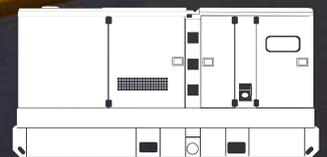


# Generators

A Focus-5 guide to help you decide what's right for you!

*Sustainable Productivity*

Atlas Copco



# Generators

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## FOCUS-5 Generators

Generators are the essential heartbeat of construction sites, infrastructure projects and outdoor events across the globe. As a versatile, reliable, power source their contribution to productivity cannot be overestimated. Specifically, their ability to provide vital energy and support to applications as varied

as urban de-watering projects, manufacturing industries, hospitals or powering a mobile kitchen serving 5,000 people in a remote location; to name just a few.

But while it is accepted that a generator is always present, often the unsung hero of the show, there may be some aspects, particularly concerning comparable performance and size of units, that need to be addressed before a purchase or rental decision is made.

**Here are five key considerations you should focus on when you choose to buy or rent a generator:**

### 1. Size really matters

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The most important thing to consider when sizing a generator is the high inrush currents associated with starting electric motors and transformers, which are typically six times the full load current. However, inrush currents for the type of high-efficiency motors being specified today can be almost double that amount.

As a result, it has been common practice to take motor and transformer starting kVA requirements as a yardstick to determine the size of a generator. This approach often results in generators being oversized for the motor running load and not based on the actual needs of the application. Moreover, it disregards other key factors that play a key role in sizing generators. For instance, harmonics caused by variable frequency drives and sequential starting of motors.

When starting motors or transformers, large voltage and frequency dips can also occur if the generator set is not sized properly. Furthermore, other loads connected to the generator output may be more sensitive to voltage and frequency

dips than the motor or motor starter, which can cause problems.

Thankfully help is at hand. Many generators can now be equipped with solutions to overcome the extra excitation systems required in the alternator. Typically, two options are offered: permanent magnet or auxiliary winding. Both provide the generator with three times their nominal current to cover inrush peaks from the electrical motor, for a minimum duration of ten seconds, via a residuary excitation current.

In certain cases even more advanced options are available. For instance, some generators feature a digital automatic voltage regulator (D-AVR) that is specifically designed to handle the high inrush currents associated with starting motors and transformers. In specific applications, this type of voltage controller allows operators to downsize the generator requirement because the transient behaviour of the power is better managed.

Another option could be to use a "Close Before Excitation" system that closes the breaker just when engine starts to run. This enables

the excitation to increase gradually as the speed of the engine does, allowing for very soft start of loads connected to the generator. This is especially useful for magnetising step up transformers in installations where medium voltage is required.

As a result, it is no longer necessary to buy larger generators than needed just to cope with the initial electrical surge upon starting. What's more, with smart control of the generator's voltage, it is possible to achieve lower fuel consumption, reduced maintenance cost and longer lifetimes.

## 2. Modular capability

Even if starting off with just one unit, it's worth asking the equipment manufacturer what steps can be taken to parallel a single generator with others to form a modular power plant set up. For instance, is the generator equipped with this capability as standard? Also, how long would it take to pair two units? With many generators, this process can take under 10 minutes, but not all offer this capability. Therefore, it is strongly recommended to check before an investment is made, in case this capability is needed in the future.



When coordinated by a network of controllers, plug-and-play generators can power up and down according to the on-site power requirements at any given time. For example, only one or two may be operational during periods of low load, thereby boosting fuel efficiency. Equally, all units may become active in periods of high demand.

There are a number of additional benefits from modular capability. Firstly, equipment reliability is enhanced as the failure of a single unit is mitigated by configuring the remaining units to increase their output to maintain the same power output. Secondly, the cost and length of service intervals is reduced, as it isn't necessary to stop the entire power delivery during essential maintenance operations.

## 3. Control systems and power management

The ideal control system should offer a variety of features. For instance, the ability to remotely start and program the machine, display warnings, for instance low fuel and other performance issues, in addition to deliver a broad range of analysis data. This helps to better utilise the efficiency of the power plant while providing a valuable overview of the application process.



Many generators are now equipped with Power Management Systems (PMS). What makes them ideally suited for rental applications is the plug-and-play design that allows for easy and rapid configuration. PMS provides the means to optimise the fuel consumption and performance of generators in parallel with load demand,



starting and stopping units with corresponding increase or decrease of load. It also helps avoid engine damage to generators from running with low load levels, thereby increasing their useful work life.

## 4. Fuel efficiency and autonomy

Thanks to a number of design innovations and energy efficiency improvements, today's mobile generators now consume much less fuel than was possible five years ago. The fact that the latest equipment can run for longer and more economically has been a big driver behind the market's growth. However, not all generators are the same and fuel can be expensive. Therefore, it is recommended to ask two or three manufacturers for a forecast on fuel consumption before making an investment.

Furthermore, modularity also contributes to fuel efficiency. For example, taking the demand patterns of a typical industrial application as a guide, the deployment of a 1 MVA generator as a prime power source could mean up to 1.677 litres of fuel being consumed each day. That compares with approximately 1.558 litres of fuel if three 325 kVA generators were doing the same job. In this case, an estimated annual fuel saving of €30.000 makes for a compelling case, not to mention 85 tons of CO<sub>2</sub> saved over the course of a year.

The options for fuelling generators are expanding nowadays and now include bio-gas and natural gas. Although this market is emerging, it is important to discuss these technologies with a manufacturer before investing in a new generator.

## 5. Physical size and transportation

It pays to determine whether units can be towed or loaded on a truck and to check for features such as lifting eyes and forklift slots. When using multiple generators, it's also worth considering if units can be stacked on top of each other for minimum footprint and access considerations. These factors have a bearing on total operation expenditure and efforts to reduce carbon costs.

## Conclusion

Consider all the foregoing factors that affect the choice of appropriate sizing. If in doubt, apply a simple rule for estimating motor starting: 1 kW of generator set rating per 3/4 to 1 hp specified on the motor nameplate. Always stay on the conservative side and remember that generators are built to work hard and the more accurate the sizing is to the application, the greater results.

It will pay to think modular because bigger is not necessarily better. Modular is not just about large installations, it can make a lot of sense with units around the 150 kVA level as well.

For users, contractors and event companies who have always rented the same size generator, now is the time to seek expert advice about the latest developments that are designed to help to match outputs to applications.

