

Exogas™ Exothermic Generators

Indirect-chilled Exothermic Atmosphere for Annealing, Brazing, Normalizing, Drawing & Tempering

Exogas atmosphere generators produce a low-cost exothermic gas for various surface treatment applications. The generator burns fuel gas and air under controlled conditions to provide an exothermic gas containing hydrogen, carbon monoxide, carbon dioxide, water and nitrogen. After start-up, operation is virtually automatic. Only minimum supervision is needed. Exogas generators produce a protective atmosphere which can be used for many processes including annealing, brazing, and normalizing.



Automatic Ratio Control

Pressure regulators automatically adjust the input of fuel

gas and air so that the air-gas ratio remains constant (within design range) regardless of changes in the rate of flow.

Adjustable Gas Analysis

The output gas can be adjusted to the desired analysis by varying the input air-gas ratios, which are then automatically maintained. Note: Actual output gas must be routinely verified.

Flexibility

Exothermic atmospheres can be produced from any fuel gas such as coke-oven, natural, propane, or butane. The generator can be converted from one gas to another by merely substituting the correct burner and flowmeters.

Automatic Fire Check

The automatic fire check gives positive protection from all backfiring. It meets all safety requirements and is provided on premix units only.

Easy Installation

Atmosphere generators are shipped completely assembled; ready for immediate connection to gas, power, and water supply lines.

Low Maintenance

There are fewer components, easy accessibility, and a minimum of moving parts thereby reducing maintenance.

1 | Page

www.secowarwick.com

For more information or to request a quote, e-mail info@secowarwick.com



Continuous Operation

Generators require few shutdowns for daily inspection having continuous 24 hour service day after day.

Safety Features

All SECO/WARWICK equipment adheres to the latest NFPA standards regarding industrial furnaces and equipment.

Construction Features

All components of SECO/WARWICK's Exogas atmosphere generators are designed to assure maximum performance and efficiency. Compare the features of these components which are built into our equipment.

Combustion Chamber-The Exogas generator combustion chamber consists of a shell fabricated of heavy sheet steel with a removable gasketed cover that is bolted on at both ends. The inner lining of the combustion chamber consists of the best quality, iron-free, high temperature refractory. The combustion chamber is filled with a catalyst (rich only) especially developed to promote rapid reaction of the air-gas mixture and to break down the more complicated hydrocarbon components. Uniformity of gas composition is assured by the construction of the combustion chamber that prevents channeling of gases as they pass through the combustion chamber. This also assures thorough mixing and complete reaction of the gases. A port for observation of the combustion chamber is also provided. The combustion chambers of all lean units are water cooled. The combustion chambers of rich units are water cooled except the 500 and 1000 cfh (14, 28 cmh) sizes.

Automatic Ratio Control—Provision is made for automatically maintaining the air-gas ratio at any set value within the minimum and maximum output capacity of the gas generator. This is accomplished by means of sensitive pressure regulators that keep the ratio of air flow to gas flow at a fixed value even when the total output is widely varied. This control is accurate, has no moving parts to require attention, and is not affected by dust particles or other impurities in the air and gas. Ratios can be adjusted or changed if desired while the unit is in operation. A combustible controller for critical atmosphere applications can be supplied at nominal additional cost. **Cooler**—A shell and tube type gas cooler is provided to cool the processed gas. The removable tube bundle type cooler is furnished as standard.

Combustion System—Two flowmeters, mounted on the side of the combustion chamber, indicate the flow of air and gas input to the generator. All rich units plus the 500 and 1000 cfh (14, 28 cmh) lean units use a premix type burner with refractory burner block and spark ignited pilot. A three-way, two port valve is installed in the mixture line to the burner so that the air-gas mixture may be diverted to the outside vent while the pilot burner is being adjusted. The premix units include an approved automatic type fire check assuring positive protection against possible backfiring and meets all safety requirements of the NFPA. The burner on lean units larger than 1000 cfh (28 cmh) is a nozzle mix type with refractory burner block and spark ignited pilot.

Pump—The mixing pump on the premix unit is a positive displacement type and is designed so that its lubrication cannot mix with the air and gas stream. The air pump on the nozzle mix systems is a positive displacement type also. In both cases the pump is equipped with a bypass regulator which maintains constant pressure at any output, pressure being adjustable from 1 to a maximum of 3 psi (52 to 155 mm Hg). The pump is mounted on a



base plate which also supports a standard open drip proof type motor. Nozzle mix units require a fuel gas pressure of 3 psi (15 mm Hg). Smaller units utilizing the premix design require fuel gas pressure from .1 to 1 psi (5 to 52 mm Hg). Gas pressures higher than stated will require service regulators while gas pressures lower than stated will require the addition of a gas booster.

Safety Equipment—Safety equipment is included to shut off the raw gas supply in event of gas pressure or power failure; stop gas pump motor if gas pressure or power fails, or stop unit if flame failure occurs.

Process and Gas Cost

An exothermic atmosphere is produced at a low cost from any regular fuel gas. Call SECO/WARWICK for a production cost estimate using your current utility prices.

Туре	Operating Range at 100% Capacity	Capacity at Complete Combustion (9.4:1)
Rich	Air-Gas Ratio 5.5 to 7.8	60%
Lean	7.0 to 9.4	100%

Operating range



Atmosphere Composition



Product Bulletin





Gas Consumption

			Gas Consumption							
			Natura	al Gas	Propane 15:01					
Model No.	Out	put	6:0	01						
Rich	cfh	cmh	cfh	cmh	cfh	cmh_				
EX-5	500	14	76	2	32	1				
EX-10	1000	28	152	4	64	2				
EX-20	2000	57	304	8	128	4				
EX-30	3000	85	456 13		192	5				
EX-40	4000	00 113 608 17		17	256	7				
EX-60	6000	170 912 26		26	384	11				
EX-80	8000	225	1216	34	512	14				
EX-100	10000	283	1520	43	640	18				
Lean	-	*	0.5.1		23	₹·1				
Lean			5.0	2.1	23.1					
EX-5	500	14	58	2	24	0.7				
EX-10	1000	1000 28 115		3	49	1.4				
EX-20	2000	57 230		7	98	3				
EX-30	3000	85	345	10	147	4				
EX-40	4000	113	460	13	196	6				
EX-60	6000	170	690	20	294	8				
EX-80	8000 225 9		920	26	392	11				
EX-100	10000	283	1150	33	490	14				
	1100		308							

4 | Page

www.secowarwick.com For more information or to request a quote, e-mail info@secowarwick.com



Product Bulletin

Rich Exothermic Atmosphere

When fuel gas is mixed properly with air, it may be burned under controlled conditions to form CO_2 , CO, H_2 and H_2O with N_2 . If combustion is carried out under a slight deficiency of air, no oxygen will be present in the resultant atmosphere. In the rich Exogas generator, sufficient heat is generated to form these reducing gases without adding external heat, but the heat generated is considerably less than for the lean exothermic atmosphere. For this reason, the rich Exogas generator is not self-starting, but must first be thoroughly heated by operation at a lean air-gas ratio. After the unit is heated, the mixture may be enriched to produce a rich Exogas atmosphere. The following reaction is typical (for a 5.7 to 1 air-gas ratio using methane as the fuel gas): $CH_4 + 1.2O_2 + 4.5N_2 \longrightarrow 1/3CO_2 + 2/3CO + H_2 + H_2O + 4.5N_2$

Lean Exothermic Atmosphere

The chemical reaction is similar to that for rich exothermic atmospheres except that leaner air-gas ratios are used and the products of combustion contain only very small quantities of hydrogen and carbon monoxide. This reaction corresponds to an operation ratio near the line representing complete combustion. $CH_4 + 2O_2 + 7.52N_2 \longrightarrow$ $CO_2 + 2H_2O + 7.52 N_2$

Simplified Schematic Flow Diagrams

Lean Exogas





Product Bulletin

Rich Exogas



How It Works

Combustion air is furnished by a positive displacement air pump drawing air through a filter. The air flows through a manual air valve and a flowmeter to the burner. Fuel gas flows through a safety valve, a ratio regulator, manual shutoff valve and a flowmeter before entering the burner. The air and gas mixture is ignited at the burner face and is passed through the combustion chamber. The processed gas leaving the combustion chamber is quickly cooled by a water cooled shell and tube gas cooler. A water separator then removes additional water vapor so that the final processed atmosphere has a dew point corresponding with a temperature of about 10°F (5.6°C) above the inlet temperature of the cooling water.

6 | Page



Sizes and Dimensions

Model	Model No. Output		Approximate Minimum Output		Approximate Dimensions						Length for Tube		Gas Pump		Approximate Shipping	
No.					Width		He	Height		Length		Removal		Motor Rating		Weight
Rich	cfh	cmh	cfh	cmh	ft	mm	ft	mm	ft	mm	ft	mm	hp	kw	lbs	kg
EX-2 EX-5 EX-10 EX-20 EX-30 EX-40 EX-60 EX-80 EX-100 EX-150 EX-200	250 500 1000 2000 3000 4000 6000 8000 10000 15000 20000	7 14 28 57 85 113 170 225 283 425 565	125 250 500 1000 2000 3000 4000 5000 7500 10000	3.5 7 14 28 43 57 85 113 142 212 283	2'-7"* 3'* 3'-5"* 3'-10" 3'-10" 4'-8" 4'-9" 5' 6' 6' 6'-3" 7'	790 910 1040 1170 1420 1450 1520 1830 1900 2130	6' 8'-3" 9'-8" 7'-9" 8' 9' 9'-8" 8' 8' 8'	1830 2510 2950 2360 2440 2740 2740 2950 2440 2440	2'-7" 3' 8'-7" 10'-11" 11'-6" 11'-8" 11'-9" 13'-8" 14'-5" 15'-2"	790 910 1040 2620 3330 3511 3560 3580 4170 4390 4620	5' 6' 7' 19' 20' 21' 21' 23' 25' 20'	1520 1830 2130 5050 5790 6100 6400 6400 7010 7600 6100	.5 .76 1.6 2 3 5 5 5 7.6	.4 .6 1 1.5 2 4 4 4 5.5	1300 1875 2900 4500 6500 6120 6400 7000 8000 20000 37000	590 850 1330 2060 2500 2715 2900 3175 3625 9075 16800
Lean					* indicates vertical combustion chamber. All other models have horizontal chambers.											
EX-2 EX-5 EX-10 EX-20 EX-30 EX-40 EX-60 EX-80 EX-100 EX-150	250 500 1000 2000 3000 4000 6000 8000 10000 15000	7 14 28 57 85 113 170 225 283 425	100 200 400 800 1200 1600 2400 3200 4000 6000	3 6 11 23 34 46 68 91 113 170	2'-9"* 2'-9"* 3'* 3'-6" 3'-9" 4' 5' 5' 5' 7'-4"	840 840 910 1070 1140 1220 1520 1520 2240	5'-2" 6'-10" 9' 6'-1" 6'-4" 6'-6" 6'-11" 7'-4" 7'-4" 8'-8"	1590 2080 2740 1850 1930 2980 2110 2240 2240 2640	2'-9" 2'-9" 3'-8" 9'-4" 9'-10" 11'-8" 13'-4" 13'-9" 13'-9" 13'-9" 14'-2"	840 840 1120 2840 3000 3560 4060 4190 4190 4010	- 22'-8" 24'-6" 26'-2" 26'-7" 26'-7" 23'-2"	- 5030 6910 7470 7980 8100 8100 7060	.б .7б 1.б 1.б 2 5 5 5 5 5	.4 .6 1 1.5 1.5 4 4 4 4	1300 1875 2900 4500 6500 6120 6400 7000 8000 20000	590 850 1330 2500 2715 2900 3175 3625 9075
EX-200	20000	565	8000	226	7'-4"	2240	8'-10"	2690	16'-5"	5000	26'-2"	8000	10	7.5	37000	16800

www.secowarwick.com For more information or to request a quote, e-mail info@secowarwick.com



Industrial Services

A wide range of services are available for our equipment. These include rebuild projects, field service, spare parts, equipment supply, control and combustion upgrades, and fabrication services. As a result of these services, we have provided our customers improved performance, lower emissions, better efficiency and enhanced product temperature uniformity.

About SECO/WARWICK

The SECO/WARWICK Group is one of the world's leading manufacturers of heat treatment furnaces and a technology leader. With our fully equipped research and development facility and cooperation with the leading academic centers in Europe, we are able to provide innovative solutions not offered anywhere else in the world. The Group is made up of companies located in five countries on three continents, and we sell our products in 45 countries around the world. We supply furnaces to customers involved with steel, titanium and aluminum production as well as aluminum recycling, forging, automotive, aerospace, commercial heat treating, HVAC/R, electronics, wind energy, medical equipment and nuclear industries.

The latest design, materials, and equipment specifications should be obtained from the company before any reliance is placed on this standard bulletin since changes may occur due to product improvement.