint allows for installation in tight areas, and the purifier can easily be moved from one location to another.

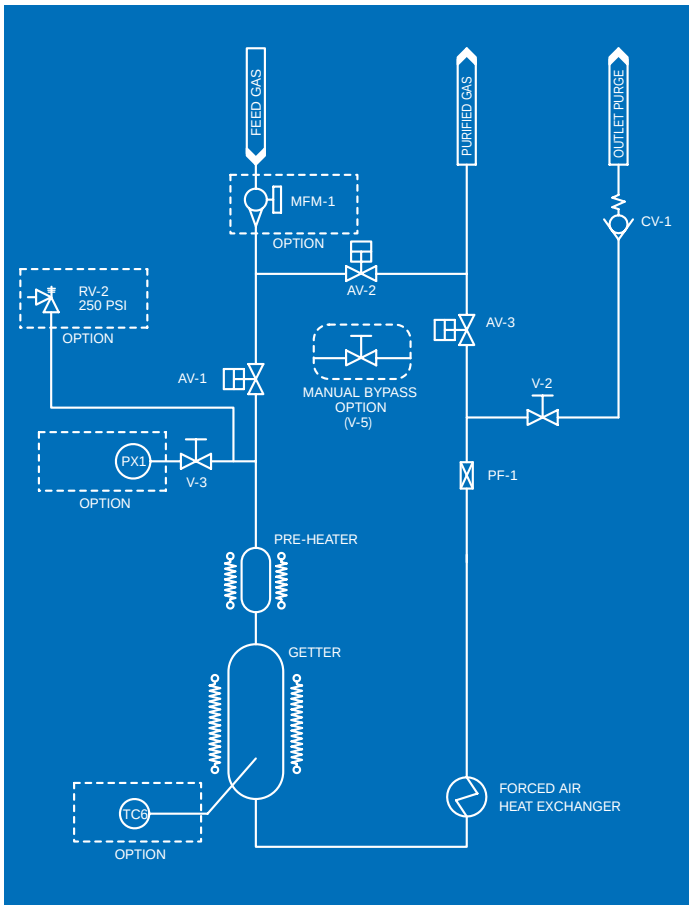
Fast delivery of these purifiers from the factory is standard to meet the urgent construction schedule typical of fab sites. All standard MegaTorr options are available.

Standard Performance - PS5 Getter

Impurity	Inlets*	Outlets
O_2	< 2000 ppb	< 1 ppb
H_2O	< 2000 ppb	< 1 ppb
CO	< 200 ppb	< 1 ppb
CO_2	< 200 ppb	< 1 ppb

**For inlet impurities outside these values, contact your local office.*

PS5 Purifier Flow Diagram



Fully automatic microprocessor control, air cooling, life status indicator, backup battery and pneumatic supplies are all standard equipment on this heated getter purifier.

Standard Specifications

Model	Maximum Flow Rate ($Nm^3/hr.$)	Average Power Consumption (kW)	Maximum Pressure Drop (bar)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight (kg)
					Height	Width	Depth	
PS5-MG40-WG	40	5.6	1.7	1.5	2032	688	671	340

PS14 Catalytic Weld Gas Purifier

Argon

For welding and purging applications that require only O_2 and H_2O removal in nitrogen or argon, SAES Pure Gas provides the PS14 Weld MegaTorr. The PS14-MG80-WG is a portable, room temperature purifier that operates without utilities.

The purification technology is based on a proprietary catalytic type adsorber, specifically tailored to the demands of purging and welding, ideal for startups and repairs when quick setup and teardown are required.

100% backup capacity and "on-line" column replacement is achieved using a dual bed design with full isolation and purge valving. Each vessel is capable of high flow rates and long life before a SAES facility refurbishment is required. Contact SAES Pure Gas for more information on the "PS14-Weld Exchange Program."

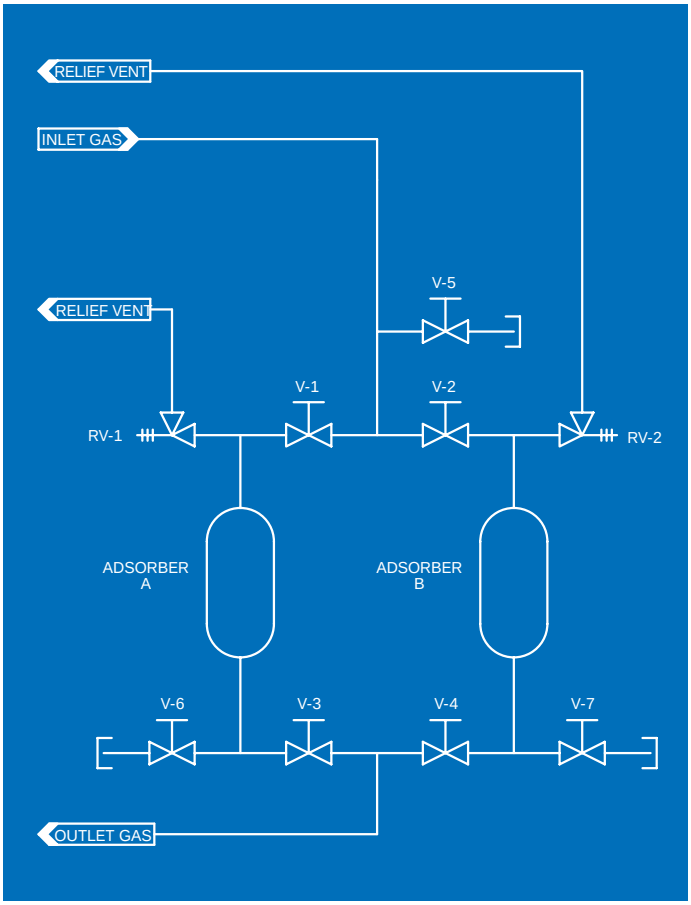
All 300 series stainless steel gas-wetted surfaces, fully automatic orbital welding and UHP bellows valves typify SAES approach to quality in this flexible platform. Available with standard MegaTorr options including mass flow and pressure measurement, high temperature safety shutdown and particle filtration.

Standard Performance - PS14 Catalytic

Impurity	Inlets*	Outlets
O_2	< 2000 ppb	< 1 ppb
H_2O	< 2000 ppb	< 1 ppb

**Capacity will be based on average flow, actual inlet impurities and operating pressure. For inlet impurities outside these values, contact your local office.*

PS14 Purifier Flow Diagram



Standard Specifications

Model	Maximum Flow Rate ($Nm^3/hr.$)	Average Power Consumption (kW)	Maximum Pressure Drop (bar)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight (kg)
					Height	Width	Depth	
PS14-MG80-WG	160	N/A	1.0	N/A	1981	1558	857	431

PS5 Process Gas Purifier Series

Process gas flows up to 30 Nm^3/hr. can be purified cost effectively using the PS5 series MegaTorr. The PS5-MG10/20-R/N MegaTorr uses SAES Getters patented getter alloys for irreversible removal of gaseous impurities certified to less than 1 ppb standard or optional certification to less than 0.1 ppb. Nitrogen, argon, helium, xenon and other rare gases can be purified in this flexible design. The PS5 platform comes in two sizes, the MG10 and MG20 with ratings up to 30 Nm^3/hr. and lifetimes of up to 2 years (24 hour/day continuous operation based on the stated inlet impurities).

Fully automatic, unassisted operation is provided standard with the microprocessor-based controller and full instrumentation. Multi-tiered fault protection keeps gas flowing while alerting the operator of any problems. Long getter life is achieved through efficient getter bed designs, which safely optimize operating temperature, bed dimensions and flow rates. The air cooling in this PS5 platform means that only single-phase power and pneumatic air supply is needed to operate the purifier. The PS5 can be installed into small areas because of the compact design and front/rear access (zero side clearance acceptable).

For rare gases only, the PS5-MG10/20-R comes standard with GettSafe™ – the state-of-the-art in fast response thermal protection. GettSafe quickly detects excessive heat in the getter column, and the built-in discrete hardware interlock takes action to isolate the purifier.

Standard features include UHP particle filter, customer interface fault relays, pneumatic system reserve accumulator and control system backup battery for increased reliability and performance. The PS5-MG10/20 can be fitted with all MegaTorr options such as mass flow meters and pressure transducers.

Standard Performance

Impurity	Inlets*		Outlets†	
	Rare Gas	Nitrogen	Rare Gas	Nitrogen
O_2	< 2000 ppb	< 2000 ppb	< 1 ppb	< 1 ppb
H_2	< 2000 ppb	< 500 ppb	< 1 ppb	< 1 ppb
H_2O	< 2000 ppb	< 2000 ppb	< 1 ppb	< 1 ppb
CO	< 500 ppb	< 200 ppb	< 1 ppb	< 1 ppb
CO_2	< 200 ppb	< 200 ppb	< 1 ppb	< 1 ppb
CH_4	< 200 ppb	< 200 ppb	< 1 ppb	< 1 ppb
N_2	< 200 ppb	N/A	< 1 ppb	N/A

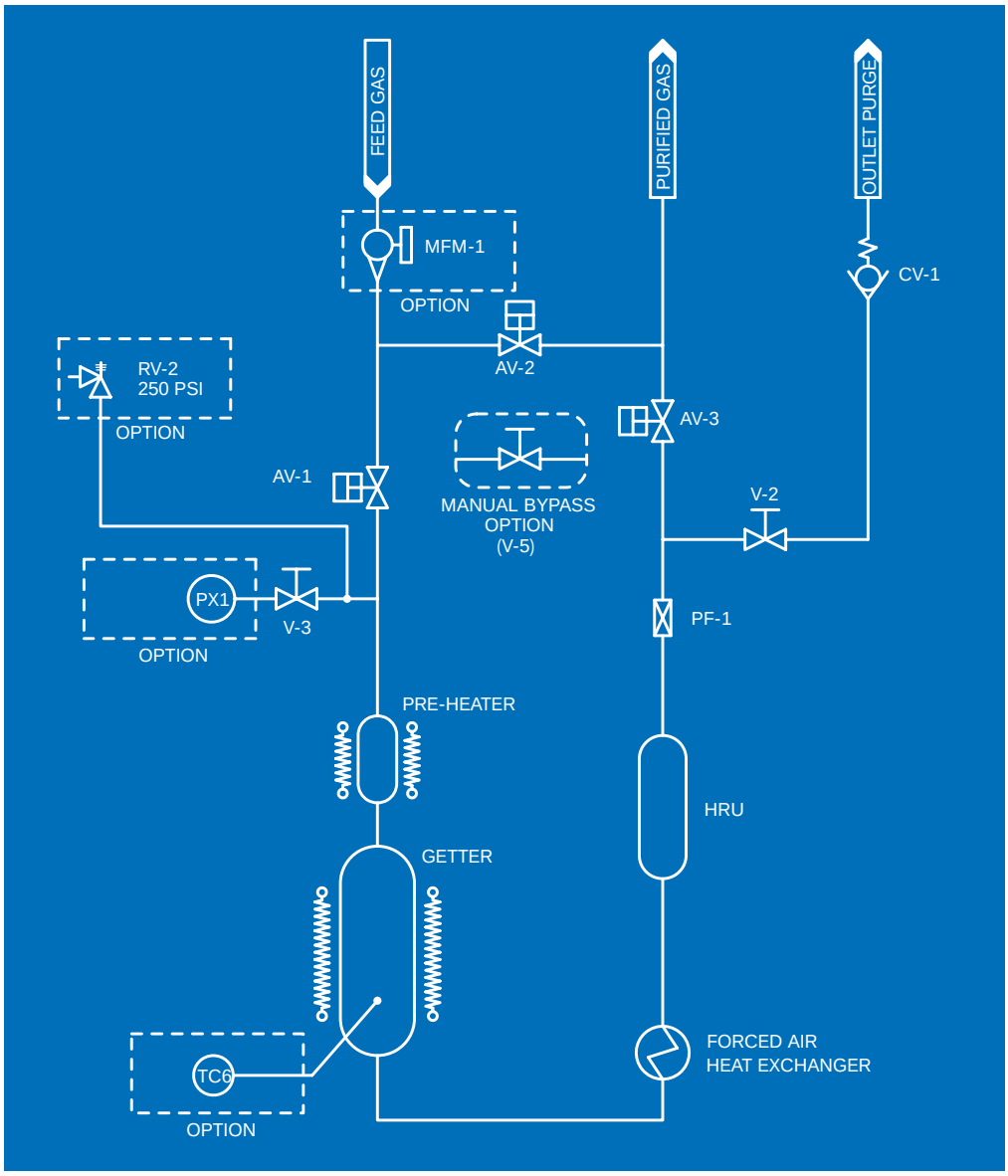
**For inlet impurities outside these values, contact your local office.*
† < 0.1 ppb certification available.

Standard Specifications

Model*	Maximum Flow Rate ($Nm^3/hr.$)	Minimum Guaranteed Getter Life†	Maximum Pressure Drop (bar)	Average Power Consumption (kW)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight
						Height	Width	Depth	(kg)
PS5-MG10-R	10	2 yr.	0.3	1.6	1.5	2032	688	671	295
PS5-MG10-R	15	1 yr.	0.5	2.2	1.5	2032	688	671	295
PS5-MG20-R	20	2 yr.	0.7	2.7	1.5	2032	688	671	310
PS5-MG20-R	30	1 yr.	1.0	3.8	1.5	2032	688	671	310
PS5-MG10-N	10	1 yr.	0.3	1.8	1.5	2032	688	671	295
PS5-MG20-N	20	1 yr.	0.7	3.1	1.5	2032	688	671	310

†Getter life based on standard inlet impurities and maximum flow 24-hrs./day and 365 days/year. **R=Rare Gas; N=Nitrogen*

PS5 Purifier Flow Diagram



PS5 Getter Inert Gas Purifier Series

Standard Performance

Impurity	Inlets*	Outlets†
O_2	< 2000 ppb	< 1 ppb
H_2	< 500 ppb	< 1 ppb
H_2O	< 2000 ppb	< 1 ppb
CO	< 200 ppb	< 1 ppb
CO_2	< 200 ppb	< 1 ppb
CH_4	< 200 ppb	< 1 ppb
N_2	< 2000 ppb	< 1 ppb

**For inlet impurities outside these values, contact your local office.*
† < 0.1 ppb certification available.

For ultra-high purity process argon at high flow rates, the PS5-MG100/150/200-R MegaTorr offers a versatile and complete solution. Rated at 100, 150 and 200 Nm^3/hr., the large PS5 series MegaTorr uses SAES Getters patented getter alloys for irreversible removal of gaseous impurities to less than 1 ppb. Argon, helium, xenon and other rare gases can be purified with this robust design. This PS5 platform offers lifetimes of up to 2 years (24 hour/day continuous operation based on the stated inlet impurities).

Fully automatic, unassisted operation is provided with the standard microprocessor based controller and complete instrumentation. The unique "touchscreen" interface allows password-protected access to all purifier functions with minimal operator input. Multi-tiered fault logic keeps gas flowing while alerting the operator of any problems. Long getter life is achieved through efficient getter bed designs which safely optimize operating temperature, bed dimensions and flow rates.

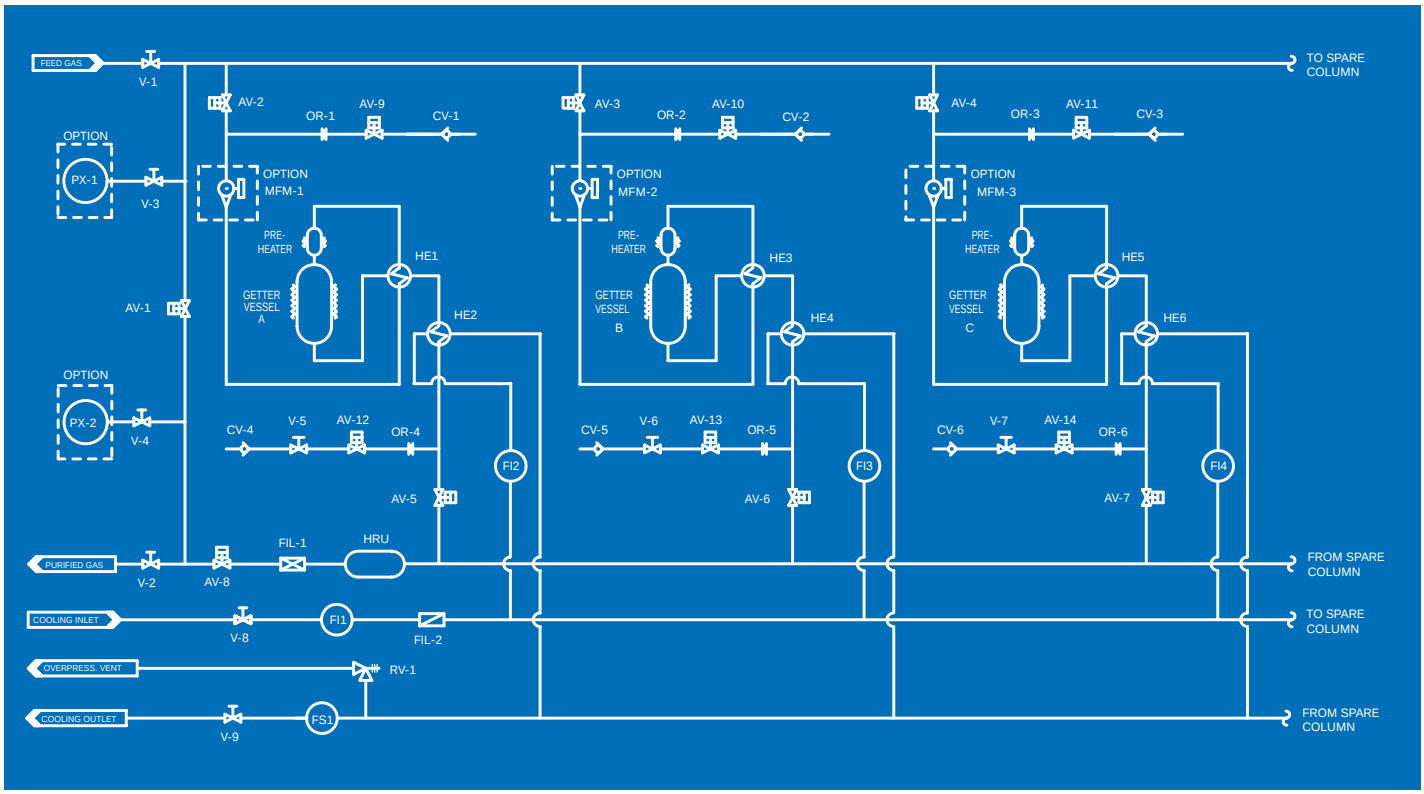
Low cost of ownership is achieved with special UHP high-efficiency heat exchangers for getter vessel heat recovery. High reliability and flexible operation can be augmented by exploiting the multiple vessel design and spare vessel options. For example, with each vessel rated for 50 Nm^3/hr., a PS5-MG100-R (100 Nm^3/hr.) 2 vessel unit can be fitted with a spare column allowing either 50% redundancy or the opportunity for expansion as gas flow increases with fab demands. This configuration allows vessels to be replaced while on-line without disruption of gas delivery.

Automatic bypass, filtered outlet gas, remote purifier status and facility fault tolerance are provided with the standard valving/outlet particle filter, customer fault status relays, pneumatic reserve protection system and control backup battery. The PS5-MG100/150/200-R can be fitted with all MegaTorr options such as mass flow meters, hardware interlocks and pressure transducers.

Standard Specifications

Model	Maximum Flow Rate ($Nm^3/hr.$)	Average Power Consumption (kW)	Maximum Pressure Drop (bar)	Cooling Water (lpm)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight (kg)
						Height	Width	Depth	
PS5-MG100-R	100	5.4	1.0	15	2.5	2007	1854	1308	1075
PS5-MG150-R	150	7.9	1.0	20	2.5	2007	1854	1308	1175
PS5-MG200-R	200	10.5	1.0	25	2.5	2007	1854	1308	1275

PS5 Purifier Flow Diagram



PS6 Catalytic Purifier Series

Standard Performance

Impurity	Inlets*	Outlets†
H_2	< 2000 ppb	< 1 ppb
H_2O	< 5000 ppb	< 1 ppb
CO	< 1000 ppb	< 1 ppb
CO_2	< 1000 ppb	< 1 ppb
CH_4	< 30000 ppb	< 1 ppb

**For inlet impurities outside these values, contact your local office.*
† < 0.1 ppb certification available. Tested w/APIMS in N_2.

Oxygen purification with methane removal from 15 Nm^3/hr. to 200 Nm^3/hr. and higher is available in the PS6 purifier product line. The PS6 is designed to remove impurities in an oxygen stream through use of a catalyst and adsorbers in series. Hydrocarbons, CO and H_2 react with O_2 in the high temperature catalyst vessel. The by-products of this reaction are CO_2 and H_2O, which are removed via downstream room temperature adsorbers. The catalyst column operates continuously at 250°C to 300°C. Parallel adsorber columns are employed downstream of the catalytic reaction vessel. These adsorbers alternate from purify mode (ambient temperature) to regeneration mode (250°C to 300°C). During regeneration mode purified oxygen is back-flushed through the adsorber column(s). Switchover time is user programmable and can be set to occur within a 24 to 72 hour timeframe to allow for unique inlet impurity specifications.

The PS6 oxygen MegaTorr provides fully automatic, unassisted operation using the multi-point microprocessor based controller and full instrumentation. Multi-tiered fault logic keeps gas flowing while alerting the operator of any problems. All purifier operations are automatic, such as adsorber regeneration, and closed loop control of all process variables gives confidence that each operation is complete and correct - there is no need for operator input.

Low cost of ownership results from the use of special UHP high-efficiency heat exchangers for catalyst vessel heat recovery. Air cooling on the 15 Nm^3/hr. unit allows flexible installations of this compact platform. Water-cooling is employed for flow rates of 30 Nm^3/hr. and higher to minimize the cooling loads on the purifier room HVAC systems.

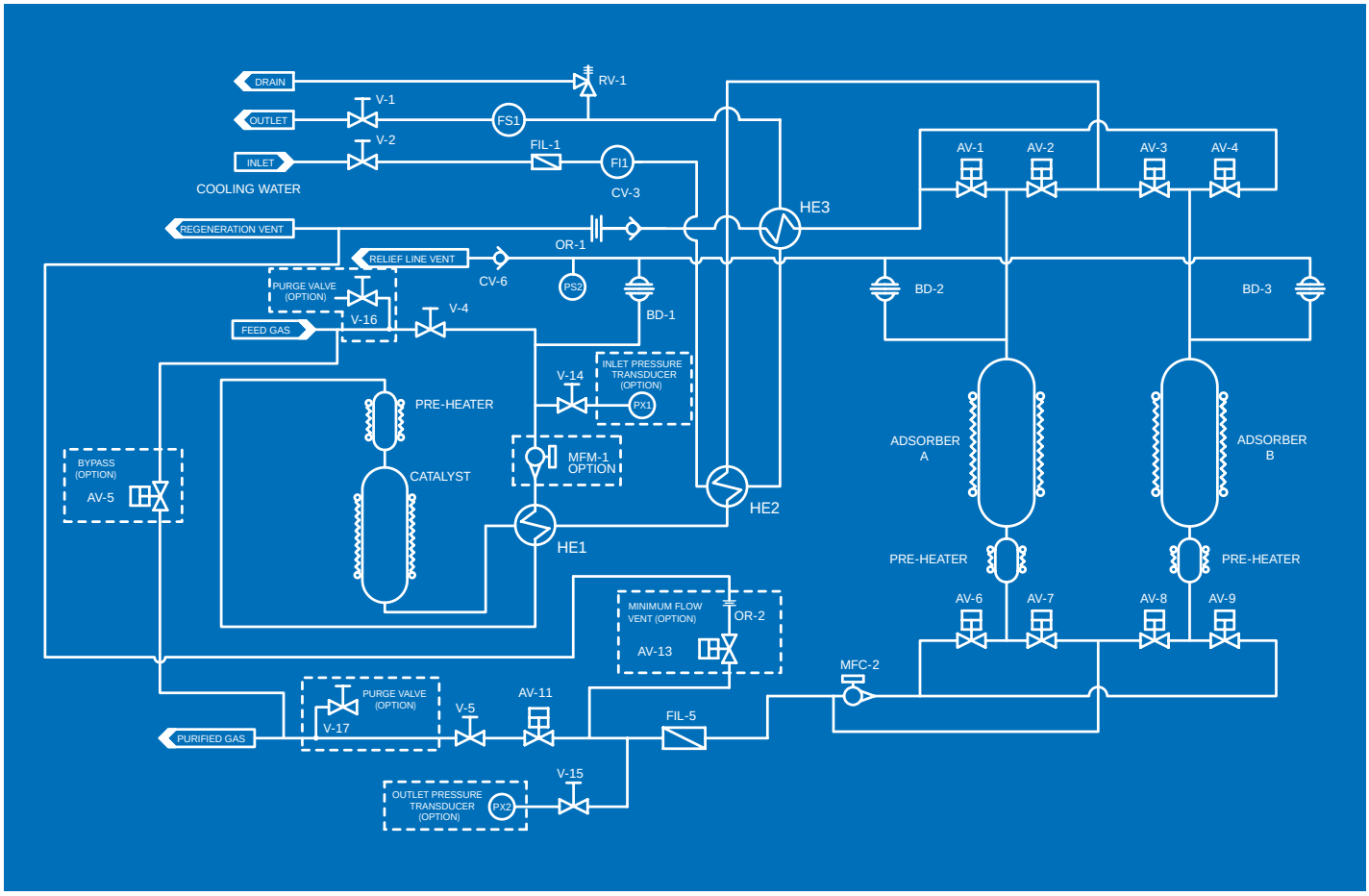
As with all SAES Pure Gas purifiers, remote purifier status and facility fault tolerances are provided with the customer fault status relays, pneumatic reserve protection system and control backup battery. The PS6-MG15 to MG200-O can be fitted with MegaTorr options such as metal/Teflon (Teflon is standard on the 30 and 60) outlet filters, configurable automatic bypasses, mass flow meters, hardware interlocks and pressure transducers.

Standard Specifications

Model*	Maximum Flow Rate ($Nm^3/hr.$)	Average Power Consumption (kW)	Maximum Pressure Drop (bar)	Cooling Water (lpm)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight (kg)
						Height	Width	Depth	
PS6-MG15-O	15	1.5	1.0	N/A	1.5	2135	813	813	400
PS6-MG30-O	30	2.4	1.0	16.0	2.5	2032	1118	1575	850
PS6-MG60-O	60	3.7	1.0	20.0	2.5	2032	1118	1575	890
PS6-MG100-O	100	5.4	1.0	24.0	2.5	2040	1473	1908	1425
PS6-MG200-O	200	10.5	1.0	30.0	2.5	2040	1443	1908	1575

**Contact your local office regarding availability of higher flow rates.*

PS6 Purifier Flow Diagram



PS7 Getter Gas Purifier Series

Standard Performance

Impurity	Inlets*	Outlets†
O_2	< 2000 ppb	< 1 ppb
H_2O	< 5000 ppb	< 1 ppb
CO	< 100 ppb	< 1 ppb
CO_2	< 100 ppb	< 1 ppb
CH_4	< 100 ppb	< 1 ppb
N_2	< 5000 ppb	< 1 ppb

**For inlet impurities outside these values, contact your local office.*
† < 0.1 ppb certification available.

The SAES solution for ultra-high purity hydrogen with low operating cost is through a proprietary adsorber/getter combination. The upstream adsorbers retain CO, CO_2, H_2O, and O_2 while the downstream getter eliminates trace N_2 and CH_4. One adsorber vessel is in purify mode (ambient temperature) while the other is in regeneration or stand-by. Regeneration of the adsorber is accomplished by heating while purified gas back-flows through the vessel. The getter column is heated continuously while the adsorbers are cycled, optimizing the capacity of the getter vessel.

This unique purification method provides built-in redundancy for CO, CO_2, H_2O and O_2 removal as both the getter and adsorber will sorb these impurities from the hydrogen. Fully automatic operation and "touchscreen" interface are standard equipment.

Purifier installation in classified environments, such as purifier rooms with hydrogen service, sometimes require unique features for local code compliance. While each installation is unique, SAES Pure Gas is experienced and capable of supporting a variety of requirements.

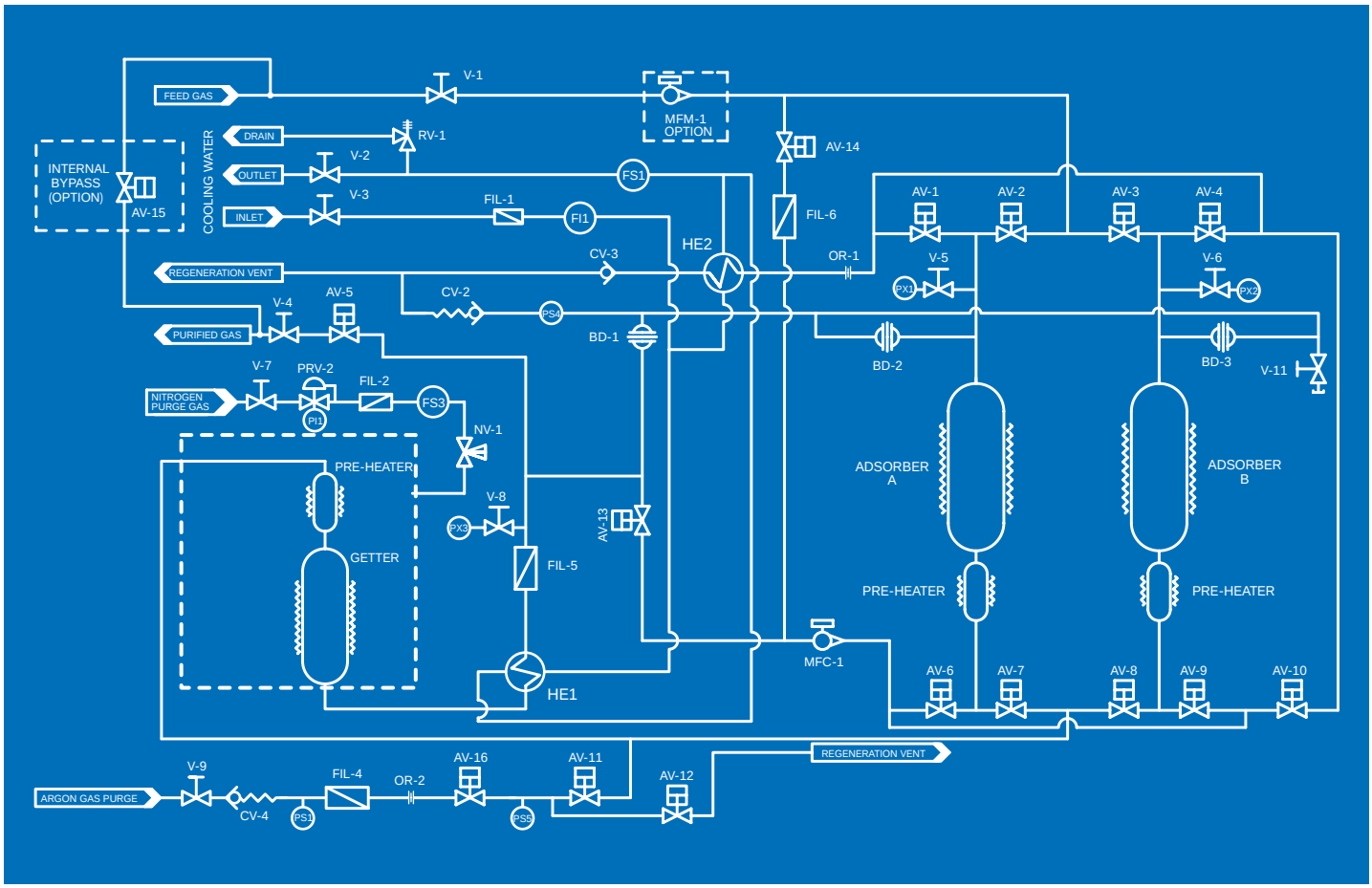
Safety in hydrogen handling is paramount. SAES has fitted the PS7 standard with safety features including: an inert purge getter column housing (including purge flow feedback), piping bay hydrogen leak detector, piping bay vent flow switch and argon safety purge system. Closed loop controls link all these features to keep the operator informed.

Remote purifier status and facility fault tolerances are provided with the customer fault status relays, pneumatic reserve protection system and control backup battery. The PS7-MG20/40/100-H can be fitted with MegaTorr options such as metal/Teflon outlet filters (Teflon filters are standard on the 20 and 40), configurable automatic bypasses, mass flow meters, hardware interlocks and pressure transducers.

Standard Specifications

Model	Maximum Flow Rate ($Nm^3/hr.$)	Average Power Consumption (kW)	Maximum Pressure Drop (bar)	Cooling Water (lpm)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight (kg)
						Height	Width	Depth	
PS7-MG20-H	20	4.0	1.0	10	2.5	1996	1092	1575	860
PS7-MG40-H	40	8.1	1.0	20	2.5	1996	1092	1575	900
PS7-MG100-H	100	26.0	1.0	60	2.5	1996	1524	1981	1361

PS7 Purifier Flow Diagram



PS8 Catalytic Inert Gas Purifier Series

Standard Performance

Impurity	Inlets*	Outlets†
O_2	< 3000 ppb	< 1 ppb
H_2	< 1000 ppb	< 1 ppb
H_2O	< 2500 ppb	< 1 ppb
CO	< 1000 ppb	< 1 ppb
CO_2	< 1000 ppb	< 1 ppb

**For inlet impurities outside these values, contact your local office.*
† < 0.1 ppb certification available.

The PS8 series ambient temperature purifier is designed to remove impurities in an inert gas through use of an advanced catalyst/adsorber hybrid material. This advanced material provides complete purification in a single column without the need for secondary adsorber vessels. Trace O_2, CO, CO_2, H_2, and H_2O are removed under room temperature operation. The two adsorber columns are automatically alternated with an elevated temperature regeneration taking place between purify and stand-by modes. Flow rates from 100 Nm^3/hr. to 3000 Nm^3/hr. and higher are available in this platform.

The PS8 nitrogen MegaTorr includes fully automatic, unassisted operation using the multi-point microprocessor based controller and full instrumentation. Operator input is accomplished via the unique "touchscreen" interface allowing password protected access to all purifier functions. All purifier operations, such as adsorber regeneration, are automatic. Closed loop control of all process variables gives confidence that each operation is complete and correct. There is no need for operator input on any process operations.

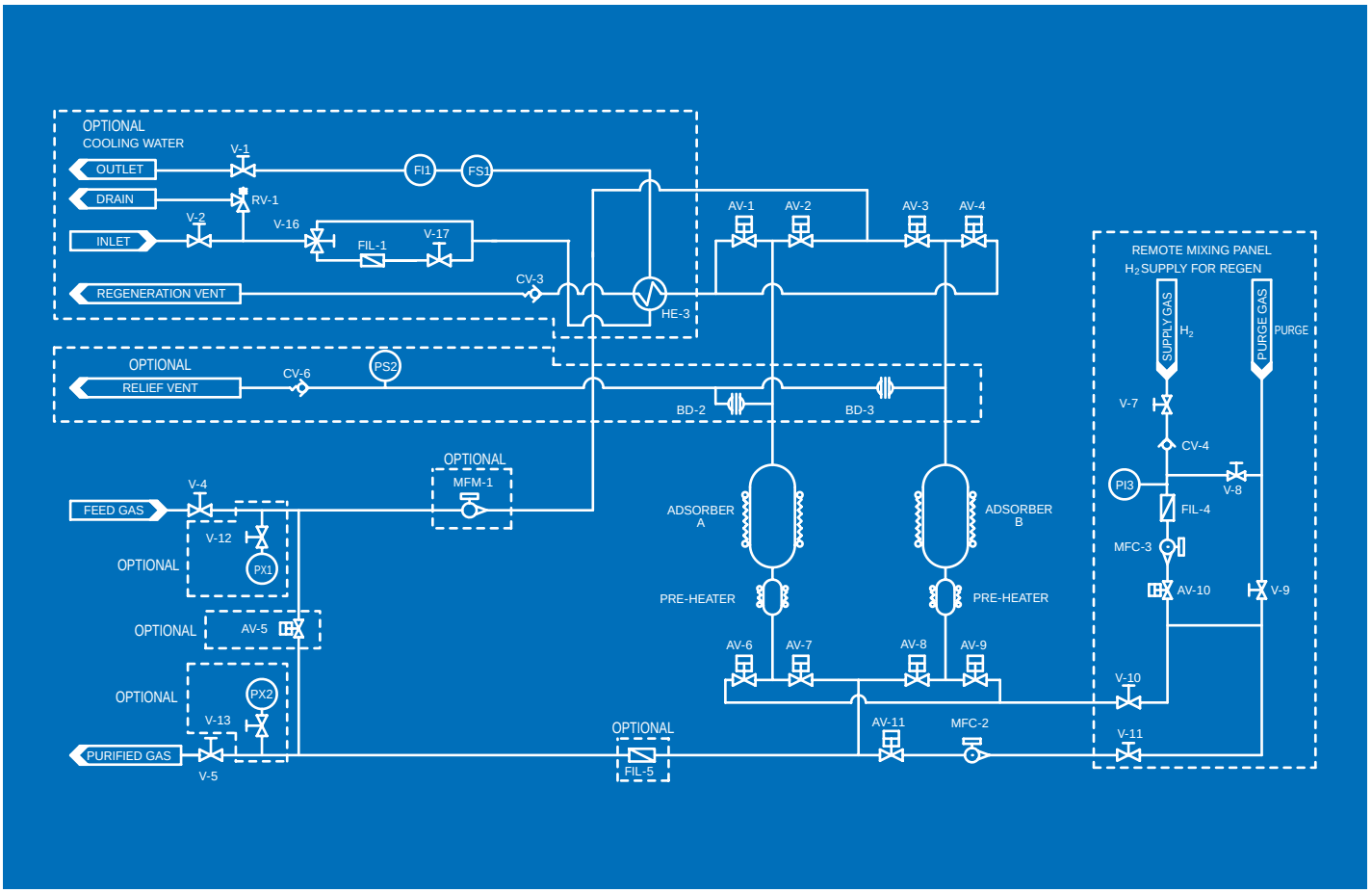
Remote purifier status and facility fault tolerance are provided standard along with the customer fault status relays, pneumatic reserve protection system and control backup battery. The PS8-MG100 to MG3000-N can be fitted with MegaTorr options such as configurable automatic bypasses, mass flow meters, hardware interlocks and pressure transducers.

Standard Specifications

Model*	Maximum Flow Rate ($Nm^3/hr.$)	Average Power Consumption (kW)	Maximum Pressure Drop (bar)	Optional Cooling Water (lpm)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight
						Height	Width	Depth	(kg)
PS8-MG100-N	100	0.4	1.0	8	2.5	2040	1473	1909	1350
PS8-MG200-N	200	0.4	1.0	8	2.5	2040	1473	1909	1500
PS8-MG400-N	400	0.5	1.0	16	2.5	2337	1880	2337	2200
PS8-MG600-N	600	0.5	1.0	16	2.5	2337	1880	2337	2300
PS8-MG800-N	800	0.5	1.0	16	2.5	2591	2464	2593	4650
PS8-MG1000-N	1000	0.5	1.0	16	2.5	2591	2464	2593	4800
PS8-MG1200-N	1200	0.5	1.0	16	2.5	2591	2464	2593	5175
PS8-MG1500-N	1500	0.5	1.0	16	2.5	2591	2464	2593	5300

**Custom sizes available*

PS8 Purifier Flow Diagram



PS9 Catalytic Inert Gas Purifier Series

Standard Performance

Impurity	Inlets*	Outlets†
O_2	< 1000 ppb	< 1 ppb
H_2	< 1000 ppb	< 1 ppb
H_2O	< 3000 ppb	< 1 ppb
CO	< 2000 ppb	< 1 ppb
CO_2	< 2000 ppb	< 1 ppb
CH_4	< 1000 ppb	< 1 ppb

**For inlet impurities outside these values, contact your local office.*
† < 0.1 ppb certification available.

PS9 series catalytic nitrogen purifiers set the industry standard for critical methane and hydrocarbon removal. A combination of a proprietary oxidizing catalyst at 300°C and room temperature adsorbers deliver sub-ppb performance for all process needs. Like the PS8 nitrogen platform, the PS9 provides reliable delivery of on-specification nitrogen. The PS9 uses twin adsorbers for fully redundant purification.

Special UHP high-efficiency heat exchangers allow up to 70% heat recovery. Unique to the PS9 and PS6 are the oxidizing catalyst materials which operate at low temperatures. Use of these materials results in high efficiencies for low operating costs and long life.

Complete oxidation of all reducing impurities such as CO, H_2 and CH_4 requires oxygen to be precisely blended with the inlet gas. The PS9 series purifier is equipped with a metering system for oxygen injection with closed loop feedback for continuous monitoring and accurate control.

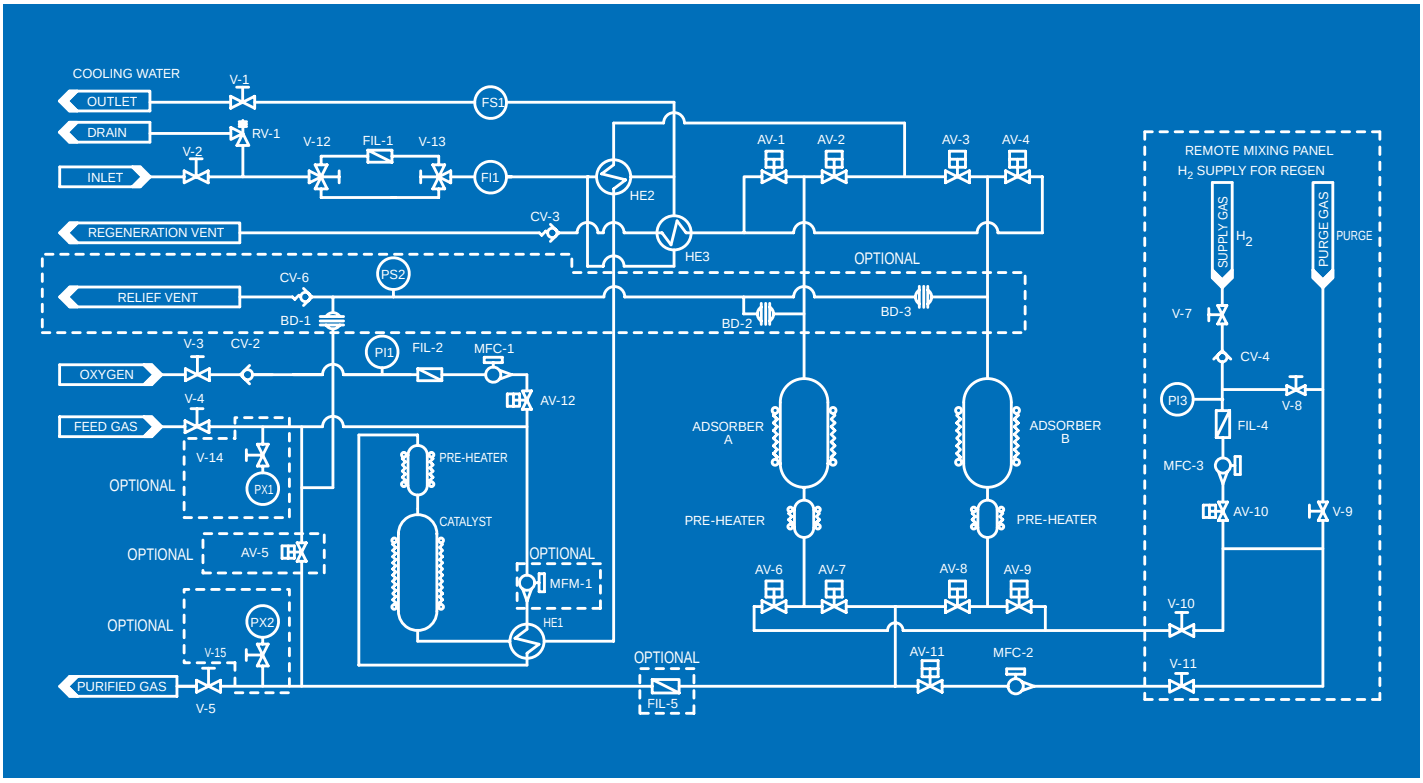
Fully automatic, unassisted operation is standard on the PS9 series purifiers using the multi-point microprocessor based controller and process instrumentation. Operator input is via the unique “touchscreen” interface allowing password-protected access to all purifier functions. All purifier operations are automatic, using closed loop controls of all process variables. This automation adds confidence that each operation is complete and correct, without the need for operator input.

Facility fault tolerance and remote purifier status is provided standard with the customer fault status relays, pneumatic reserve protection system and control backup battery. The PS9 series purifiers can be fitted with MegaTorr options such as outlet particle filters, automatic bypasses, mass flow meters, hardware interlocks and pressure transducers.

Standard Specifications

Model	Maximum Flow Rate ($Nm^3/hr.$)	Average Power Consumption (kW)	Maximum Pressure Drop (bar)	Cooling Water (lpm)	Control Backup Battery (hrs.)	Dimensions (mm)			Weight (kg)
						Height	Width	Depth	
PS9-MG100-N	100	5.4	1.0	24	2.5	2040	1473	1909	1425
PS9-MG200-N	200	10.5	1.0	30	2.5	2040	1473	1909	1575
PS9-MG400-N	400	18.5	1.0	64	2.5	2337	1915	2339	2700
PS9-MG600-N	600	23.2	1.0	75	2.5	2337	1915	2339	2800
PS9-MG800-N	800	30.7	1.0	85	2.5	2591	2474	3101	5180
PS9-MG1000-N	1000	38.3	1.0	95	2.5	2591	2474	3101	5300
PS9-MG1200-N	1200	45.5	1.0	105	2.5	2591	2474	3101	6050
PS9-MG1500-N	1500	57.3	1.0	115	2.5	2591	2474	3101	6200

PS9 Purifier Flow Diagram



SAES OPAL™ - Integrated Purification and Analytical Systems

SAES OPAL systems optimize cost, schedule, performance and quality in the following ways:

- Design, permit and building efforts are minimized or eliminated as the "purifier room" becomes a modular enclosure, requiring only facility connections for installation.
- Multiple functions and multiple sources are consolidated. SAES Pure Gas integrates the variety of gas distribution, purification and analytical equipment components as the single, qualified ISO 9001 supplier.
- On-site sub-system integration is reduced and much of the normal field welding, assembly, test and certification of interconnecting piping and components are eliminated.
- Time is saved for other project management issues.
- On-site quality management and verification costs are reduced. The SAES Pure Gas quality system guides the design, fabrication, test and qualification of the SAES OPAL.

The SAES OPAL™ (Outdoor Purification Analytical Link) is an integration of MegaTorr gas purifiers and analytical instruments linked together within a prefabricated enclosure. This complete, climate-controlled, modular purifier "building" is ready for outdoor installation in any environment. The SAES OPAL can be fitted with bypass and isolation manifolding, pressure control and regulation, filtration skid(s) and the SAES Data Acquisition System.

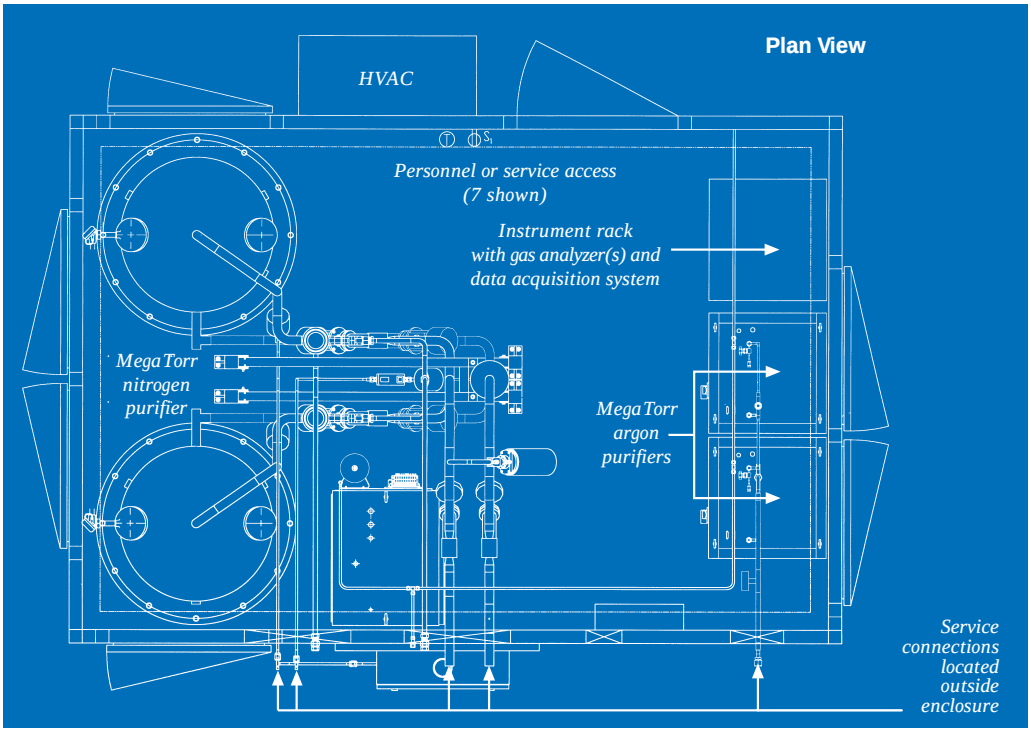
The finished SAES OPAL system is fully tested and can be factory certified using APIMS technology.

SAES OPAL can include:

Multiple purifiers
Line regulators
Filter skids
On-line analyzers
Data acquisition system
Gas sampling port
Closed loop water cooling

Outdoor Purification Analytical Link

Example of a SAES OPAL™ system equipped with MegaTorr nitrogen and argon purifiers linked with gas analyzers through computer-managed data acquisition.



MEGATORR®

Purifier Options

High Temp Hardware Interlock
Temperature sensing system that provides discrete protection from process vessel over-temperature faults.

Inlet and Outlet Pressure Transducers
Pressure transducers allow continuous display of pressure at purifier. Includes 4-20mA output to allow remote display.

Separate Control Power
Separate power circuit for purifier controls. Ensures that purifier controls and displays will function if main power is off.

Filter
Electronic grade Teflon or metal particle filter installed at purified gas outlet prior to final isolation valve.

Mass Flowmeter
Mass flowmeter and totalizer installed at purifier inlet can display current and total flow. Includes 4-20 mA output for remote display.

MGB-2
A 250 psig pressure relief system for PS5-MG10/20/100/150/200 MegaTorr purifiers. Allows operation of the purifier with inlet pressures up to 250 psig.

MGB-3
Primary/Secondary configuration for PS5-MG10/20 MegaTorr purifiers including all hardware, wiring and piping. Establishes one of two purifiers, installed in series, as primary and the other as secondary.

MGB-5
Remote contact shut-down provides relay connections that allow purifier to be shutdown from a remote location.

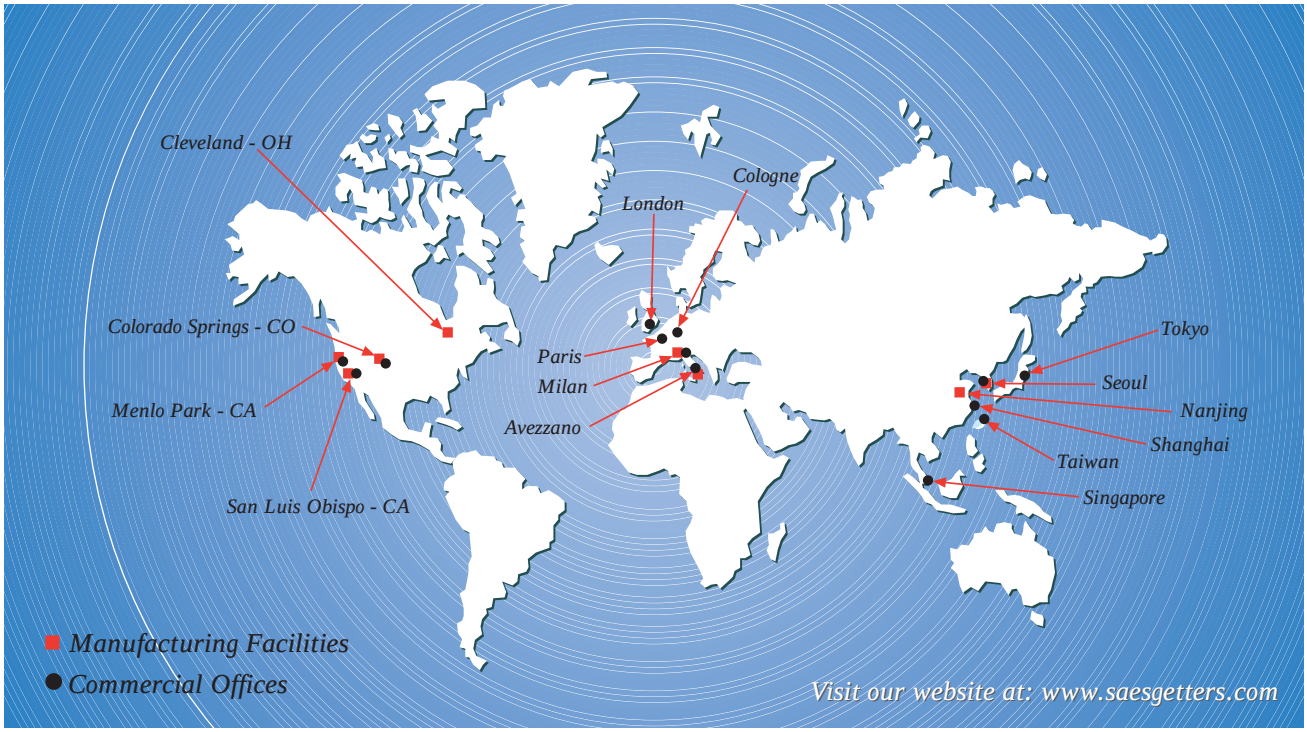
MGB-6
Parallel piping configuration for two PS5-MG10/20 Megatorr purifiers of the same type. Isolation valves may also be added. Includes inlet and outlet piping.

MGB-7
Series piping configuration for two PS5-MG10/20 MegaTorr purifiers. Includes inlet and outlet piping.

Bypass (external/internal)
For PS6, PS7, PS8 and PS9 Series, bypass during alarm conditions can be provided via internal or external bypass valves, piping and electronics.

Purge Port Sample Valves
Manual valve assemblies allow easy connection of purge gas at purifier inlet and outlet.

The SAES Getters Group



Sales and Service Locations

SAES Getters S.p.A.

Group Headquarters
Viale Italia, 77
20020 Lainate (Milano), Italy
Tel.: +39 02 93178 1
Fax: +39 02 93178320

SAES Pure Gas, Inc.

Pure Gas Technologies Headquarters
4175 Santa Fe Road
San Luis Obispo, CA 93401, USA
Tel.: +1 805 541 9299
Fax: +1 805 541 9399

U.S.A.

SAES Pure Gas, Inc.
4175 Santa Fe Road
San Luis Obispo, CA 93401
Tel.: +1 805 541 9299
Fax: +1 805 541 9399

Trace Analytical
3517A Edison Way
Menlo Park, CA 94025
Tel.: +1 650 364 6895
Fax: +1 650 364 6897
www.traceanalytical.com

EUROPE

SAES Getters S.p.A.
Viale Italia, 77
20020 Lainate (Milano), Italy
Tel.: +39 02 93178 1
Fax: +39 02 93178320

SAES Getters Deutschland GmbH
Gerolsteiner Strasse 1
D - 50937 Köln, Germany
Tel: +49 221 944 0750
Fax: +49 221 944 0754

SAES Getters G.B., Ltd.
5 Southern Court, South Street
Reading, Berkshire RG1 4QS, Great Britain
Tel: +44 118 956 6856
Fax: +44 118 950 4074

SAES Getters France S.a.r.l.
14 rue Drouot
Paris, France 75009
Tel: +33 1 482 48696
Fax: +33 1 482 41052

ASIA

SAES Getters Japan Co., Ltd.
2nd Gotanda Fujikoshi Bldg.
23-1 Higashi Gotanda 5 Chome
Shinagawa-ku, Tokyo 141
Tel: +81 3 542 00431
Fax: +81 3 542 00438
Pure Gas Technologies
Tel: +81 3 5420 0435
Fax: +81 3 5420 0439

SAES Getters Singapore PTE, Ltd.
171 Chin Swee Road #04-04
San Centre
Singapore 169877
Tel: +65 534 0757
Fax: +65 534 0307

SAES Getters Singapore, Taiwan Branch
No. 86-1 Kung Yuan Road
Hsin Chu
Taiwan, R.O.C.
Tel: +886 3 562 4650
Fax: +886 3 562 4656

Hankuk Getters Corporation
5th Floor, Shinwoo Bldg. 1631-1
Seocho-Dong, Seocho-Ku
Seoul, Korea
Tel: +82 2 523 0341/4
Fax: +82 2 523 0345
Pure Gas Technologies
Tel: +82 2 523 1302/3
Fax: +82 2 523 1304

SAES Getters S.p.A., Shanghai Representative Office
Suite 2806 Shartex Plaza
No. 88 Zun Yi Nan Road
Shanghai, P. R. of China 200335
Tel: +86 21 627 51177
+86 21 627 58796
Fax: +86 21 620 91777

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