Engineering Air Systems & Packaged Solutions

Over 60 years of experience managing and implementing
engineered to-order air packages for complex technical requirements

Ingersoll Rand

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Engineered Systems and Services
www.ingersollrand.com/en/project-solutions

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01 Introduction

1.1 Ingersoll Rand Profile

Ingersoll Rand is a global market leader with a broad range of innovative and mission-critical air, fluid, energy, specialty vehicle and medical technologies, providing services and solutions to increase industrial productivity and efficiency. Since merging with Gardner Denver in early 2020, we have more than 300 years of combined experience and innovative expertise.

Today's Ingersoll Rand brands offer market-leading solutions and services to help make life better. Customers rely on our proven products in a variety of industries and markets across the globe. Ingersoll Rand's diverse and innovative products range from complete air compressor systems, tools, ARO pumps, material handling systems and more. The market sectors served by Ingersoll Rand are primarily industrial manufacturing, transportation, energy, mining, construction, environmental, food and beverage, and more.

We take pride in our products and work tirelessly to ensure that they meet and exceed the growing demands of the industries we serve. That is why our customers return to us, our brands are ready to serve your needs for support on applications, products, service and warranty.

1.2 Our scope

Through the years, we have developed our know how and ability to support our customers globally, and today we are able to provide a range of **bespoke services**. As a company, we will continue to offer a full suite of **solutions for Air and Gas with the following products in scope:**

1. Air Compressors
- Screw Compressors
- Centrifugal Compressors
- Reciprocating Compressors
- Rotary Vane Compressors
- High Pressure Products
- Reciprocating Compressors

2. Air Treatment
- Desiccant Air Dryers (Heatless, External Heater, Heater Blower and Non-purge)
- Refrigerant Dryers
- Hybrid Packages

3. Nitrogen Generation
- PSA Systems
- Membrane Systems

4. Oxygen Generation (PSA)

5. Blowers
- Multi stage centrifugal blower. Integral geared sing stage

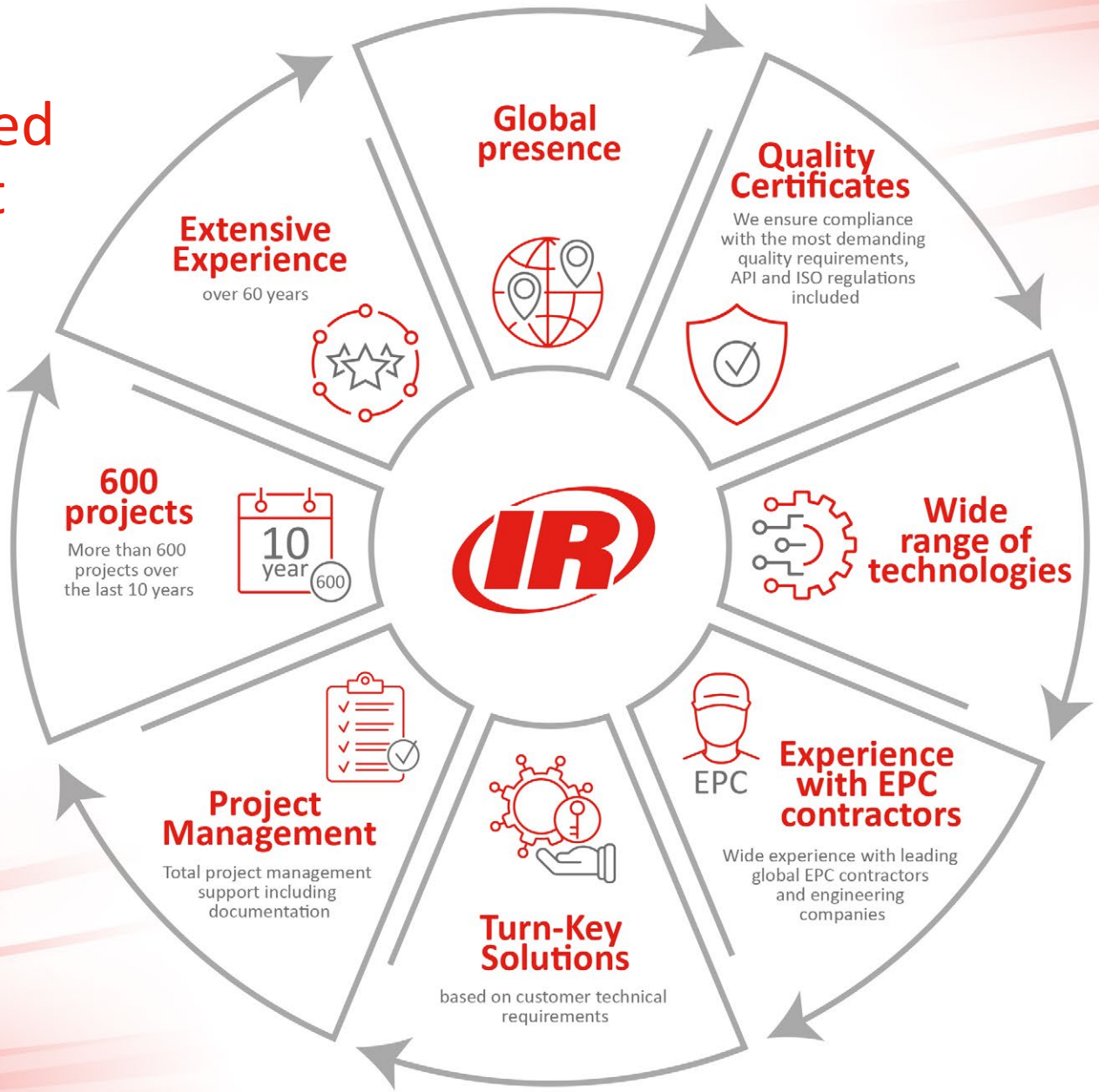
1.3 Industries

With more than a century of application experience and a range that covers every major technology, we can advise on, design, and supply the right machine **for a range of industries:**

- **Power Generation:** hydroelectric, nuclear, coal, cogeneration, gas, renewable energy plants, waste-to-energy and others.
- **Oil & Gas:** onshore, offshore, midstream.
- **Hydrogen Production Plants.**
- **Chemical & Petrochemical:** ammonia, ethanol, sulfuric acid, propane, carbon capture, propylene and others.
- **Water:** water desolation, water treatment and others.
- **Mining:** coal, gold, silver, copper and others.
- **Heavy Industry:** shipbuilding, steel production plants and others.
- **Other Industries.**

02 Added Values

2.1 Our Added Values at a Glance



2.2 Expertise in EPC Contracts

Ingersoll Rand has provided **specialized custom compressed air and nitrogen generation packages to international EPC contractors and engineering companies** across a range of industries.

Using the extensive experience that we have gained by working with EPC companies, Ingersoll Rand has developed the capabilities to carry our complex projects that are tailored to our customers' requirements. Engineered for performance, our range of equipment is built to provide maximum efficiency, reliability and uptime.

We are a leading global business provider, offering custom-made products to satisfy a range of customer needs, based on: **Market to Order (MTO), Engineering to Order (ETO), special configuration and Project Lifecycle Support (PLS) for complex projects and EPC contractors.**

2.3 Project Management

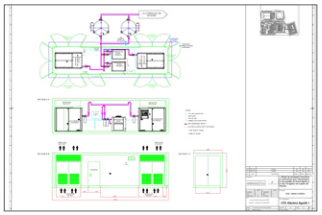
Ingersoll Rand offers a **complete project management service**, including equipment installation and integration services.

Our project management team of expert engineers control **the whole process, from the design through to assembly, commissioning and start-up; including technical & quality management.**

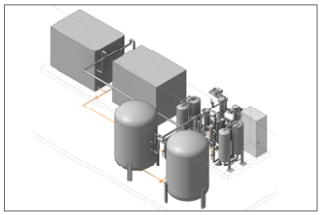
Ingersoll Rand supports you throughout the project lifecycle

EPC*	Order	Installation, Commissioning & Start up	Maintenance
Design phase. Specification & Product Customization	Project Management and Quality Assurance		Global Presence & Local Support

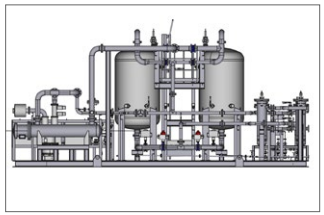
*Engineering, Procurement and Construction



GAD



3D Model of The Installation



3D Model

2.3 Our Standard Project Execution Procedure

Provided Services by Project Phase

DESIGN

- Basic and detailed design engineering
- Equipment modification to customer requirement
- Project integration
- Quality, environmental and safety management

PROJECT MANAGEMENT

- Documentation to customer requirements (mechanical, electrical, I&C, quality, logistics, etc.)
- Preparation of as built Drawings: P&ID, general arrangement, sectional drawings and 3D modelling
- Complete assembly of the package, including piping and control of the installation (PLC)
- Preparation of Installation, operation and maintenance manuals
- Protection against severe ambient conditions
- Purchasing, inspection, expedition and logistics management
- Inspection tests (mechanical, hydrostatic, packing) and final tests

COMMISSIONING AND START-UP

- Construction, assembly, pre-commissioning, commissioning and start-up
- Marking and packaging of the whole supply
- Shipping
- Customer training

AFTERMARKET

- Local Support
- Genuine Parts and Lubricants
- Multi-brand Solutions
- Extended warranties
- Remote Monitoring and Preventive Maintenance
- Training & Seminars

2.4 Installation Solutions

Ingersoll Rand can custom design and manufacture your equipment package including components such as: structural baseframe, machinery mounting pads, piping, tubing, electrical wiring, instrumentation, and controls. The different installation types are purpose **designed in accordance with customer specifications and applicable ISO/ API standards and to major international codes and standards.**

Container
- Ambient conditions inside the shelter controlled
- Compact design

Skid
- Easy transportation
- Connection points with customer at skid edge: inlet/outlet, make-up water drains and electrical supply

Supply of system components
- Whole installation mounted in our facilities. We have the capability to run the package fully assembled.
- Before transportation, all interconnecting piping and wiring is disassembled

Containerized Air Compressor Packages

Skid Mounted Nitrogen Feed
Air Compressor & Dryer Package

Supply of air compressor

2.5 Turnkey Installations

At Ingersoll Rand we know that every customer has unique necessities. **Every machine can therefore reflect the particular requirement of each customer.** Ingersoll Rand Air and Nitrogen Packages are also designed to operate in harsh environments. Our equipment is engineered to face the most extreme ambient temperatures and extreme environmental conditions.

Modifications

A wide variety of options can be customized to meet even the most demanding customer requirements:

- Outdoor Installation
- HAT (55°C ambient temperature)
- MV Motors
- ATEX Certified Motors
- PLC Control Panels
- Special Instrumentation
- ATEX Certification (Zone 2)
- Coolers Design and Materials (Sea Water Cooling)
- Inlet Filters for Ambient Desert Conditions
- Air Ducts & Heaters for Low Ambient Temperatures
- Stainless Steel Canopies
- API 618, API 619 And API 672 Compliant Equipment

2.6 Quality Standards

Ingersoll Rand has multiple **quality certificates, issued by different institutions worldwide**. We continually optimize our management systems to supply our customers with high-quality products, service, and solutions tailored to their individual needs.

API 618
Ingersoll Rand reciprocating compressors meet the requirements of API 618. We custom engineer every unit by designing each cylinder and valve, and select other components to meet
API 618 technical requirements.

API 619
Ingersoll Rand compressor technology is based on the requirements of API 619. These compressors offer a horizontal balanced design, moderate and low speeds and a low operating temperature for reliable operation year after year.

API 672
Integrally Ingersoll Rand Geared Centrifugal Compressors (IGC) obtained their recognition as a pursuable technology for the critical process gas services thanks to the implementation of a dedicated API 672 – 4th ed. for the application of instrument and utility air compressors.

Ingersoll Rand has a long tradition of providing solutions tailored for explosive environments. As specialists in compressor and blower technologies, protection within different ATEX and IECEx-zones is part of our day-to-day business. We have many years of expertise in providing IECEx certified air-cooled oil-free screw and ATEX certified air-cooled oil injection screw compressors. In addition, we deliver certified instrumentation, ATEX certified PLC control panel, pneumatic operated LCP for air dryers, explosion proof certified junction boxes, cable glands and IS barriers.

These compressor and dryer packages were built according to API specifications

2.7 Global Presence

We are committed to providing our global customer base with around the clock care and support.

With innovative products and services, Ingersoll Rand team works with our customers to solve even the toughest technical challenges. Via our group's global network, we make sure that the decades of knowledge and expertise gained working on complex EPC projects is made available to each and every EPC contractor and end-user working on your project.

As one of the world's largest manufacturers of engineered air compressors, air treatment, and nitrogen packages; Ingersoll Rand is represented by a comprehensive network branches and authorized partners in over 50 countries.

2.8 References

Engineering Project solutions has supplied its special packages for nitrogen or instrument air to many renowned global international EPC contractors and engineering companies in power generation, also in other industries such as oil & gas, chemical, water treatment, and mining industries.

We have supplied **more than 600 customized projects over the last 10 years.**

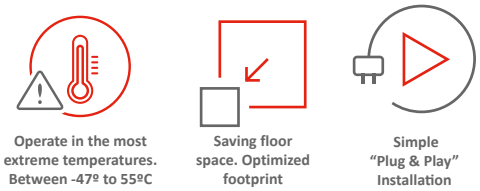
PLEASE ASK FOR THE LATEST VERSION OF OUR REFERENCE LIST

03 Products

3.1 Air Compressor Packages

The majority of our air compressor packages are **custom built and shipped with all components.**

Our tailored air compressors are ready for operation, flexible, easy to integrate into any process, help minimize operating costs and prepared to face the strictest quality standards. Ingersoll Rand is your single source solution for engineered air systems for instrument, plant, bulk and nitrogen generation feed air applications.



3.1.1 Rotary Screw Compressors

Our lubricated and oil-free rotary screw compressors incorporate the very latest technological advances and guarantee a continuous supply of high quality compressed air. The screw compression element is designed and manufactured in-house, using the latest CNC rotor grinding machinery.

Industry Application

Rotary screw compressors are often used to supply vast amounts of air to a large industrial applications. The advanced technology allows the compressor to run continuously, providing a large output of high-quality air flow, perfect for demanding applications in the following sectors:

- Oil & Gas
- Power Generation
- Chemical & Petrochemical
- Mining
- Water Treatment
- Electronic
- Industrial
- Medical & Pharmaceutical
- Others

Oil-free Air
Compressor & Dryer
Package assembled in a container

IECEx Ex energy API 619, 618, 672

TECHNICAL DATA	
• **Flow rate:**	Oil-free: up to 3,000 m³/hr (FAD) (air-cooled) / 5,000 m³/hr (FAD) (water-cooled) Oil injected: up to 2750 cfm (FAD) (air-cooled) / 4000 cfm (FAD) (water-cooled)
• **Operating Pressure:**	Oil-free: up to 10.5 (air-cooled and water-cooled) Oil injected: up to 14.4 barg
• **Power:**	Oil-free: up to 400 kW (air-cooled) / up to 670 kW (water-cooled) Oil injected: up to 500 hp

Comfortable even when hot

The air-cooled compressor packages are designed to operate in temperatures of up to 55°C, working under strenuous conditions either outdoor or indoor, refineries, deserts and sandy environments. These compressors are built to withstand the most extreme temperatures, and so designed to work in challenging environments

3.1 Air Compressor Packages

High Efficiency

Long Life Expectancy

Easy Maintenance

3.1.2 Reciprocating Compressors

Our reciprocating compressor packages are known for their excellent energy efficiency. We have consolidated and at the same time consistently developed this proven technology, maintaining its cutting edge, high-quality, robust construction along and excellent efficiency. The result is an improved Return On Investment (ROI) and shorter payback time.

Industry Application

Ingersoll Rand reciprocating air compressors are often served in a wide range of applications. The most typical types of applications are:

- Oil & Gas
- Power Generation
- Food & Beverage
- Chemical
- Cement
- Pharmaceutial
- Textiles

TECHNICAL DATA	
• **Flow rate**	112 m^3/hr- 3,400 m^3/hr 68 cfm- 2,000 cfm
• **Operating Pressure:**	2-90 barg
• **Power:**	Up to 650 kW

Two sets of Reciprocating Air Compressor Packages on one Common Skid

IECEx Ex energy API 619, 618, 672

3.1 Air Compressor Packages

3.1.3 Centrifugal Compressors

Integrally geared centrifugal compressors represent the latest technology to deliver higherflows for relatively constant air demands. They are highly efficient and cost-effective when compared to other technologies.

Industry Application

We offer a broad portfolio of reliable centrifugal products that will adapt to your application:

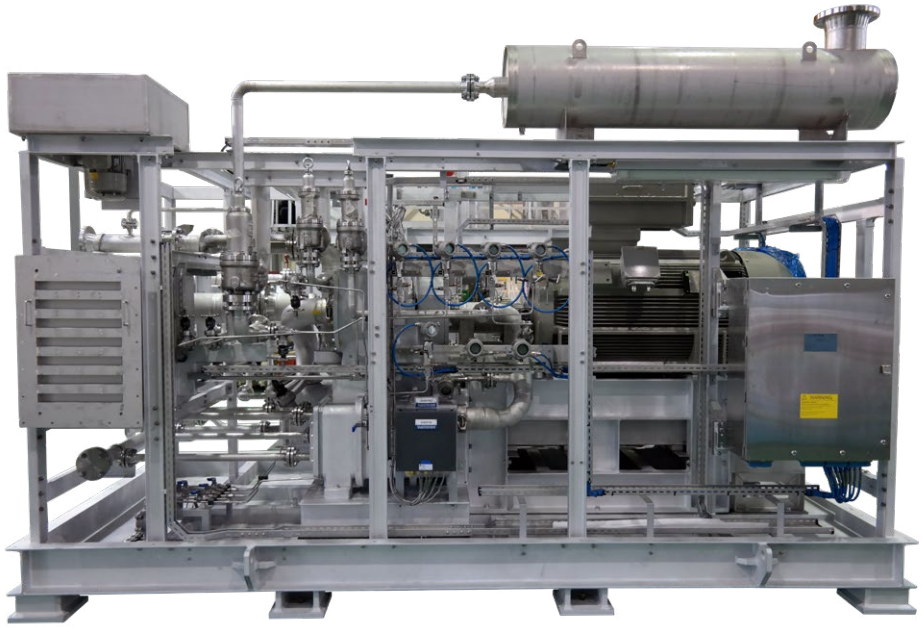
- Oil & Gas
- Chemical
- Electronics
- Food & Beverage
- Textile
- Aerospace

TECHNICAL DATA	
• **Flow rate**	2718 m³/h – 47572 m³/h 1600 cfm- 28,000 cfm
• **Operating Pressure:**	3 to 42 barg
• **Power:**	4,5 MW

High Efficiency

Easy Maintenance

Simple "Plug & Play" Installation



Water Cooled Centrifugal Air Compressor

IECEx

Ex

energy API 619, 618, 672

3.2 Air Dryer Packages

All units can be fully packaged, including the PLC based controller and can be supplied as per customer requirements. (this first sentence in bold). Ingersoll Rand provides standards designs or totally engineered for heavy-duty and severe ambient installations, extreme temperatures or explosive environment conditions.

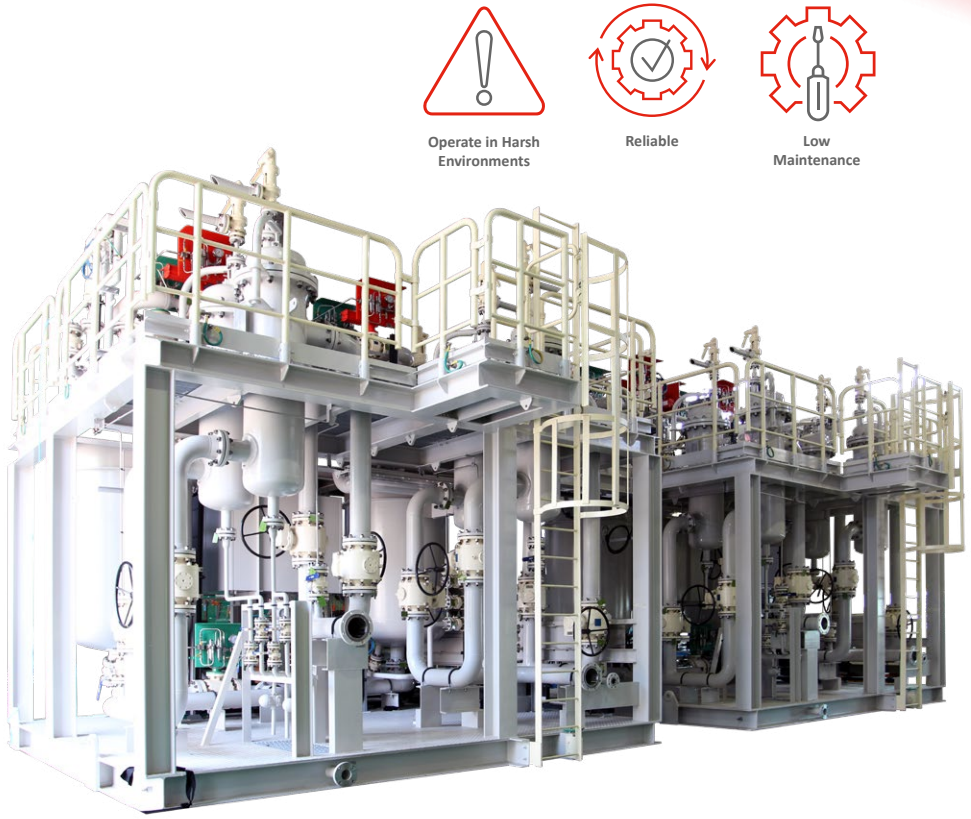
Ingersoll Rand manufactures a wide range of adsorption, refrigerant and hybrid air dryers suitable for any kind of application and specific needs.

Our compressed air systems utilize the **latest technology to provide energy efficient solutions with low life cycle costs**. Air purity meets that meets international standards and can only be achieved with filtration, water separation and drying. The use of clean dry compressed air ensures high levels of reliability, and guarantees that quality standards are met and can reduce production costs.

3.2.1 Adsorption Air Dryers

Adsorption compressed air dryers are designed to remove moisture by passing air over a regenerative desiccant material, which attracts and retains water vapour molecules. The term pressure dew point refers to the temperature at which water condensation will occur, a typical pressure dew point specified for an adsorption dryer is-40°C which prevents corrosion and inhibits the growth of microorganisms.

TECHNICAL DATA	
• **Flow rate:**	As per requirement
• **Operating Temp./ Pressure:**	Up to 60 deg.C / 13 barg
• **Dew point (PDP):**	-40 def.C (heatless) /-70 deg.C (heater)



Heatless Regeneration Desiccant Air Dryer

3.2 Air Dryer Packages

3.2.2 Refrigerant Air Dryers

Ingersoll Rand designs and manufactures packages refrigeration systems with as alternative technical solutions to ensure no more vapor forms in compressed air. This is achieved thanks to the heat exchangers that are used to cool compressed air which will condense the bulk amount of water vapor within the air.

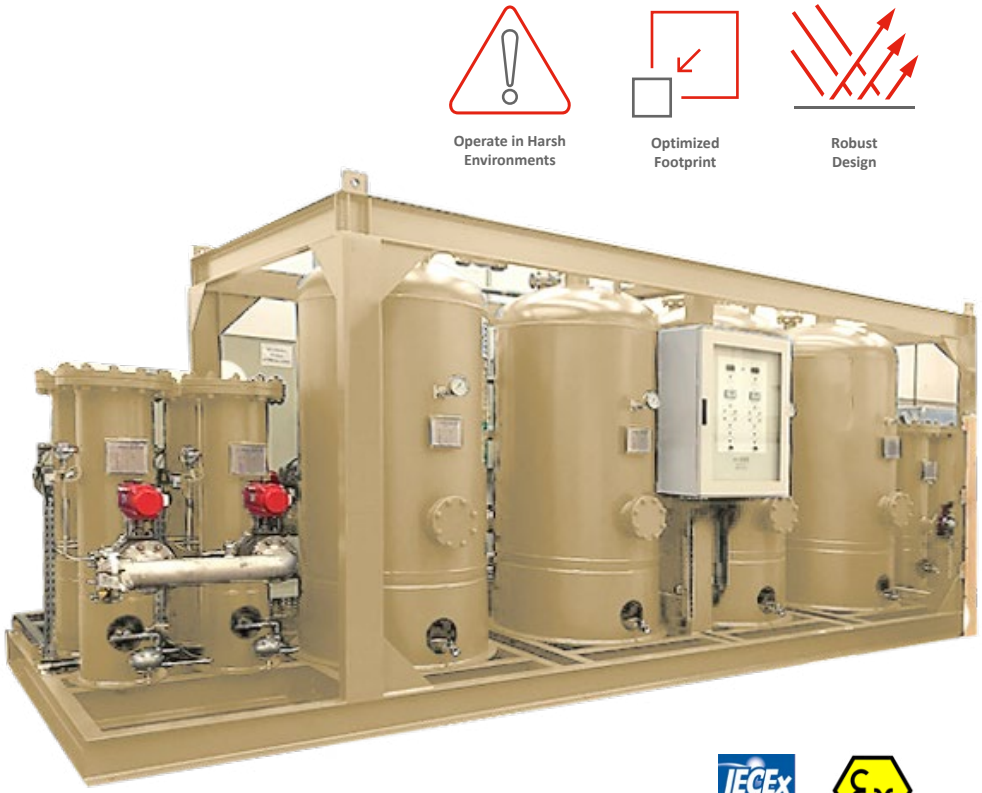
The pressure vessels design code can be manufactured and certified as per ASME/PED or other standards.

Industry Application

Ingersoll Rand refrigerant dryers deliver a comprehensive, cost-effective solution to multiple applications across a wide range of sectors including:

- Power Generation
- Oil & Gas
- Chemical & Petrochemical
- Water Treatment
- General manufacturing
- Mining
- Medical & Pharmaceutical
- Others

TECHNICAL DATA	
• **Flow rate:**	4,9 m³/hr- 5028 m³/hr 2,8 cfm – 2959 cfm
• **Dew point (PDP):**	2,5 to 16 barg
• **Power:**	Up to 325 kW



Refrigerant Air Dryer

3.2 Air Dryer Packages

3.2.3 Hybrid Combination Dryer Packages

Hybrid combination dryers blend the best of both refrigerant and desiccant air drying technologies. This innovative mix provides air dryers that produce higher quality air while using less energy. Ingersoll Rand has developed these hybrid dryers to cater to diverse compressed air systems, offering the strong moisture removal you get from desiccants with the energy-smart benefits of refrigerant-based drying.

Industry Application

We offer a broad portfolio of reliable centrifugal products that will adapt to your application:

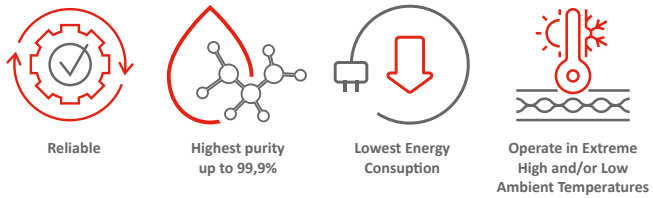
- Oil & Gas
- Chemical
- Water Treatment
- Electronics
- Food & Beverage
- Textile
- Aerospace

TECHNICAL DATA	
• **Flow rate:**	4,9 m³/hr- 5028 m³/hr 2,8 cfm – 2959 cfm
• **Dew point (PDP):**	2,5 to 16 barg
• **Power:**	Up to 325 kW

Hybrid Air Dryer

3.3 Nitrogen Generation Packages

Our custom-designed nitrogen generation packages are supplied with PLC based controllers. They are mainly used for blanketing and purging applications in a wide range of industries. Our experience covers installations at desert or artic ambient conditions, as well as in classified areas.



3.3.1 PSA Systems

Hybrid compressed air dryers from combined refrigerant and adsorption dryer technology. This unique combination of technology offers higher quality air and lower energy consumption compared to traditional heatless and heat regenerative adsorption dryer technology.

Industry Application

We offer a broad portfolio of reliable centrifugal products that will adapt to your application:

- Oil & Gas
- Chemical
- Water Treatment
- Electronics
- Food & Beverage
- Textile
- Aerospace

Nitrogen Generator. Pressure Swing Adsorption Type

3.3 Nitrogen Generation Packages

3.3.2 Membrane Systems

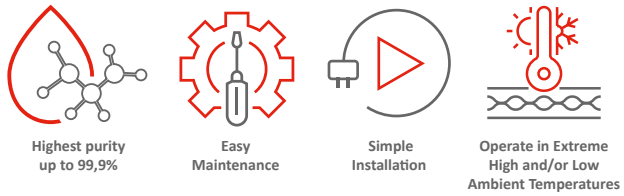
Ingersoll Rand can supply membrane nitrogen packages as per customer requirements.

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. Dried and cleaned compressed air (<+5°C pdp) that enters these fiber walls is filtered of water vapor, CO2, and oxygen.

Ingersoll Rand can advise the most effective membrane selection as per specific project conditions.

Industry Application
Ingersoll Rand membrane nitrogen packages can be supplied in a wide range of industries including:

- Oil & Gas
- Power Generation
- Chemical & Petrochemical
- Mining
- Marine



Nitrogen Generator. Membrane Type

TECHNICAL DATA	
• N_2 Flow Capacity:	Max. 2,000 Nm^3/hr
• N_2 Purity:	95- 99,99%

3.4 Oxygen Generation Packages

Our custom-designed nitrogen generation packages produce oxygen from compressed air by using PSA technology. This technology separates oxygen from other gases in the air under pressure.

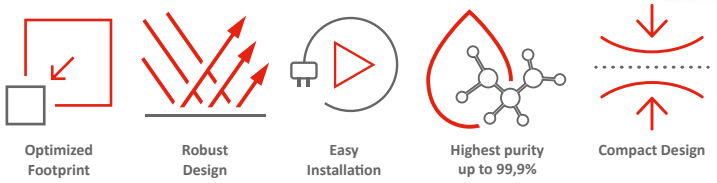
Oxygen generators produce oxygen from compressed air. These packages offer a cost-effective, reliable and safe alternative to traditional oxygen gas generators.

Our oxygen generators can be supplied as a containerized oxygen.

Containerized oxygen package
Our custom-designed nitrogen generation packages are containerized and produce oxygen from compressed air by using PSA technology. This technology separates oxygen from other gases in the air under pressure.

Skid mounted oxygen generator
Ingersoll Rand's skid mounted oxygen generators are built on the skid with one central electric socket, enabling quick start up. The unit consists of air compressor, compressed air treatment system, oxygen generator, air and oxygen tank, gas booster and filling ramp. This compact, plug & play solution does not require extensive installation.

Industry Application
Ingersoll Rand oxygen packages can be supplied for the following industries:
- Medical
- Steel



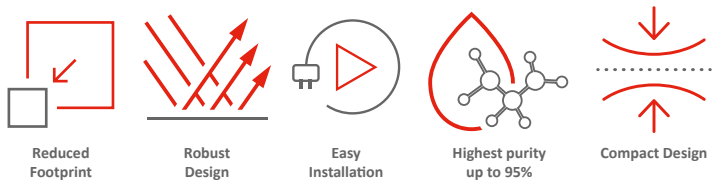
Oxygen
Generator Package

TECHNICAL DATA		
ITEM	**STANDARD**	**CUSTOM MADE SKIDS**
O_2 flow capacity (Nm^3/h)	0.5 ~ 575	Up to 3000
O_2 purity	90 ~ 95%	90 ~ 95%
Discharge pressure (barg)	4 ~ 6,5	4 ~ 7

3.5 Blower Generation Packages

Ingersoll Rand is also a global manufacturer of blowers. We specialize in highly engineered blowers to provide the quality you need and the performance you expect.

Our blower packages are customised and adapted with different kinds of features and accessories to meet your individual needs. Minimise operational costs with easy maintenance and maximize efficiency with the many available options.



Industry Application

Ingersoll Rand blower generation packages can be supplied for the applications of ash handling conveying, oxidation, agitation and processing & conveying commonly found in:

- Oil & Gas
- Power Generation
- Industrial Processing
- Water Treatment

TECHNICAL DATA	
• **Flow rate**	Up to 68,000 m^3/hr or 40,023 CF<
• **Operating Pressure:**	Up to 1.3 barg
• **Power:**	Up to 2,000 kW

Multistage Centrifugal Air Blower

IECEx Ex energy API 619

04 Aftermarket & Service

04 Aftermarket & Service

Ingersoll Rand offers a **comprehensive line of maintenance packages and programs.** We provide a **range of service, replacement parts and support products** to help our customers increase their return on investment, maximize safety and performance, and provide total peace of mind.

We have a comprehensive global network of strategically located manufacturing facilities, sales offices, and authorized service centers. This allows us to **think globally and act locally**, providing service and support to our customers where and when they need it.

Ingersoll Rand takes customer service very seriously and we have developed our aftermarket capabilities year on year. Our customers rely on us day after day to keep their systems running **cost-effectively and at optimum performance.**

INSTALLATION AND COMMISSIONING SERVICES

With Ingersoll Rand Installation and Commissioning you can ensure a technically sound start-up supervised by an Ingersoll Rand Service Technician. We ensure on-site performance meets design specifications, and will provide baseline performance readings that provide valuable information for ongoing maintenance.

- Pre-commissioning Activities
- Commissioning and Start-Up
- Site Training

RECOMMENDED SPARE PARTS & LUBRICANTS BENEFITS

- Small investment
- Avoid unplanned maintenance repairs
- Eliminate lead time on critical consumable items

05 Engineered Systems and Services (ESS)

05 Engineered Systems and Services (ESS)

Ingersoll Rand's Engineered Systems and Services (ESS) is dedicated business line to providing market-leading, **custom-engineered solutions.**

Formed from a merger of three renowned business units - Ingersoll Rand Air & Gas Solutions, Ingersoll Rand Engineering Project Solutions, and K. LUND Offshore - Ingersoll Rand Engineered Systems and Services (ESS) leverages extensive experience to serve Engineering, Procurement, and Construction (EPCs) contractors and other firms in need of specialized engineering Services.

With a portfolio that includes state-of-the-art **air and gas compressors, dryers, nitrogen generators, and gas recovery Systems**, Ingersoll Rand Engineered Systems and Services (ESS) is committed to pioneering innovation and maintaining the highest standards of engineering excellence. We pride ourselves on managing intricate projects across the globe, employing cutting edge technology to drive the success of our customers.

06 Contact details

06 Our Manufacturing Facilities

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Ingersoll Rand India
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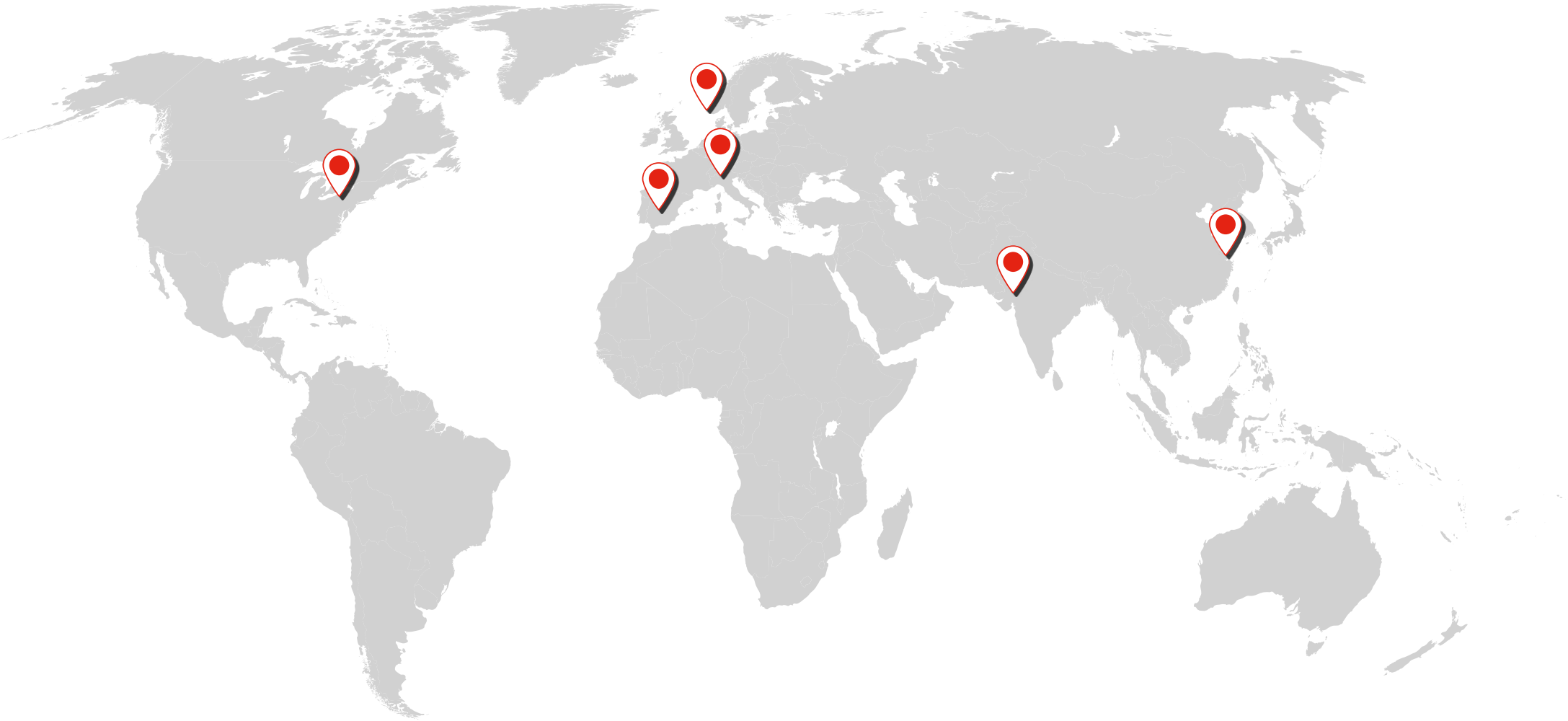
Phone: +91 79 4070 6200



Ingersoll Rand

Request a Quote

Engineered Systems and Services
www.ingersollrand.com/en/project-solutions