

# ***PRISM® Nitrogen Standard & High Purity PSA Generators***



*“PRISM® Nitrogen PSA's meet our customers' most stringent flow, purity, and pressure requirements. Our low-cost, customised solutions offer the best overall value in the gas industry”*

*Mark Levine,  
Global Product Owner,  
PSA Product Line*



*Air Products has designed, engineered, manufactured and operated on-site gas generation systems for over 40 years, which has created an outstanding global product line.*

Air Products' proprietary standard and high purity Nitrogen Pressure Swing Adsorption (PSA) Systems offer a highly-reliable, low-cost nitrogen supply alternative with savings of up to 50% over traditional supply modes. The systems are available in a wide range of models that can be customised to suit each customer's application requirements. The standard and high purity equipment range offers flow rates of up to 2500 Nm<sup>3</sup>/hr and nitrogen purities up to 99.9995%.

#### **Technology at Work the World Over**

These extremely cost-effective nitrogen systems feature a proprietary adsorption process developed by Air Products. In our unique process cycle, oxygen, moisture, and carbon dioxide are removed from air through use of a molecular sieve to produce nitrogen gas with maximum efficiency. As a leading innovator of adsorption technologies since the early 1970's, Air Products has hundreds of Nitrogen PSA Systems in operation around the world.

#### **A System to Suit Your Application**

Understanding that every application and location is unique, Air Products offers a family of standard and High purity Nitrogen PSA Systems to meet a wide range of requirements. For each model, the type of molecular sieve, the compressor frame size, the operational cycle, and other internal process parameters can be optimised to meet your specifications for flow, purity, and pressure. Engineered for on-site operation, Air Products PSA Nitrogen Systems can also be configured with advanced telemetry capabilities for remote monitoring.

## Features

- Proven proprietary PSA technology
- Our diverse product line can achieve Oxygen content from 50,000 down to 5ppm
- Few moving parts and simple engineering
- Small footprint
- Highly sophisticated PLC control
- Integral Sound abatement
- Economiser shutdown
- Exclusive stayfill bed containment
- Proprietary rapid clean-up technology
- Remote monitoring telemetry system

## Benefits

- Produces highly reliable nitrogen supply at your site
- Liquid Nitrogen purity from PSA systems that deliver liquid Nitrogen purity without compromising flexibility or cost savings
- Minimal maintenance and maximum reliability
- Allows compact installation
- Allows unattended operation and maintains highest efficiency
- Environmentally friendly, meets international standards
- Saves energy during periods of low demand
- Extends bed life indefinitely
- Allows quick equipment startup
- Air Products operating experience to provide total supply solution

## Options Available

- Nitrogen booster compressor for high pressure storage and/or use
- Air Products supplied air compressor and air tank
- Dual oxygen analysers
- Pay meter quality flow meter
- Remote monitoring via telemetry or analog signals for customer use
- High specification design and construction for demanding environments
- Professional start-up and/or complete after-service agreements for Sale of Equipment customers

## Process Description

The standard PSA system is comprised of four major operations: Feed Air Compression; Feed Air Pre-treatment; Adsorption/Desorption; Product Delivery.

### Feed Air Compression

Atmospheric air is elevated to high pressure by a packaged air compressor.

### Feed Air Pre-treatment

The high-pressure feed air from the compressor passes through a mist eliminator to remove water droplets and entrained oil. The air then passes through the carbon filter to remove oil vapors prior to entering the buffer tank.

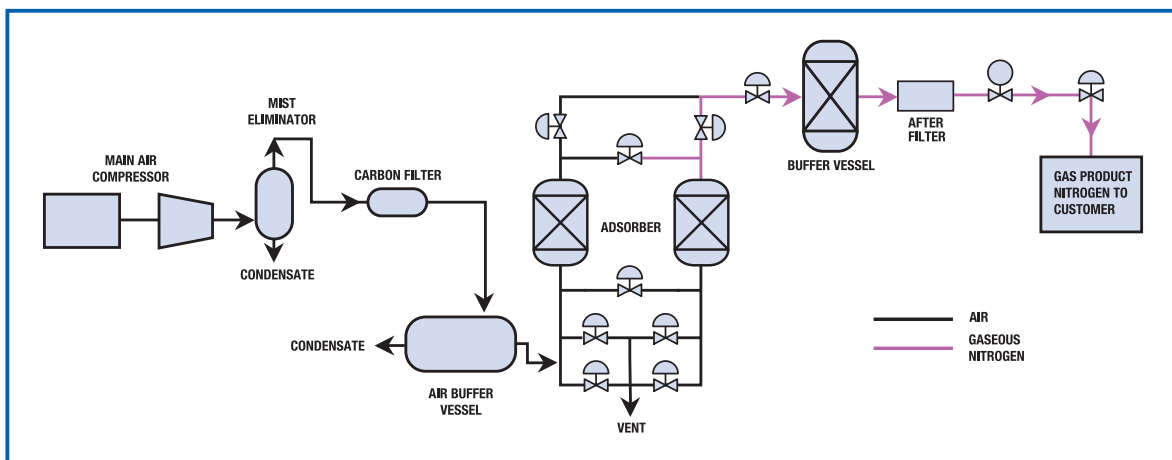
### Adsorption/Desorption

The "treated" air enters an adsorption tower where it is contacted with carbon molecular sieve to remove oxygen. "Purified" nitrogen passes to product delivery operation.

When the oxygen capturing capacity of the onstream adsorption tower is diminished, the feed flow process valves switch to a second adsorption tower. The first adsorption tower is then depressurised rapidly and purged to remove the adsorbed oxygen. When the second bed becomes saturated with oxygen, the feed flow process valves switch back to the first adsorption tower and the cycle begins again.

### Product Delivery

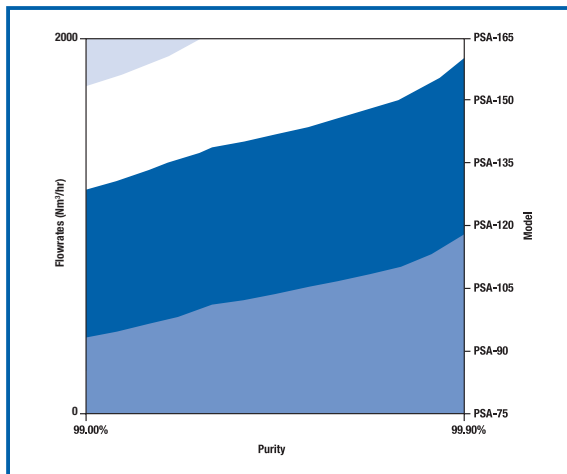
The "purified" nitrogen enters a nitrogen receiver tank that provides gas to the adsorber vessels during product re-pressurisation and nitrogen buffer capacity. The nitrogen purity is continuously monitored by an oxygen analyser prior to delivery to the customer houseline. Should the oxygen level rise above the preset alarm point, the product delivery valves isolate any off-specification product from the customer houseline. The system will automatically enter a "clean-up" mode and product delivery will resume when the nitrogen purity is within specification. A flow control system prevents system overdraw.



## PRISM® PSA Performance

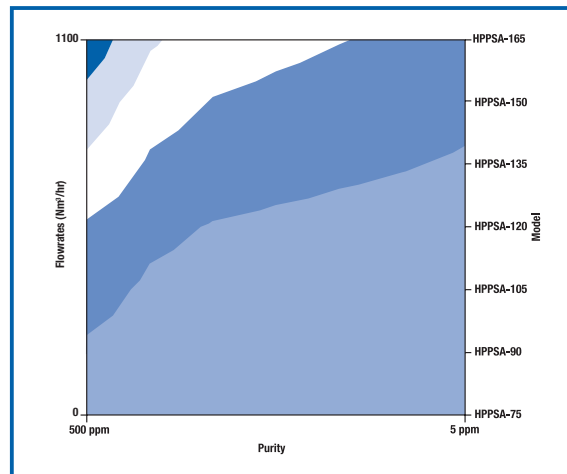
The Standard nitrogen PSA system covers nitrogen purity from 50,000ppm down to 1,000ppm Oxygen content and nitrogen production rates up to 2,630 Nm<sup>3</sup>/hr.

### Standard Purity PSA's

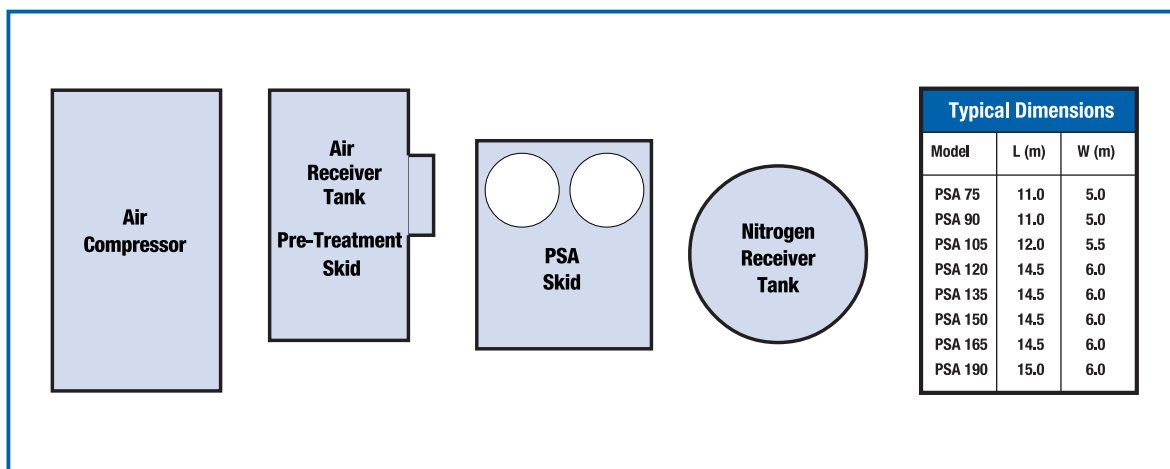


The High purity nitrogen PSA system covers nitrogen purity from 500ppm down to 5 ppm Oxygen content and nitrogen production rates up to 1,315 Nm<sup>3</sup>/hr.

### High Purity PSA's



## Typical Plant Layout



## Standards and Specifications

### Safety, Health & Environment

Air Products believes that nothing is more important than safety.

We have extensive Safety Management systems, procedures (including HAZOP analysis) and detailed engineering standards, as well as 50 years of Air Separation plant operation experience. This expertise is applied to all plant and equipment that Air Products operates and sells, to ensure the safety of employees, customers and the general community. As a result Air Products is widely acknowledged to be the safety leader in the industrial gas industry and also has one of the leading performances in the chemical industry as a whole.

### Quality

Air Products follows established engineering procedures and can meet ISO9001 where required.

### Pressure Vessels

Standard pressure vessels are designed, fabricated, and stamped in accordance with the American Society of Mechanical Engineers (ASME Code for Unfired Pressure Vessels, Section VIII, Division I). European systems are designed per the European PED.

### Pressure Piping

Standard piping conforms with American National Standards Institute (ANSI) B31.1. Fittings 2 inches and larger are forged steel standard weight/schedule 40 butt weld type per ANSI B16.9, with flanges per ANSI B16.5. Other codes can be satisfied in high specification applications.

### Electrical

Standard wiring and controls are furnished in accordance with the National Electric Code (NEC), as published by the National Fire Protection Association (NFPA) and the National Electrical Manufacturer's Association (NEMA) standards. All individual electrical components are chosen for their heavy duty industrial quality and are UL approved wherever feasible. European systems are designed to IEC standards and meet CE plating requirements.

### Compressors

Air Products' supplied compressors are generally designed per the manufacturer's standard unless otherwise specified.

### Noise level

85 dB(A) time weighted average at 3 feet (1 meter) standard, in free field area with no other noise sources considered.

## Typical Scope of Supply and Schedule

Air Products' **PRISM**® Nitrogen PSA (or HP-PSA) units can be supplied on an on-site basis, where Air Products installs and operates the equipment on the customers behalf or on a Sale of Equipment basis where Air Products transfers asset ownership to the customer.

Typical ex-factory delivery for standard units is 18 to 20 weeks after receipt of order. For On-site supply units, the ship, install and commission activities typically add two weeks to the ex-factory delivery.

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