ETA Process Instrumentation
www.etapii.com
sales@etapii.com
tel 978.532.1330
New England

Martech Controls
www.martechcontrols.com
sales@martechcontrols.com
tel: 315.876.9120
Upstate New York

Titus AIR SYSTEMS

NGN Series Twin Tower PSA Nitrogen Generators

Features and Benefits
NGN Series Nitrogen Generators

Sensible Design Layout
Provides for easy access and low-cost maintenance while maintaining the smallest possible footprint.

Generously Sized Adsorption Towers
NGN adsorption towers provide generous bed sizes to ensure consistent, high quality nitrogen gas flow throughout the adsorption cycle.

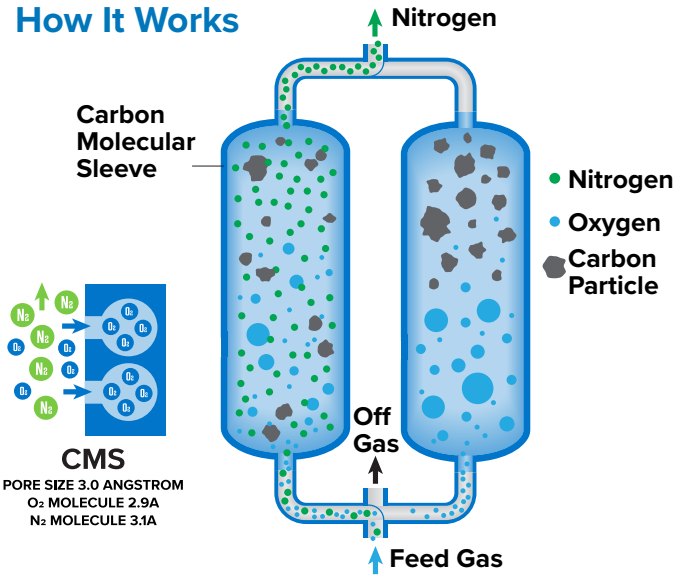
Long Life Carbon Molecular Sieve
Utilizes premium grade Carbon Molecular Sieve (CMS) that provides a service life in excess of 10 years, with proper system maintenance, to insure the lowest cost of ownership possible.

Low Pressure Drop
Oversized pipelines ensure minimum pressure drop and the highest efficiency while eliminating unwanted turbulence.

Large Stable Adsorption Beds
For guaranteed nitrogen purity and to allow for an even & consistent adsorption process.

Renowned Components
Only world renowned electrical and pneumatic components are utilized in the NGN resulting in low maintenance and a high level of reliability.

How It Works



High N_2 Rates
PneuTech NGN solution with PSA works under the principle of adsorption equilibrium and kinetic theory. NGN's kinetic adsorbent is highly selective to components such as O_2, CO_2 and water vapors, while allowing nitrogen molecules to pass through the adsorbent bed. O_2, CO_2, and CO molecules easily diffuse inside the adsorbent pores when the bed pressurizes (adsorption). Nitrogen molecules, which have a larger diameter in comparison, cannot diffuse inside. The result is a purified nitrogen stream in the product. When depressurized (desorption), the adsorbed impurities are released through the exhaust port.

NGN PSA units consist of two identical beds filled with proprietary CMS C adsorbents, connected together. Compressed air feed enters the bottom of the first vessel. As O_2, CO_2, water vapors and other trace contaminants stick to the adsorbents, the product stream leaves from the top of the vessel. When the adsorbent bed reaches the saturation point, it depressurizes and lets the desorbed gases move to the second vessel (equalization) at an intermediate pressure. This allows for a continuous production flow of nitrogen.

Adjustable Flow and Purity from 95% to 99.999%
NGN offers 22 standard PSA units. Sizes are a function of the required product flow rate, purity, temperature and pressure. All are suitable for use on-site and equipped with all the components necessary to concentrate nitrogen from air. Depending on size, NGN PSA units can be installed inside cabinets, or can be provided as skid mounted or containerized solutions.

Green Energy
The nitrogen product dew point is about -58°F/-50°C at atmospheric conditions. The PSA system uses no process water or chemicals for gas purification and generates no wastewater in the exhaust stream. It operates at ambient temperatures of 40 to 104°F/5 to 40°C, and the design pressure is 150 psig/10 bar.

N2 Output Design Capacity
NGN Series Nitrogen Generators

	95.000%		96.000%		97.000%		98.000%		99.000%		99.500%		99.900%		99.950%		99.990%		99.999%	
Model	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM	SCFM	NCHM
NGN0003	2.6	4.2	2.4	3.8	2.1	3.4	1.8	2.9	1.4	2.3	1.3	2.0	0.9	1.5	0.8	1.3	0.6	1.0	0.3	0.5
NGN0005	6.2	10.0	5.7	9.1	5.0	8.0	4.4	7.0	3.5	5.5	3.0	4.9	2.2	3.5	1.9	3.1	1.4	2.3	0.7	1.2
NGN0010	8.9	14.2	8.1	12.9	7.1	11.4	6.2	9.9	4.9	7.9	4.3	6.9	3.1	5.0	2.7	4.4	2.1	3.3	1.0	1.7
NGN0015	15.9	25.6	14.5	23.3	12.8	20.5	11.1	17.9	8.9	14.2	7.8	12.5	5.7	9.1	4.9	7.9	3.7	5.9	1.9	3.0
NGN0020	22.3	35.8	20.4	32.7	17.9	28.8	15.6	25.1	12.4	19.9	10.9	17.5	7.9	12.7	6.9	11.1	5.2	8.3	2.6	4.2
NGN0025	26.6	42.7	24.3	38.9	21.4	34.3	18.6	29.9	14.8	23.7	13.0	20.9	9.5	15.2	8.3	13.3	6.2	9.9	3.1	5.0
NGN0030	32.9	52.7	30.0	48.1	26.4	42.3	23.0	36.9	18.3	29.3	16.1	25.8	11.7	18.7	10.2	16.4	7.6	12.2	3.8	6.2
NGN0050	49.8	80.0	45.4	72.9	40.0	64.2	34.9	56.0	27.7	44.5	24.4	39.2	17.7	28.4	15.5	24.8	11.6	18.6	5.8	9.4
NGN0060	63.3	101.7	57.7	92.7	50.9	81.6	44.3	71.2	35.2	56.5	31.0	49.8	22.5	36.1	19.7	31.5	14.7	23.6	7.4	11.9
NGN0080	81.9	131.4	74.7	119.8	65.7	105.5	57.3	92.0	45.5	73.1	40.1	64.3	29.1	46.7	25.4	40.8	19.0	30.5	9.6	15.4
NGN0100	102.2	164.0	93.2	149.5	82.0	131.7	71.5	114.8	56.8	91.2	50.0	80.3	36.3	58.3	31.7	50.9	23.7	38.0	11.9	19.2
NGN0150	150.2	241.1	137.0	219.9	120.6	193.6	105.2	168.8	83.5	134.0	73.5	118.0	53.4	85.7	46.6	74.8	34.9	55.9	17.6	28.2
NGN0200	216.3	347.2	197.2	316.6	173.7	278.8	151.4	243.1	120.3	193.0	105.9	170.0	71.9	115.4	67.1	107.7	50.2	80.6	25.3	40.6
NGN0250	259.6	416.7	236.7	379.9	208.4	334.6	181.7	291.7	144.3	231.6	127.1	203.9	92.3	148.1	80.5	129.3	53.5	85.9	30.4	48.7
NGN0300	302.9	486.1	276.1	443.2	243.2	390.3	212.0	340.3	168.4	270.2	148.2	237.9	107.6	172.8	94.0	150.8	70.3	112.8	35.4	56.8
NGN0350	353.3	567.2	322.2	517.1	283.7	455.4	247.3	397.0	196.4	315.3	172.9	277.6	125.6	201.6	109.6	176.0	82.0	131.6	41.3	66.3
NGN0400	412.2	661.7	376.0	603.5	331.0	531.3	288.6	463.2	229.2	367.8	201.8	323.9	146.5	235.2	127.9	205.3	95.6	153.5	48.2	77.4
NGN0500	473.2	759.6	431.5	692.6	380.0	609.9	331.3	531.7	263.1	422.2	231.6	371.8	168.2	270.0	146.8	235.7	109.8	176.2	55.3	88.8
NGN0600	584.1	937.6	532.6	854.8	469.0	752.8	408.9	656.3	324.7	521.2	285.9	458.9	207.6	333.2	181.2	290.9	135.5	217.5	68.3	109.6
NGN0700	681.4	1094.0	621.3	997.3	547.2	878.3	477.0	765.7	378.8	608.0	333.5	535.4	208.9	335.3	211.4	339.4	158.1	253.8	79.7	127.9
NGN1100	1104.0	1772.0	1007.0	1616.0	886.6	1423.0	772.9	1241.0	613.8	985.2	540.4	867.5	392.5	629.9	342.6	549.9	256.2	411.2	129.1	207.2
NGN1500	1427.0	2290.0	1301.0	2088.0	1146.0	1839.0	998.8	1603.0	793.1	1273.0	698.3	1121.0	507.1	814.0	442.7	710.6	331.0	531.3	166.8	267.8
Air/N2 ratio	1.9		1.9		2.0		2.2		2.4		2.6		3.2		3.5		4.6		6.4	

Note: Calculated at design basis conditions.

Sizing Example NGN0600 system @ 99%, 101 PSIG, 95°F Nitrogen flow at design basis conditions = 324.7 SCFM Air/N2 Ratio at design basis conditions = 2.4. For 95°F and 100 PSIG: F1=0.95 AND F3=0.93 Nitrogen Flow = 324.7 x F1 x F3 = 286.9 SCFM For 95°C and 101 PSIG: F2 = 1.07
AND F4 = 1 Inlet Air Flow = 286.9 x Air/N2 Ratio x F2 x F4 = 736.8 SCFM

Who Uses Nitrogen Gas?

Making Your Own Nitrogen Makes Sense

Nitrogen (N2) is a dry, inert, colorless, odorless gas. It is commonly used in a wide range of industry applications because it prevents both fast and slow oxidization.

Blanketing

Due to its low reactivity, nitrogen is an excellent blanketing gas. Blanketing protects a product from the environment or vice-versa. Blanketing is a common practice in the chemical, food, pharmaceutical, oil & gas, glass and metallurgical industries.

Modified Atmosphere Packaging (MAP)

The presence of oxygen inside packaged foods and beverages promotes bacterial growth and oxidation, compromising quality and shelf life. By flushing packaged foods with high purity nitrogen, oxygen levels can be reduced to below 1%. This technique is increasingly popular and represents an easy and economical way to protect product and improve package integrity.

Metal Processing

A number of high-temperature metallurgical processes are affected by contact with oxygen, which favors the formation of oxides. By using nitrogen to minimize the oxygen contact, quality and operating costs can be optimized.

Electronics

The presence of oxygen and water vapor during electronic processing and packing can also lead to the formation of oxides, which compromises yield and quality. Nitrogen is used to create inert areas around the process and soldering chambers.

Oil & Gas Extraction

Inert gases such as nitrogen are commonly used in the oil & gas industry for gas lift. High-pressure gases like nitrogen are injected into the tubing in order to reduce the density of the fluids. This allows for a reduction of flowing bottom hole pressure (BHP). Nitrogen is also used during electrical generation for blanketing the seals on natural gas compressors.

Engineered Solutions Provide Cost-Effective, On-Demand Nitrogen Production

5 YEAR WARRANTY

Applications

Industrial Processes
- Annealing
- Hardening
- Autoclaving
- Sparging
- Mixing
- Plasma Cutting
- Laser Cutting
- Metallurgical Carburizing

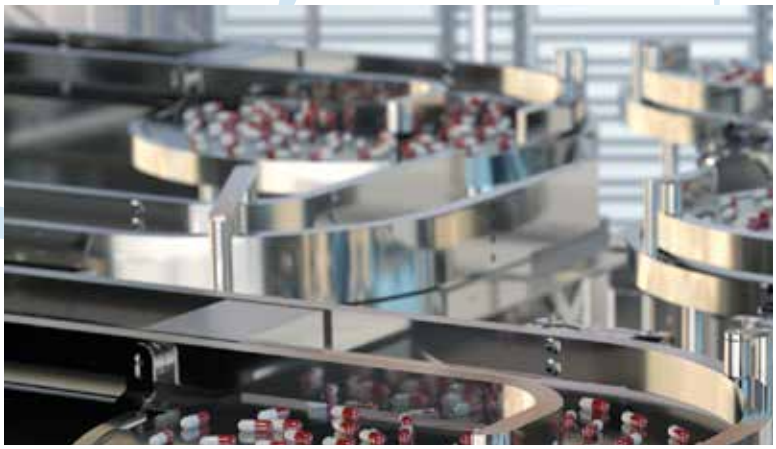
Food Packaging & Food Processing
- Food Preservation
- Controlled Atmospheric Storage
- Modified Atmospheric Packaging
- Ingredient Mixing
- Blanketing
- Gas Knifing
- Beer & Wine Dispensing
- Flushing
- Purging
- Canning

Laboratory Sciences
- Carrier Gas
- Make-up Gas
- Instrument Gas
- Glove Boxes
- Fume Cupboards
- LCMS/GCMS

Pharmaceutical Processing
- Blanketing
- Powder Transport
- Ingredient Stabilization

Electronics Manufacturing
- Chamber Stabilization
- Positioning Gas
- Soldering
- Circuit Imprinting

Petrochemical/Chemical Processing
- Tank Blanketing
- Tank/Line Purging
- Dry Material Transfer
- Line Pigging



Dimensional Specifications
NGN Series Nitrogen Generators

	Connections			Dimensions							
				Height		Width		Depth		Weight	
				mm	in	mm	in	mm	in	kg	lbs
NGN0003	3/8"	1/4"	3/8"	1016	40	457	18	356	14	44	100
NGN0005	1/2"	3/8"	3/4"	1600	63	737	29	610	24	67	150
NGN0010	1/2"	1/2"	3/4"	1524	60	914	36	711	28	111	250
NGN0015	3/4"	1/2"	1"	1626	64	978	39	711	28	169	380
NGN0020	1"	3/4"	1"	2032	80	978	39	711	28	200	450
NGN0025	1"	3/4"	1.5"	1676	66	991	39	711	28	231	520
NGN0030	1"	1"	1.5"	2083	82	1118	44	787	31	244	550
NGN0050	1.5"	1"	1.5"	1803	71	1245	49	889	35	288	650
NGN0060	1.5"	1"	1.5"	2134	84	1372	54	914	36	346	780
NGN0080	1.5"	1.5"	2"	1905	75	1448	57	1067	42	586	1320
NGN0100	1.5"	1.5"	2"	2159	85	1473	58	1067	42	665	1500
NGN0150	2"	1.5"	2.5"	2845	112	1829	72	1321	52	932	2100
NGN0200	2"	2"	2.5"	2845	112	1880	74	1321	52	1198	2700
NGN0250	2.5"	2"	3"	3150	124	1880	74	1321	52	1331	3000
NGN0300	2.5"	2"	3"	3048	120	2184	86	1321	52	1597	3600
NGN0350	2.5"	2"	3"	3075	121	2206	87	1472	58	1909	4200
NGN0400	3"	2.5"	3"	3172	125	2305	91	1529	60	2182	4800
NGN0500	3"	2.5"	4"	3262	128	2398	94	1583	62	2500	5500
NGN0600	3"	2.5"	4"	3403	134	2547	100	1668	66	3068	6750
NGN0700	4"	3"	4"	3511	138	2662	105	1733	68	3568	7850
NGN1100	4"	3"	4"	3870	152	3056	120	1954	77	5727	12600
NGN1500	6"	4"	6"	4075	160	3288	129	2083	82	7364	16200

Technical Information

Operating Pressure	90-150 PSI
Operating Temperature (feed air)	40°-104°F
Dew Point (at ambient temperature)	-40°F
Voltage, Frequency	115V / 60 Hz
Power Consumption	<300W
Nominal Sound Level	75dB(A)

Compressed Air Quality (Inlet)
Class 1.4.1 acc. to ISO 8573-1
(0.1µm; 37.4°; <0.01 mg/m3/h)

Filters Included
Duplex Inlet and Particulate Outlet

Standard Components Included

- Set of External Feed Air Filters
- ASME Adsorber Vessels in Carbon Steel
- Ultra-Long Life Pneumatic Valves
- Nitrogen Purity/Flow Regulation
- Control System with PLC & Touchscreen

Options

- Oxygen Analyzer with Zirconium - Oxide Sensor
- Electronic Product Flow Meter
- Feed Air / Product Moisture Analyzer
- Feed Air / Product Pressure Transmitters
- Feed Air / Product Temperature Transmitters
- Nitrogen Sterile Filters
- Nitrogen Booster
- Nitrogen Cylinder Filling System

Other PneuTech Products

RK Fixed Speed Rotary Screw
5HP-50HP

RK Variable Speed Rotary Screw
5HP-75HP

RSP VSD & Fixed Speed Rotary Screw
75HP-450HP

RKHD VSD & Fixed Speed Rotary Screw
50HP-420HP

FHO Inline Filtration

RDA Refrigerated Air Dryers
Non-Cycling - 13-550 CFM

CSO Oil Water Separators

RDA Refrigerated Air Dryers
Variable Speed - 800-6,000 CFM

5-Year Pneu-Assure Warranty

Industry-Leading Peace-of-Mind

- ☑ **5-Year Warranty on Pressure Vessels**
- ☑ **2-Year Warranty on the Entire Unit**
  Regular maintenance NOT included
- ☑ **Guaranteed Support**
  From PneuTech and your local dealer
- ☑ **Technical Expertise**
  Industry-leading knowledge & experience

Warranty subject to change based on region and dealer agreement.

5-Year Warranty on Pressure Vessels requires the use of Genuine PneuTech Parts

Cost Comparison

Outsourced Nitrogen vs. In-House Production

The typical range in cost of various types of conventional sources of N2 supply in the North American marketplace:

Cylinder
$8.00 - $40.00 per 100 ft³

Liquid Dewar
$1.80 - $4.50 per 100 ft³

Bulk Liquid
$0.40 - $2.50 per 100 ft³

Depending on nitrogen purity required, geographic location and associated electricity costs, typical operating costs (energy and maintenance) for generating nitrogen on site:

Low Purity 95-97%
$0.06 - $0.10 per 100 ft³

Medium Purity 99.%
$0.10 - $0.18 per 100 ft³

High Purity 99.99%
$0.17 - $0.30 per 100 ft³

Ultra-High Purity 99.999 %
$0.26 - $0.45 per 100 ft³

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