



# Nitrogen Generation Packages

PSA and Membrane Systems



**Customized Nitrogen  
Generation Packages  
for complex projects  
and EPC contractors**

# Engineering Project Solutions

Using the extensive experience that we have gained by working with EPC companies, Ingersoll Rand has developed the capacity to carry our complex projects that are tailored to our customers requirements. Whatever details matter to you, Ingersoll Rand can design a solution to meet your exacting needs. Engineered for performance, our range of equipment is built to provide maximum efficiency, reliability, and uptime. Our custom designed compressed air systems and solutions offer total flexibility. Our compressors, dryers, and nitrogen generation packages are engineered to meet the rigorous, non-stop demands of your operation.

We are a leading global business provider, offering custom products to satisfy a range of customer needs, based on:

- Market to Order (MTO)
- Engineering to Order (ETO)
- Special Configurations
- Project Lifecycle Support (PLS)

## What we can provide

- Compressors, Air Treatment, Nitrogen Generation and Oxygen Packages as per customer requirements
- Structural Skids, Dryers, Filters, Air Coolers, Receiver Tank Design & Fabrication
- Customized Packaging
- Conforming to API 681, API 619, API 672 standards
- ATEX, IECEx directive certified
- Conforming to ISO and other quality standards
- Customized Packaging
- Project Management
- Documentation / Engineering / 3D Modeling
- Implement Unique Support Teams for Your Needs
- Global Support
- Aftermarket / Warranty / Training

## Project Documentation & Support

A dedicated project management team provides you total support throughout the entire project. From the design, through assembly, to commissioning, including technical & quality management, we are here to help.

We can supply you with all the required project documentation, including electrical diagrams, instrumentation lists, procedures, certifications, etc. Our dedicated project management team will provide the documentation either in Ingersoll Rand format or in a format specified by the customer. The databooks are supplied in English, but other languages can be provided on request.

We use advanced engineering (AutoCAD, 3D modeling, simulation) and management and analysis tools (Microsoft Project). The sales team, together with the Project Management Manager, work closely with both the customer's technical and engineering staff.

# Nitrogen Packages Applications

Our custom-designed nitrogen generation packages are mainly supplied for applications in the oil & gas, power generation, chemical, and mining industries. Our experience covers installations at desert or arctic ambient conditions, as well as in classified areas.

## Nitrogen Supply in Oil & Gas Plants:

In refineries of the oil and gas industry, nitrogen is used in a wide range of applications:

- Reduction of fire and explosion risk as well as unwanted oxidation
- Conveying within piping systems
- Keeping pipe lines clear
- Tank ventilation
- Purging of controls
- Flare gas inerting
- Dry gas sealing
- Tank blanketing

## Nitrogen Supply in Power Plants:

Nitrogen generators are used to throughout the power generation industry. Some applications are:

- Dry gas compressor or gas turbine sealing
- Inerting of HRSG (heat recovery steam generator)
- Protection against corrosion on the inner walls of wetted parts, condensers and boiler tubs
- Purging of natural gas and ammonia.

## Nitrogen Supply for Chemical applications:

Nitrogen generation is particularly appropriate for the following applications:

- Fire prevention
- Explosion prevention
- Blanketing of oxygen-sensitive compounds (chemicals)
- Pipeline purging
- Pressure transfer of liquids
- Pressure testing
- Pneumatic transport

## Nitrogen Supply for Mining applications:

Nitrogen is used in the following mining applications:

- Extinguishing of coal mine fires
- Inerting of sulphuric acid plants for heap leaching
- Inerting of abandoned mine areas
- Purging of LPG lines in copper / nickel / uranium mines



# Pressure Swing Adsorption (PSA) System Packages

PSA (pressure swing adsorption) is a technology for used for air separation to enable the creation of a continuous stream of nitrogen by means of air filtration. Ingersoll Rand nitrogen generators use Pressure Swing Adsorption (PSA) technology to separate nitrogen molecules from other molecules found in compressed air. Oxygen and other trace gases are removed, while nitrogen is allowed to pass through to the application.

The design and control features employed by nitrogen generators help maximize gas output and reduce air consumption to achieve efficiency.

Our modular concept offers greater flexibility. The Ingersoll Rand Series can be configured to suit installations for everyday supply of nitrogen and when nitrogen demand increases. Additional modules can provide extra capacity on standby or serve as backup for peace of mind. The compact design also means the units can fit through standard doorways. Our PSA Nitrogen Generation Packages can be supplied inside a shelter, on skids, or turn-key installed inside ISO and other standard freight containers. All components will be selected based on the local ambient conditions and the area classification of the installation site.

Ingersoll Rand is able to provide nitrogen packages for any customer-specific requirement. We can customize the PSA package to your needs.

Nitrogen	
N2 flow capacity	N2 purity
Max. 2,000 Nm <sup>3</sup> /hr	95 - 99,99%



Adsorption vessels



## Benefits at a Glance

- Critical components engineered for the application
- Proper material selection
- Certification of any component
- High purity nitrogen at consistent flow and pressure
- Compact space-saving design
- Flexible modular design
- Low cost of ownership
- Proven high reliability

## Standards Applied

- Areas & Temperatures
- Hazardous area (Zone 1 / 2 or Class 1 div. 2)
  - Extreme ambient temperatures Quality International and Local Standards, i.e.:
  - API 619
  - ISO 10440-1
  - ISO 10440-2
  - ATEX
  - API R14
  - EN 60034
  - ASME VIII DIV. 1 AND U STAMP
  - PED

# Membrane System Packages

Membrane Nitrogen Generation Systems consist of fibrous membrane modules arranged in a convenient housing equipped with a control system and integral filtration. High quality compressed air can be separated by means of membranes composed of small, hollow polymer fibers. In the permeation process, dried and cleaned compressed air (<+5°C pdp) that enters these fiber walls is filtered of water vapor, CO<sub>2</sub>, and oxygen. At the same time, residual gas, mainly nitrogen, goes along the fibers and is collected as a product of the process.

The membranes are designed to remove unwanted gases such as oxygen and water vapor through the hollow fiber wall and out to the atmosphere while retaining nitrogen. This nitrogen product flows continuously through to the application. The intake air should be correctly cleaned and dried before it enters the membrane. If not, the shallow fibers will quickly clog. Air treatment through filters and dryers is necessary to avoid clogging.

Our membrane nitrogen generation systems can be supplied inside a shelter, on skids, or turn-key installed inside an ISO and other standard freight containers. All components will be selected based on the local ambient conditions and area classification.

We are able to provide membrane nitrogen generation systems for any customer-specific requirement.

Nitrogen	
N2 flow capacity	N2 purity
Max. 2,000 Nm <sup>3</sup> /hr	95 - 99,95%



Membrane modules



## Benefits at a Glance

- Proper material selection
- Engineered components
- High Efficiency
- Very Low Maintenance
- Stable Flow
- Certification of any component
- Very low noise level
- Dedicated inspection plan for every project
- Detailed manufacturing recording book (MRB)

## Standards Applied

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- Hazardous area (Zone 1 / 2 or Class 1 div. 2)
  - Extreme ambient temperatures Quality International and Local Standards, i.e.:
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# Choosing Between a PSA and Membrane Systems

Ingersoll Rand PSA and membrane systems offer unique benefits and value. Many more factors outside of pressure, flow, and purity affect the ultimate choice of a generator. Ease of installation, special customer requirements, location, and application, are only a few of the other considerations.

In general, membrane technology is better suited to low purity applications while PSA technology is best suited for higher purity applications. If required, our qualified engineers can assist in the selection of a suitable solution for your application.

	PSA	Membrane
Achievable Purity	Very high purity	High purity
Efficiency	Higher	High
Differential Pressure	1.5-2 bar	1-1.5 bar
Flow Stability	Fluctuating in/on/outlet	Stable
Buffer tank required	Surge air receiver and nitrogen mixing vessel required	No
Noise	High (blow-off peaks)	Silent operation
Control type	PLC, Auto control	PLC, Auto Control
Inlet temperature	Operation to 60 deg.C	Operation to 60 deg.C
Start-up time	Minutes / hours	Seconds
Weight	Medium	Low
Maintenance	Low	Lower
Moving parts	Frequently change over of valves	No required

# Total Aftermarket Service and Support

Reliable and responsive after-sales service is an integral part of our business philosophy. Ingersoll Rand's Engineering Project Solutions expert technicians are able to travel to customers all over the world to ensure the correct installation, commissioning, and start-up of your solution.

Today, Ingersoll Rand is globally renowned for its comprehensive, class leading service and support, including:

- Turn-key customer support agreements
- Worldwide service network
- Factory-trained service engineers
- Free extended warranty programs
- Equipment audits & analysis
- Recommended spare parts

## Quality

All activities within our company strictly comply with the procedures of our certified quality management system, which is regularly updated and optimized.

Our qualified engineers work according to the most stringent quality regulations. Before packing and shipment, all our packages will be thoroughly tested. We can also do so in the presence of the customer, if so required.

## References

Ingersoll Rand has supplied its special packages for nitrogen or instrument air to many renowned global international EPC contractors and engineering companies in the oil & gas, power generation, chemical, water treatment, and mining industries. We supplied more than 600 customized projects over the last 10 years.

Please ask for the latest version of our reference list

## About Ingersoll Rand Engineering Project Solutions

We are global business leader that provides tailored air compressors, air treatment, and nitrogen packages using extensive application expertise, and experience managing complex projects.

Our scope and know-how, combined with our ability to support our customers, has grown globally and allowed us to provide personalized service on a broad portfolio of complex projects. With total flexibility, we custom design and engineer our compressed air systems to provide the highest level of performance and reliability, to meet even the most rigorous and non-stop operational demands.

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About Ingersoll Rand Inc.

Ingersoll Rand Inc. (NYSE:IR), driven by an entrepreneurial spirit and ownership mindset, is dedicated to helping make life better for our employees, customers and communities. Customers lean on us for our technology-driven excellence in mission-critical flow creation and industrial solutions across 40+ respected brands where our products and services excel in the most complex and harsh conditions. Our employees develop customers for life through their daily commitment to expertise, productivity and efficiency.

We are committed to using environmentally conscious print practices.

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