Centrifugal Air Compressor

MSG® TURBO-AIR® Series

Ingersoll Rand®

Ingersoll Rand Profile

Ingersoll Rand is one of the first foreign companies to enter China after its reform and opening up and to introduce screw air compressor technology to China. Since its operation in China in 1922, Ingersoll Rand has been committed to building long-term partnerships with Chinese suppliers, manufacturers and customers, and has made significant contributions to China's industrial and economic development by continuously expanding the depth and breadth of its involvement in China's economic activities through direct investment and the introduction of new products and technologies.

Currently, Ingersoll Rand has 1 investment company, multiple trading companies, multiple manufacturing bases, and 1 Asia-Pacific regional technology research and development center in China, with business operations covering more than 30 cities nationwide. Our strong performance driven by technology in building key business processes and providing industrial solutions has earned us the trust of our customers.

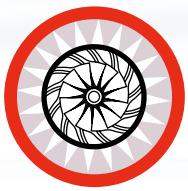
Ingersoll Rand values people-oriented innovation and uses digital transformation to drive a low-carbon sustainable development strategy. Driven by entrepreneurship and a sense of ownership, the company encourages all employees to actively participate in various activities, frugal education programs, and other related community initiatives to reduce environmental impact. As a responsible corporate citizen, Ingersoll Rand is committed to energy-saving and environmentally friendly sustainable operations and has announced environmental goals for 2030-2050 to mitigate climate challenges. Adhering to the value of "Trusted to make your life better," the company serves global customers and helps them improve their living and working environments through the use of Ingersoll Rand products. Due to its outstanding contributions to promoting China's economic and social development over the years, Ingersoll Rand has been awarded the "Outstanding Brand Image Award" for five consecutive years and has received numerous public welfare awards. It has been repeatedly selected by Fortune magazine as one of the "World's Most Admired Companies" and is included in the Dow Jones Sustainability Global Index and the North America Index.

Ingersoll Rand and its employees are fully committed and persistent in providing reliable expertise to customers, helping them increase productivity and efficiency, establishing lifelong connections with customers, and striving to make continuous contributions to China's economic growth.

Advantages of Centrifugal Compressor Technology

Leveraging over half a century of rich experience in the compressor industry, the robust, efficient, and economical integrally geared centrifugal compressors possess technical advantages that old-style compressors cannot match.

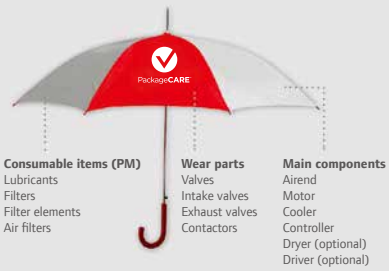
When comparing the innovative centrifugal compressor technology with other machines, such as positive displacement compressors, its advantages become even more apparent.

	Ingersoll Rand's Centrifugal Compressor	Other Compressors
 **Low Maintenance Cost**	■ No need for regular replacement of wear parts ■ Easy replacement of oil & gas filter elements	■ Requires regular maintenance and exchange of the airend ■ High operating and maintenance costs, downtime wastes valuable production time
 **Oil-free Air**	■ 100% oil-free compression ■ Prevention of system contamination	■ Must install oil filter at the exhaust outlet ■ Potential oil content poses contamination risk to the process
 **No Pulsation**	■ No pulsation, no need for surge tanks	■ Requires the use of surge tanks to reduce pressure fluctuations
 **Superior Control**	■ Automated operation suitable for any operating conditions ■ State-of-the-art Maestro control system	■ Limited range of load variation ■ Need for expensive variable speed drives to achieve load adjustability
 **No Vibration**	■ Truly vibration-free ■ No need for a dedicated foundation	■ Requires large, deep foundation to withstand significant weight and imbalance forces ■ Must take precautions to prevent vibration transmission to other equipment

PackageCARE™

- With PackageCARE, both parties can focus on their respective areas of expertise, allowing each to do what they do best. Ingersoll Rand takes care of your compressed air needs, while you can concentrate on your core business.
- By opting for PackageCARE, you can transfer all risks to us from day one, ensuring peace of mind without any worries.
- We guarantee that your equipment is installed correctly from the outset, equipped with the right tools and spare parts.We handle inventory management, delivering value, convenience, and efficiency. This ensures that none of your equipment is overlooked.

Total equipment cost analysis



Simple Installation

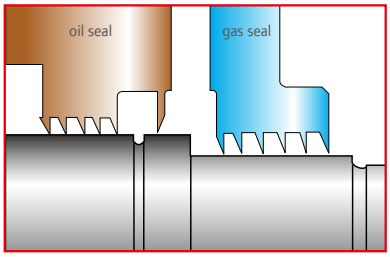
- The compressor, lubrication system, intercooler, coupling, coupling guard, and interstage piping are all mounted on a common base
- Easy access and maintenance of components
- Offering exceptional flexibility, and able for fully customized to meet clients' requirements
- Smaller structure
- No pulsation

Inherent Variable Load Capacity

The advanced control system of our centrifugal compressors provides inherent variable load capacity, eliminating the need for variable speed drives that have high maintenance requirements. This unique feature offers the following advantages:

- High efficiency
- Lower maintenance costs
- Simple operation

Oil-free Air



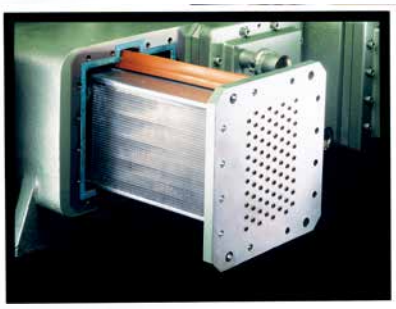
Seals-The non-contact, wear-free labyrinth gas and oil seals meet Class 0 standards for oil-free gas seals, helping reduce air leakage rates and extend maintenance cycles.

High Reliability

Ingersoll Rand centrifugal compressors are known for their high reliability, thanks to the following features:

- Thrust load absorption at low speeds
- Corrosion-resistant compression elements
- Energy-efficient, high-quality gear design
- Gear bearing design with no life limitation
- Non-contact gas and oil seals

Easy Operation and Maintenance

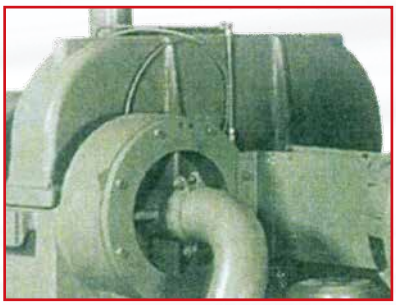


Intercooler - The intercooler is designed with a water-in-tube configuration, allowing for easy extraction and facilitating inspection and cleaning.

- Removable intercooler and aftercooler units for convenient cleaning.
- Horizontally split gearbox, enabling quick and easy maintenance.
- Water-in-tube design of the intercooler simplifies the mechanical cleaning process
- Prevention of system contamination
- Elimination of potential fire risk from oil carryover
- Cost savings from avoiding oil accumulation cleanup
- Savings on oil removal filter expenses and maintenance costs

Advanced pinion bearing design - Unlimited operational life under any load.

- State-of-the-art control devices for dedicated control systems
- Automatic operation achievable in any working condition
- Fault self-diagnosis system
- No wearing parts in the compression element that require regular replacement
- No need for oil removal filters



Horizontally split gear unit - Facilitates regular inspection and maintenance by users

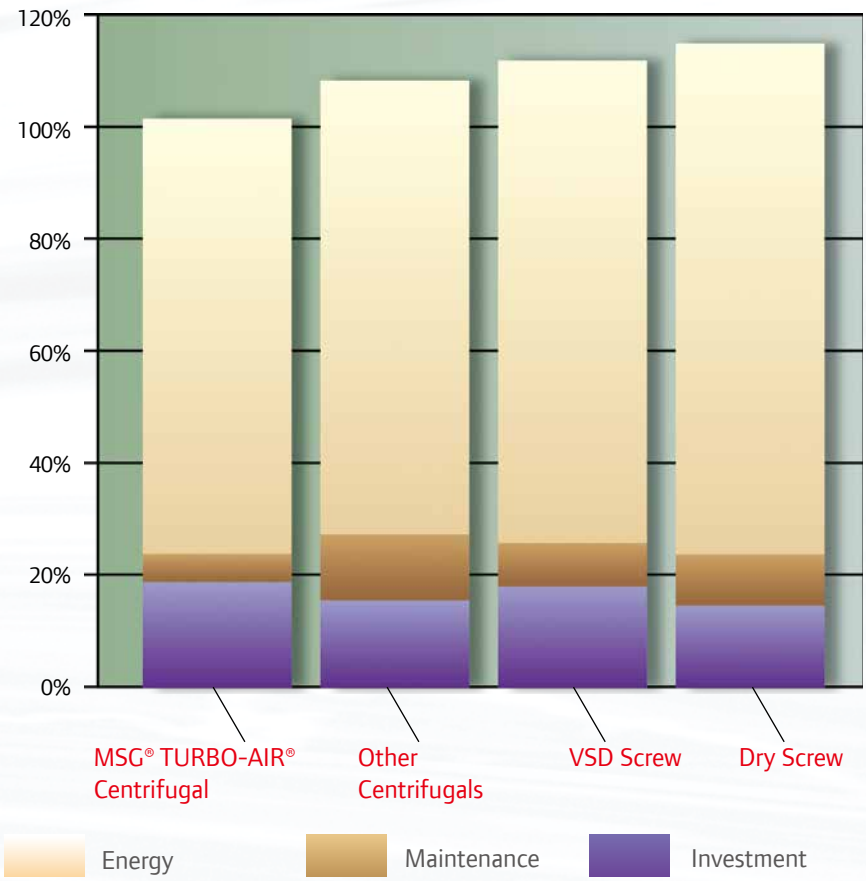
More Economical Compressor Operating Costs

As operating time accumulates, the greater expenditure for compressed air systems is the energy consumption required to maintain their continuous operation. In today's world, where energy consumption is highly valued, the energy expenditure of air compressors becomes particularly important. Considering the initial investment, operating energy expenses, and maintenance costs of air compressors is a crucial basis for estimating the lifecycle cost of an air compressor.

As shown in the table below, among all types of air compressors, including dry screw compressors, variable speed drive (VSD) screw compressors, and other centrifugal air compressors, choosing the MSG® TURBO-AIR® series centrifugal air compressor is equivalent to choosing a more economical investment method. VSD screw compressors often emphasize that their machines can achieve 50% airflow capacity through variable speed and save energy. However, users can also choose a smaller model to save on initial investment. Additionally, as operating time increases, the maintenance costs and expenses for wearing parts of dry screw compressors become higher and higher, and energy expenditure also shows a gradually increasing trend.

By comparing with other screw and centrifugal compressors of the same capacity, it can be seen that the MSG® TURBO-AIR® centrifugal compressor is the ideal choice for users in terms of economic efficiency in all applications. The obvious energy-saving mode allows users to recover their initial investment faster and improve the return on investment.

Comparison of Lifecycle Costs for 10 Years of Operation at 80% Load



Variable Inlet Guide Vanes

- Variable inlet guide vanes can save up to 9% of electrical energy.
- Inlet guide vanes can adjust the airflow direction at the inlet to align rotation direction with the impeller, thereby reducing energy consumption.
- Net power can be saved when the flow decreases or the gas temperature is lower than the design temperature.
- Inlet guide vane is close to the impeller, resulting in higher efficiency.

Compressors to Meet Your Needs

Whatever your application requirement is, there is always a centrifugal compressor that can meet. TURBO-AIR® Series have a total installed base of over 18,000 units worldwide, spanning nearly every continent, and has earned a solid reputation across a wide range of industries. Factory air applications include:

- Textile
- Food and Beverage
- Automobile
- Pharmaceutical
- Chemical
- Electronics
- Aerospace
- Industrial Gases
- Oil and Gas Refining
- Water Treatment
- Artificial Snowmaking
- Power Generation
- General Industry
- Petrochemical

Control Systems

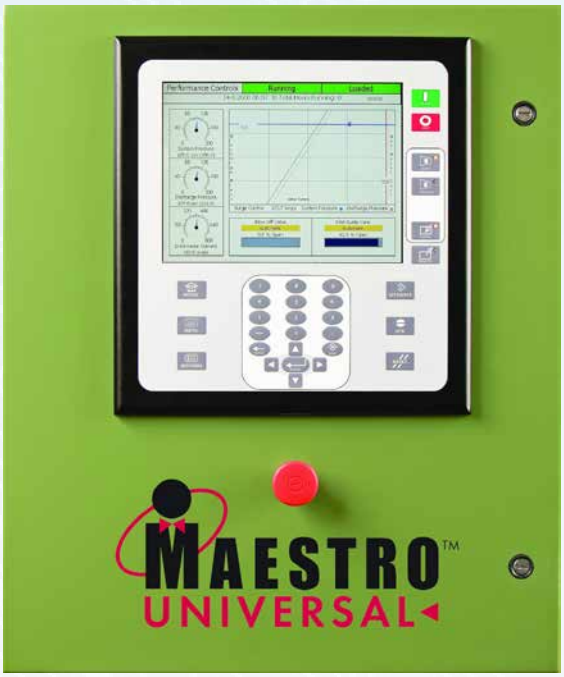
We can provide the right control system specifically designed for your application.

MAESTRO™ Universal

MAESTRO™ is a control system that offers enhanced protection and control for your compressor system. The MAESTRO control system includes models that are sure to meet your needs.

MAESTRO™ Universal

- Windows CE-driven system, including a built-in web server and a setup wizard for quick configuration
- Capable of handling multi-level configurations, specifically designed for various compressor constructions and models
- 10" color graphic display for easy monitoring
- Built-in USB port for system configuration and data logging
- Ability to monitor and control the entire system across multiple units
- Standard I/O modules, including 10 digital signal inputs, 11 digital signal outputs, 13 analog signal inputs, 4 analog signal outputs, and 10 RTD signal inputs
- Supports multiple communication methods: Ethernet, Modbus, USD, Networking Port (MCM), CANBus
- Built-in with 20 system languages
- Built-in RS485 communication interface, allowing data transmission to the DCS system via the MODBUS protocol, thereby enabling DCS system monitoring of the air compressor
- Offers stainless steel housing as an upgrade option
- Provides multiple protection level options: NEMA12, NEMA4, NEMA4X
- Can meet explosion-proof level Class 1, Div 2 (optional)



Certified with ISO Class 0

The Turbo-Air centrifugal compressor product line has a history of producing oil-free air for over 60 years. This certification signifies that our compressors are capable of producing certified oil-free air, providing our customers with a strong quality assurance.

True Oil-Free ZERO ISO 8573-1 Class O

MSG® TURBO-AIR® Series Compressor Models

MSG® TURBO-AIR® centrifugal compressor provides an advanced, high-quality oil-free air source for factory air and other applications.

MSG® TURBO-AIR® 2000

MSG® TURBO-AIR® Cooled 2000

MSG® TURBO-AIR® 3000

MSG® TURBO-AIR® 6000

MSG® TURBO-AIR® NX8000

MSG® TURBO-AIR® NX12000

MSG® TURBO-AIR® 2040

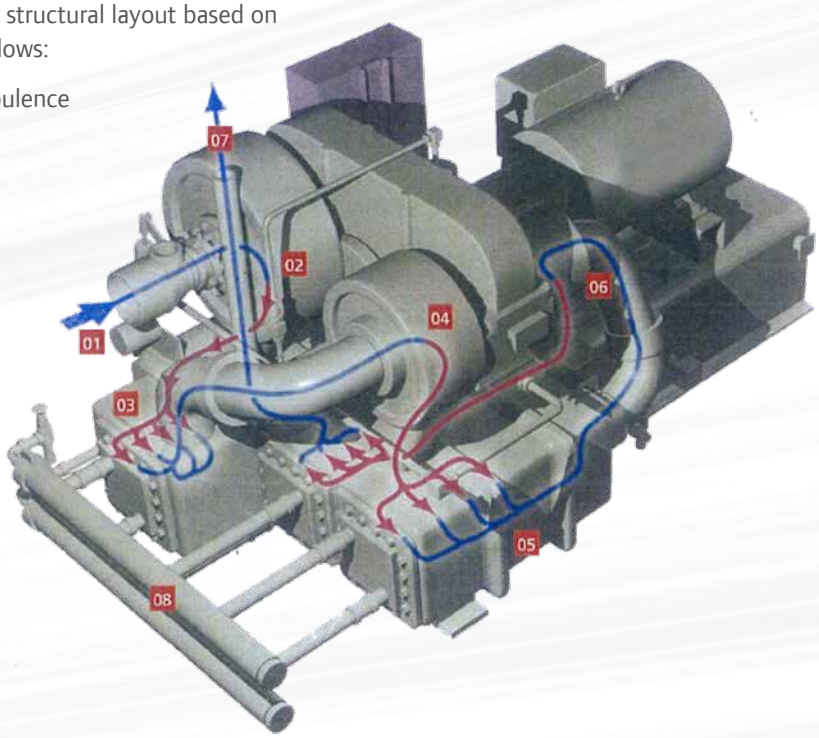
MSG® TURBO-AIR® 6040

Model	Power range kW	Power range hp	Flow range m^3/min	Flow range cfm
MSG® TURBO-AIR® 2000	93~260	125~350	14.3~50	505~1,765
MSG® TURBO-AIR® 3000	298~597	580~800	57~120	2,000~4,000
MSG® TURBO-AIR® 6000	670~1,270	900~1700	113~240	4,000~8,500
MSG® TA-NX 8000	750~2,700	1,000~3,750	135~338	4,850~11,950
MSG® TA-NX 12000	1,100~4,200	1,500~5,650	210~560	7,500~18,500
MSG® TURBO-AIR® COOLED 2000	93~260	125~350	14.3~50	505~1,765
MSG® TURBO-AIR® 2040	430~597	580~800	42~51	1,500~1,800
MSG® TURBO-AIR® 6040	1,678	2,250	127~167	4,500~6,000

Typical Compressor Layout Diagram

Centrifugal compressors are designed with a rational structural layout based on the characteristics of air flow. The features are as follows:

- Guiding air flow to reduce friction caused by turbulence
- Cooling the air after each stage to ensure higher isothermal efficiency



TURBO-AIR

01: Compressor inlet

02: First stage compressor volute

03: First stage intercooler

04: Second stage compressor volute

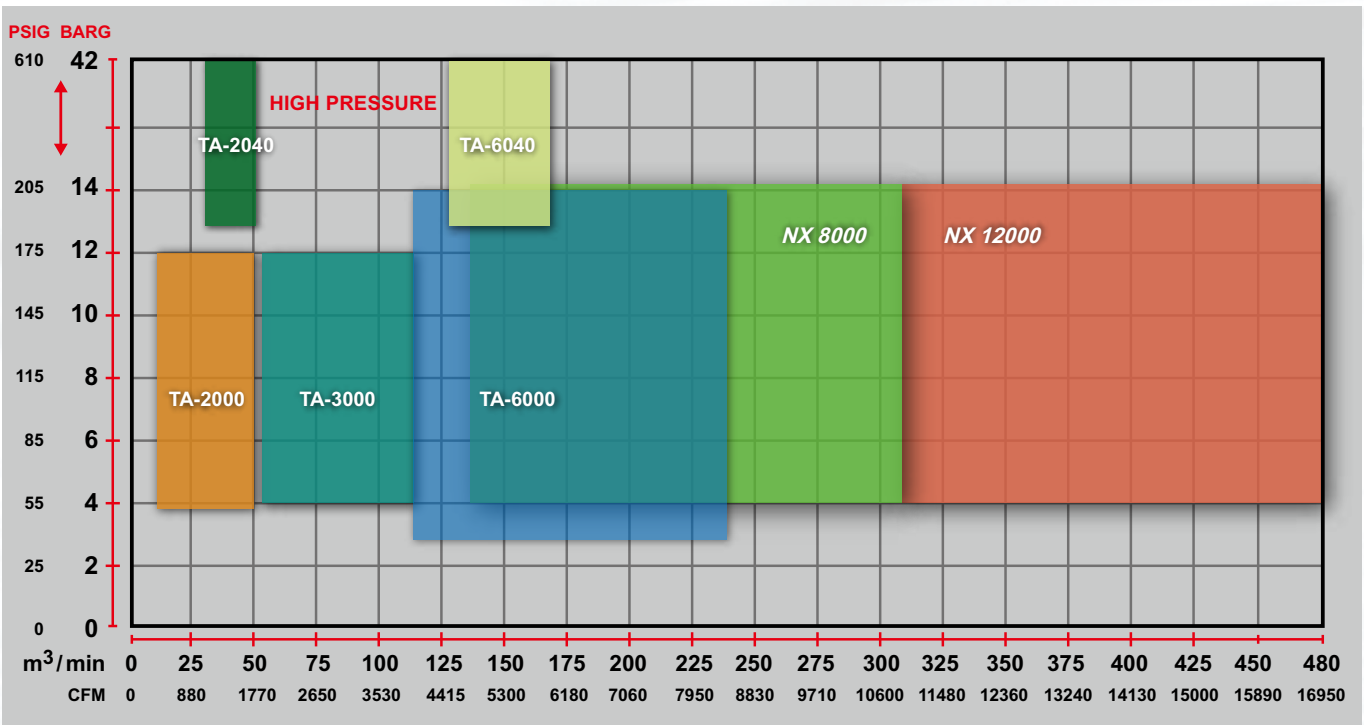
05: Second stage intercooler

06: Third stage compressor volute

07: Compressor outlet

08: Inlet water manifold (optional)

Air Compressor Product Parameter Range



Note: This chart represents a typical process flow diagram. For higher pressure or airflow requirements, please consult Ingersoll Rand

Professional Manufacturing Capabilities

With advanced technical expertise, extensive management experience, and superior manufacturing standards, we have consistently been at the forefront of the manufacturing industry worldwide. We have obtained the ISO 9001:2008 quality management system certification and have used it to improve product quality and optimize delivery cycles.

Manufacturing Technology Highlights

- CAD/CAM Systems
- Vertical Machining Centers
- Five-axis Impeller Machining Centers
- Horizontal Boring Centers
- Cellular Manufacturing
- Advanced Testing Equipment

Our Quality Standards

Certified with ISO 9001:2008 quality management system

Certified with ISO 14001:2004 environmental management system

Certified with Chinese Pressure Vessel Code

DNV Certification, Inc.
ISO 14001 REGISTERED FIRM

ZERO True Oil-Free ISO 8573-1 Class O

We Can Offer More

In addition to the MSG® TURBO-AIR® series products, we also provide application-specific engineered gas, industrial, and process gas centrifugal compressors with a wide range of capacities and power ratings. Our MSG (Multi-Stage Geared) compressors feature application-specific designs, offering a variety of configurations to meet flow requirements ranging from 2720m³/hr (1620cfm) to 255,000m³/hr (150,000cfm), with power ratings up to 33,500kW (45,000hp) and discharge pressures up to 83barg (1200psig).

API 672/MSG® TURBO-AIR® 3000

Twin-Turbo Dual-Flow Combined Compressor

4MSG®-16/15 Air Compressor

3R2MSGPM-5G/30 Gas Compressor

TAE-55 Air Compressor

Skid-Mounted Natural Gas Booster Compressor

4MSG®-16/15 Air Compressor - Application: Located in China, serving as the primary air compressor for an air separation unit. Specifications: Flow rate of 59,000Nm³/hr, discharge pressure of 1241kPaA

3R2MSGP B-5G/30 Gas Compressor - Application: Located in Algeria, used as an evaporation compressor. API 617 Specifications: Flow rate of 20,000kg/hr, discharge pressure of 747kg/cm²A

TAE-55 Air Compressor - Application: Located in a refinery in Texas, powered by a Dresser Rand steam turbine, serving as an air compressor for an olefins plant, API 672 special service. Specifications: Flow rate of 6700SCFM, discharge pressure of 125psig

Skid-Mounted Natural Gas Booster Compressor - Equipped with a gas scrubber, seal frame, motor, bypass piping, and recirculation piping.
Specifications: Flow rate of 69,864MMSCFD, discharge pressure of 710psig

Ingersoll Rand Inc. (NYSE:IR), driven by an entrepreneurial spirit and ownership mindset, is dedicated to Making Life Better for our employees, customers, shareholders, and planet. Customers lean on us for exceptional performance and durability in mission-critical flow creation and industrial solutions. Supported by over 80+ respected brands, our products and services excel in very complex and harsh conditions. Our employees develop customers for life through their daily commitment to expertise, productivity, and e¸ciency. For more information, visit www.IRCO.com.

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