



Application Selection Guide:

# Choosing the Right Air Compressor

# Table of Contents



## **Types of Air Compressors**

---

- 4 Oil-Injected Rotary Screw Compressor
- 4 Oil-Free Rotary Screw Compressor
- 5 Oil-Free Rotary Tooth Compressor
- 5 Reciprocating Piston Compressor
- 6 Scroll Compressor

## **Air Compressor Applications**

---

- 7 Oil-Injected Rotary Screw Compressors
- 7 Oil-Free Rotary Screw Compressor
- 7 Oil-Free Rotary Tooth Compressor
- 7 Scroll Compressor
- 7 Reciprocating Piston Compressor

## **Air Compressor Comparison**

---

- 8 Oil-Injected Rotary Screw Compressors
- 8 Oil-Free Rotary Screw Compressor
- 8 Oil-Free Rotary Tooth Compressor
- 8 Scroll Compressor
- 8 Reciprocating Piston Compressor

## **Selecting the Right Air Compressor With Airmatic Compressor**

---

- 3 Selecting the Right Air Compressor With Airmatic Compressor

# Application Selection Guide: Choosing the Right Air Compressor

Used everywhere from operating rooms to chemical processing plants, air compressors come in a wide range of shapes, sizes, and styles. Since there are so many options, it's important to take the time to familiarize yourself with the differences between the various types of air compressors so that you can identify the best fit for your application. In this guide, we outline the primary options for air compressors to help you make the right decision.



## Types of Air Compressors

Air compressors can be distinguished by a number of critical variables. One of these is whether the compressed air comes into contact with oil at any point during the filtration and compression process. While most air compressors use oil at some stage in the process, whether for cooling or lubrication, oil-free compressors are specifically designed to keep the air pure.

The other primary differences involve how the air compressor generates flow (and based on demand, pressure) and cools the heated air. The most common types of air compressors based on these parameters, include:

## Oil-Injected Rotary Screw Compressor

Oil-injected rotary screw compressors are among the most common compressors. As the name suggests, these compressors are distinguished by their use of oil (or occasionally another liquid) to directly cool the air being compressed, as well as to cool, lubricate, and seal the compressor's mechanical components. Oil-injected rotary screw compressors compress gas through the use of interlocking helical screws, which quickly rotate to force gas through the chamber.



Their operation is quick, quiet, and efficient, making them a popular choice for many applications. With improvements in technology, the footprint of modern screw compressors has decreased. They take up to 50% less space and operate at a quiet 70db or less.

## Oil-Free Rotary Screw Compressor

Oil-injected rotary screw compressors bathe the rotating screws in oil to allow for a tighter seal and cooler operation. The oil-free variety functions much the same, but in the absence of oil as the screws do all of the compression on their own. While this results in a slightly lower compression output than their oil-injected counterparts, these compressors are better suited for applications where the air must remain uncontaminated.



Depending on the design, oil may be used to cool other moving components, but it will never contact the actual compressed gas. Without a fluid medium to cool and seal, oil-free air temperatures run hotter and typically employ a larger aftercooler.

There is an alternate oil-free screw technology that uses water (typically RO) to cool and seal in the screw chamber known as water injected screw. The water is removed and clean oil-free air is delivered downstream.

## Oil-Free Rotary Tooth Compressor

Another oil-free option is the oil-free rotary tooth compressor. Instead of using rotating helical screws, these compressors draw air through rotating tooth rotors, which have matching male and female rotor teeth. These compressors trap air within a chamber, then compress it as the rotors continue to rotate toward one another, decreasing the amount of space available for the gas to occupy. This form of compression is known as displacement. Why use the tooth technology over screw? Efficiency and production costs. As the screw size gets smaller, the tolerances are tighter (the oil-free air gap between the screws must be tighter than oil lubricated to maintain efficiency because there is no fluid to seal) so production costs go up. Since small screws cannot be produced competitively, the tooth technology picks up where the screw leaves off...at ~ 50HP.



## Reciprocating Piston Compressor

Reciprocating piston compressors compress air using the up and down motion of a piston within a cylinder. On the downward stroke of the piston, air is forced into the cylinder, and when it returns up, the air is compressed. One-way valves on either end of the cylinder allow the air to enter and exit while ensuring that it cannot escape, maintaining the generated pressure.





While reciprocating piston compressors can range in size and generate a sizable amount of compressed air, rotary screw compressors are better for large-scale industrial operations. Current design reciprocating piston compressors are better for small to medium operations or for those with variable needs for compressed air. They are also not designed for continuous operation and rely on a storage tank and intermittent demand. Continuous operation generates too much heat and shortens the life of the compressor.

## Scroll Compressor

Scroll compressors are commonly used to pressure (flow) refrigerant in HVAC systems, but they are also used to pressurize (flow) air. Like rotary screw compressors, scroll compressors use rotation to create compression; however, there is only one primary moving part and one that remains stationary. The moving scroll orbits around the fixed one, forcing the gas to condense toward the center of the chamber, which usually contains the exhaust valve.



Scroll compressors are smooth and quiet, requiring absolutely no oil since they have no metal-to-metal contact. However, they cannot match the output of traditional designs as described above, so they are best suited for small to medium oil-free applications. Scroll compressors are not designed for heavy duty cycle operation and should only be applied for medium and light duty purposes. Due to the significantly higher costs for oil-free screw and tooth compressors vs. lubricated, scroll compressors will be placed in applications beyond their design capacity to save money. Do not make this mistake.

# Air Compressor Applications



Given their different capabilities, these types of air compressors all find different primary applications across many industries.

## **Oil-Injected Rotary Screw Compressors.**

These are excellent general-purpose air compressors, used in virtually all kinds of general manufacturing.

## **Oil-Free Rotary Screw Compressors.**

This type of compressor shares many strengths with their oil-injected counterparts, but they are specifically used in situations where air must remain pure, including pharmaceutical, chemical processing, food and beverage, and medical applications.

## **Oil-Free Rotary Tooth Compressors.**

Oil-free rotary tooth compressors are desirable in industries that prioritize ultra-clean, efficient air production. Examples include the semiconductor and electronics industries, along with biopharmaceuticals, clean packaging, and other medical-related applications.

## **Scroll Compressors.**

These find use in both residential and industrial applications, offering energy-efficient, oil-free compression for laboratories and clean rooms alongside more general-purpose HVAC systems.

## **Reciprocating Piston Compressors.**

Reciprocating piston compressors are especially popular in the automotive industry for car and truck manufacturing and repair. They are also common in a variety of other light-medium duty manufacturing settings.

# Air Compressor Comparison



## **Oil-Injected Rotary Screw Compressor.**

A classic general-purpose design, oil-injected rotary screw compressors boast fast, reliable performance for industrial manufacturing applications. Inherent in screw technology is the ability to quickly respond to variations in demand.

## **Oil-Free Rotary Screw Compressor.**

For large-scale industrial pharmaceuticals, chemical processing, or food and beverage applications, oil-free rotary screw compressors balance the performance of a rotary screw design with the benefits of oil-free compression for a pure and reliable output. Both screw and tooth technology are designed for thousands of hours of operation in a heavy-duty cycle environment.

## **Oil-Free Rotary Tooth Compressor.**

An excellent option for semiconductor and electronics clients, the oil-free rotary tooth compressor offers a pure output from an efficient displacement compressor.

## **Scroll Compressor.**

Scroll compressors are quiet, innovative, and completely oil-free, providing smooth operation for smaller laboratory and cleanroom applications. Scroll compressors provide a competitive solution in lighter duty oil-free environments.

## **Reciprocating Piston Compressor.**

Reciprocating piston compressors are a favorite among the automotive industry as they can be used in settings with variable, intermittent demand for pressurized air. In many cases they are the low-cost solution to a compressed air system.



# Contact Airmatic Compressor for Air Compressor Guidance

Choosing the right air compressor for your application is essential, but it can feel overwhelming. To learn more about the types of air compressors available for your application, [contact Airmatic Compressor](#) or [request a quote](#) today. We'll work with you to identify the perfect model for your constraints and budget.



A photograph of an industrial facility, likely a manufacturing or processing plant. In the foreground and middle ground, several large, grey Atlas Copco industrial air compressors are visible, connected by a complex network of silver metal pipes and valves. The compressors have the 'Atlas Copco' logo on them. The background shows a brick building with large windows and more industrial equipment. The entire image has a blue color overlay.

## About Us

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Founded in 1975 by Nestor Vowteras, Airmatic Compressor Systems is a customer-focused company that helps businesses reduce operating costs and improve productivity while providing exceptional and sudden service.

We train our staff to listen to your needs and find the right solution to your compressed air and vacuum questions. We then help you design the right air system and address a service need in a sudden manner.

As New Jersey's largest distributor of air compressors and vacuum pumps, we provide the most efficient and reliable equipment, sudden and reliable service and professional and smart air compressor installations.

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