

Guide to selecting the optimal compressor for your needs



From the moment of their invention, air compressors have begun a meteoric rise to become an essential tool used in countless industries and in every corner of the globe. Today, a world without compressed air is unthinkable. From remote mining locations and construction sites, ships and trains, production sites everywhere and research facilities in Antarctica, compressors can now be found virtually anywhere

Before we get into the different types of compressors, let's first take a closer look at **how and where compressed air is used.**

In industrial applications, we generally distinguish between “**energy air**” and “**active air**.”

Energy air is used for storing and transmitting energy for mechanical work. More specifically, energy air powers pneumatic production equipment, pressure cleans parts and conveys or cools components during production.

This type of air is used across too many industries to list them all. But the next time you drive by a

construction site and see a jackhammer operated, you know that it is powered with energy air.



Active air, on the other hand, is required as an active and integral part of a specific process. In this case, it comes into direct contact with an end product and, therefore, indirectly also with consumers. That is why air quality is particularly important for active air.

With so many different uses, it is no surprise that compressors come in all types and sizes. From massive machines that keep huge production

Here are some industries in which this clean, dry air plays an especially important role:

- Chemicals
- Pharmaceuticals
- Food & Beverage
- Aeration & Agitation
- Semiconductor & Electronics
- Medical breathing air

plants running to the small versions that avid

do-it-yourselfers are using, there is a compressor for everyone.

But that begs the question: **With so many models to choose from, which one is the right compressor for you?**

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Sizing your compressor



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o find the ideal compressor for you, we have to start with determining what its ideal size would be. The main reason why sizing is so important is the one

major downside of compressing air: it requires quite a bit of energy.

In fact, energy expenses make up the vast majority of the costs of conventional compressors over their lifetime. The initial investment, on the other hand, only accounts for a fraction of this total cost of ownership.

And that is why properly sizing your compressor pays off in two ways: You can not only reduce your investment costs but also significantly lower your operating expenses when the compressor you choose meets your needs and doesn't waste energy.

Obviously, picking a compressor that is too small is problematic because it will not be able to meet your demand.

So now you know why sizing is important. **But how do you do that?**

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Pressure & flow

To properly size your compressor, you first need to know your flow and pressure requirements.

The pressure of the air can either be measured in pounds per square inch (psi) or bar (metric measure of pressure). If these technical terms do not help you much, think of it like this: **Pressure refers to the amount of force needed to perform a certain amount of work at any given point in time.**

If that still doesn't help, think back to something you might have done as a child. The task was to move an object across a table without touching it. That is why you blow against it. Some objects might be easy to move while others require a lot more effort, i.e. air pressure. At the same time, it would be a waste to exert more energy than necessary to move it.

It's just like that in the case of compressors. They have to provide enough pressure to perform a given task.



For example, if you need 100 psi to accomplish a task (like moving a piece of wood across a table), then anything less will not get the job done. That is why you have to understand which amount of pressure is needed to size the compressor properly. **Otherwise, you either waste energy or run into performance problems.**

That brings us to the flow, which is also referred to as free air delivery. Depending on your geographic location, it is measured in cubic feet per minute (cfm), liters per second (l/s) or cubic meters per hour (m³/h).

In simpler terms, flow is the ability of the compressor to continue performing a task within an acceptable time frame. The amount of flow that is required is determined by the length of time needed to complete a given task.

Going back to the example of the wooden block, let's consider two scenarios. In the first, the block has to be moved a certain distance every hour. This

will require less flow and can be achieved with a smaller compressor and a storage tank. The compressor will cycle on and off and refill the storage tank for the next time the wooden block has to be displaced.

However, if the block has to be moved constantly within a given time frame, a larger flow of air (or

CFM) with continuous flow will be needed. This, in turn, means a larger compressor is required. If the flow is insufficient, then the process has to be interrupted frequently while the compressor builds up pressure in the reserve tank. This is a clear indication that the compressor might be undersized.



That is why you have to consider **the amount of compressed air flow needed at a specific pressure** to ensure that a process works properly.

So how do you find out the total flow needed?

One way is to contact the manufacturer of the equipment that uses compressed air and request data sheets with the desired information.

However, it is even better to perform a **“compressed air audit”** to determine the optimal flow. For this, all you have to do is to contact an Atlas Copco compressed air sales professional.

To summarize, pressure is determined by the job you are performing. Flow, on the other hand, will require the understanding of how frequently the job has to be done, or how many jobs you are performing at the same time.

Keep in mind that undersizing a compressor will result in pressure drops and the inability to complete a task. Oversizing the unit not only



wastes energy and needlessly increases costs but can also lead to future mechanical problems and a potential failure of the compressor.

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The Atlas Copco logo, consisting of the brand name in a white serif font, centered between two horizontal white bars on a blue rectangular background.

Atlas Copco

The background of the slide is a collage of industrial equipment. On the left, there are large, dark grey Atlas Copco industrial compressors with blue vertical accents. On the right, there is a smaller, blue Atlas Copco LT10 portable air compressor with a black motor and a large cooling fan. A semi-transparent blue banner with a white technical drawing of a compressor mechanism is overlaid on the left side of the image.

**What type of
compressors do you
need?**

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ow that you know your compressor size, you have to decide which type of compressor would be best for your application.

To help you with that search, let's look at the two most popular types of compressors available.

However, before we explore your options, you first have to ask yourself these questions:

- What is the application?
- How much flow does my facility/workshop use?
- What pressure is needed within the facility?
- Do I need clean/dry air (use of dryer and filters)?
- How many hours per year does my compressor operate?
- How many shifts do I run per day?
- Is there a fluctuation in flow demand between shifts? (if so, a compressor with variable speed drive would be best. You can find out more about them below)
- Do you expect to expand any time soon?

With the answers to these questions in hand, you

can now figure out which type of compressor best meets your needs.

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There are two main types of compressors:

Piston compressors

Rotary screw compressors.

Piston compressors

Piston compressors, which are sometimes also called reciprocating air compressors, are **the most economical and least expensive air compressors available**. They are very simple and robust

machines that can often be found in workshops, machine shops, body shops, tire shops and small manufacturing facilities. High-pressure compressors generally also rely on piston technology.

One of the benefits of piston compressors is that they are relatively easy to maintain. In addition to their low investment cost, they are economical to operate. In other ways, they are a great “starter compressor” and well-suited for operations with a limited compressed air demand.



Obviously, their simple design and low cost also means there are some drawbacks that should be taken into account prior to making an investment decision.

Piston compressors are mainly designed for intermittent use, meaning that the compressor can only work at about 50-60% of its duty cycle. The duty cycle refers to the amount of time a compressor can be operated at a standard ambient temperature.

In this case, that means a piston compressor will run 30 to 35 minutes per hour and then have to cool down. If you operate it longer than that, it may overheat and fail.

In addition, piston compressors also use a lot of oil and, if the compressed air is not properly treated, it could damage the downstream equipment and, if applicable, contaminate end products.

While piston compressors are easy to service, maintenance cost are higher than for screw compressors as reciprocating units contain more moving parts (pistons, piston rings, in- and outlet

valves) that are prone to wear and tear.

Lastly, piston compressors tend to be loud. As a result, they can be hard on anybody working in close proximity to where it is set up.

Rotary screw compressors

Rotary screw compressors are often the ideal choice for operations that require a constant compressed air supply. Unlike piston compressors, they can be used for applications that require up to a 100% continuous duty cycle. Rotary screw compressors are built for a long lifetime of reliable operation.

They come in different types and sizes, so there is a rotary screw air compressor for any need and budget.

You can also enhance them with other equipment. For example, by integrating a dryer, you get a compressed air system that is ideal for applications requiring clean and dry air. And smaller screw

compressors can be tank-mounted. This adds storage capacity which, coupled with an integrated dryer, allows for plug-and-play installation.



This makes the system ideal if you have limited space at your facility and if you want to save on installation costs.

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The benefits of VSD compressors

Atlas Copco has invented and refined an innovative drive concept for compressors. We call it the variable speed drive (VSD). As you now know, energy expenses are by far the greatest factor in determining a compressor's total cost of ownership. That also means that they contribute a great deal to an operation's environmental footprint.

A VSD compressor can do something about that.

While traditional compressors run at full speed whenever they are turned on and regardless of how much compressed air is required, VSD compressors adjust their motor speed to the air demand. For example, on slow days or during shifts where a facility operates with a skeleton crew, they produce much less air and, therefore, also require a lot less energy. In fact, they can reduce the energy consumption of a compressor by up to 60%.

Sure, their initial investment cost is higher than that of conventional compressors but this is quickly recouped. Depending on the compressor size, VSD technology can achieve savings that range from \$100s to \$10,000s annually or more.

**Energy savings of up to 60% are illustrative and can vary based on factors such as compressor model, usage patterns, and operating conditions. Consult one of our compressed air experts for tailored recommendations.*

Contact an expert

The image shows three large, industrial-grade Atlas Copco ZT 160 VSD oil-free compressors arranged in a row inside a modern factory. Each unit is a dark grey cabinet with a large, light-colored, textured air intake hood on top. The units are connected to a network of large, silver, insulated pipes that run along the ceiling. On the left, a control panel with a digital display and buttons is mounted on the wall. The floor is a smooth, light-colored concrete. The overall scene is clean and professional, highlighting the industrial nature of the equipment.

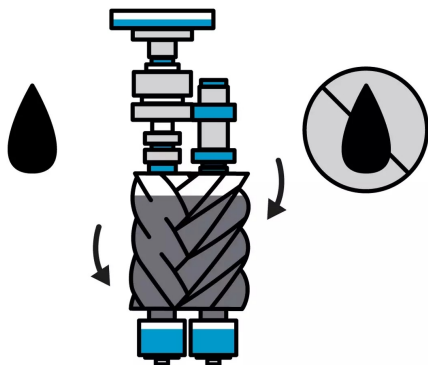
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Do you need an oil-free compressor?

The final question you have to answer is whether you need an oil-free compressor. This is primarily an issue of air quality (although all compressed air systems benefit from clean air in some ways).

Therefore, to answer this question, you need to understand your air quality requirements. But before we get to that, you first have to understand why air quality is so important.

Generally, oil and other contaminants in your air are a bad thing. In the compressed air system itself, as well as in any downstream equipment, the contaminants can lead to reduced service lives and higher maintenance costs.



In end products, these contaminants can cause even worse – and more expensive – problems. For example, imagine a company working in the food and beverage sector that allows oil residue to get into its products. Or what about a pharmaceutical manufacturer whose prescription drugs are contaminated in that way?

The consequences could be disastrous: **Sick customers, expensive recalls, lawsuits ...**

So how do you avoid these problems? It all starts with knowing your air quality requirements.

Different applications have different air quality obligations. In some cases, air quality hardly matters. For example, if the compressor powers a jackhammer on a construction site, the quality of the compressed air it produces is not as important as its reliability.

That is obviously not the case for a compressor that operates in a cleanroom environment. Here, air quality is the top priority.

To navigate your air quality requirements, you

should either contact the experts of Atlas Copco or consult the ISO standards for compressed air.

If you need top-quality air, you have to properly treat it. And that begins with an



oil-free compressor. While oil-injected compressors use oil for lubrication and to prevent corrosion, as a sealant and to cool the compressed air, oil-free compressors do not.

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What is ISO 8573-1?

ISO 8573-1 (ed. 2010) is the most important internationally recognized air quality standard. It is divided into seven air quality classes and the three main types of contaminants (oil, particles and moisture). ISO 8573-1 will serve as your essential guide to determine how clean your air has to be. Essentially, it defines how many contaminants your air is still allowed to contain at a specific point in your compressed air system after it has been treated.

In some cases, this figure can be quite high. For example, if your application calls for Class 6 air, then it can contain any number of solid particles. Class 0, on the other hand, is reserved for the cleanest air.

Therefore, the most important (and stringent) classes are Class 1 and Class 0.

Class 1 specifies an oil concentration of 0.01 mg/m³ at 1 bar(a) 14.5 psia and 20°C (68°F). It is sometimes referred to “technically oil-free solution.”

Class 0, on the other hand, is the only category that is absolutely oil-free.

That is why, when choosing an oil-free compressor, make sure to pick a Class 0 oil-free compressor and not a “technically oil-free” option.

It is important to note that this does not mean that there are no traces of oil in the compressed air produced with an oil-free compressor. The reason for this is that there is also oil in the ambient air that is being compressed. However, these trace amounts can be cleaned with the help of filters or other air treatment equipment.

While oil-free compressors are more expensive, they are essential to the production of a wide range of sensitive products – **from semiconductors, medication and paper.**



Things to consider for small and medium- sized businesses

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hile large companies probably have a compressed air expert on staff, things are often a bit more complicated for small and medium-sized businesses.

So here are some additional things for them to consider:

Your (ambient) conditions matter

Does the physical size of the compressor matter or will it have to fit in a closed space? Does it have to operate quietly? Will you need an air receiver? What will the ambient conditions be, i.e. will your compressor have to operate in a place that is particularly hot/cold or humid or located far above sea level?

Keep in mind that you always want to put it in a place that is as dry and clean from dust as possible. That will save you money on air treatment later.

Know the law

Are there national or local regulations that have to be observed? Or are there certain industry standards that you have to comply with? You should find out before you design your compressed air system and



purchase your equipment. This not only includes air quality standards but also issues such as noise levels.

Control and costs

And what about the controller? In some cases, a simple controller is sufficient if you just need to turn your compressed air system on and off. However, if connectivity of the controller is important to you, then you may want to consider

an advanced model. Finally, how much do you want to spend overall, i.e. the total cost of ownership from the initial investment to anticipated energy consumption and maintenance costs?

Get help if you need it

There is a good chance that all of these questions (and it's not even a complete list) do not make the challenge of picking the right industrial air compressor seem any less daunting. But there is more good news: Atlas Copco can help you every step of the way.

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The Atlas Copco advantage

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The Atlas Copco advantage

With Atlas Copco as an air compression partner, you can't lose. We offer a range of online tools that can help you determine your compressed air needs, compare the different options and explain the benefits of each compressor.

And, obviously, you can turn to our experts, who will assist you in finding the optimal compressor.

Most importantly, we always **offer the best solution to meet your needs**. From small piston compressors for do-it-yourselfers to our ultra-efficient VSD compressors, we have the right model for you. In addition, you can turn to us for everything from dryers, aftercoolers, filters and the most modern controller technologies.



Thank you for reading

Guide to selecting the optimal compressor for your needs

Would you like to talk to an expert to know more on the guide to selecting the optimal compressor for your needs and to find the best solution for your business? Click the button below and we'll contact you shortly.

Get in touch with our experts

