# A-10 Electric Generators in Homestead Living

Everything's humming right along and then one fine day—blink—everything goes dark. Uh-oh. An hour or two later it's getting toward double uh-oh. Three or four more hours and it's a really serious uh-oh.

## Current Grid Situation – 2025

No matter where you live, dependence on electricity is existing very precariously on the edge of failure. The problem is the wires with the amount of electrons that have been flowing through the metal. This is called resistance which causes wire to get hot whereby the plastic sheathing on cables weakens until one day it blinks. This is basically a 25-30 year lifespan. With much of the current electric infrastructure having been installed within the same time frame, significant failures have already been happening with devastating fires as the consequence. This is a massive nationwide issue that's getting little to no attention.

Fixing this is not simple involving finite natural resources of raw materials. For instance, there's only so much copper in the depths of the Earth. Then it needs to be mined and refined requiring massive amounts of energy and water—more finite resources. Then there's massive amounts of plastic insulation. Then transportation and installation with associated trucks and equipment. In other words, the electric grid in this country is heading for a great big crash with almost no fallback position.

Adding to this extraordinary debacle are massive data farms for artificial intelligence demanding huge amounts electric power that's pushing the grid to its absolute limits and sucking up water resources in an attempt to cool down all of this electrical resistance. When this crashes due to limited resources that can be extracted from the earth and the ecosystem, the folly from this AI-driven greed will become obvious.

## Our Role in the Debacle

To a certain degree, we're already stuck. We have become dependent on everything from cell phones to computers to the internet to our food. No doubt some forward-thinking folks saw this coming but unfortunately these thinkers were deep in the petrochemical industry, building our dependence on their products—oil, gas (so-called natural and petrol), and plastic leading straight to more and more demand for electricity. Today we find ourselves pawns in their long game of greed over conservation of resources.

Shouting at politicians and the petrochemical industry is like Don Quixoti shouting at windmills. When the chips are down and your dependence on electricity remains, the time is coming when you will be on your own. This is when you'll fervently wish you had the foresight to have a fully functioning generator or to be off-grid with batteries powered by solar, but even all of these require electricity to manufacture.

Then there's the debacle of hydroelectric power. In just about every case worldwide, dams and reservoirs have fed the electric beast at the expense of disrupting natural ecosystems that sustained life for many thousands of years—so that lights go on, cell phones work, and the internet exists. Even right now, as these words are being typed through a computer, you are receiving this communication through electricity. The end results have been devastating worldwide.

Take for instance what happened during the previous 20 years in Syria and now throughout the African continent. Mass migrations of people are not being driven by political ideologies or economic greed but rather by imminent survival because hydroelectric dams have stolen natural water from the ecosystem which has disrupted the ability of people to feed themselves—and people get desperate for survival. Whether we like it or not, our dependence on electricity has caused all of this.

## Getting Past the Crash

Accept the fact that we are inextricably attached to electricity. When the grid system blinks, we need backup plans, notwithstanding that electric-dependent family members will be wandering around with complaints similar to, "I've got nothing to do."

Solar is great but requires some major considerations such as the position of roofs for maximum sun exposure. If buildings are not aligned toward the south, this can be a significant limitation. The option would be a stand-alone set up but that requires significant allocation of square footage.

This brings us back to simple—a backup generator. The following is verbatim from a *Popular Mechanics* magazine article and much of the following good advice is paraphrased from several of their articles:

"Having a home generator can be a game-changer during unpredictable situations, whether caused by severe weather or downed power lines in your neighborhood. But to make sure your generator actually *works* when you need it, it's important to perform routine maintenance on your system.

Choosing the best home generator for your needs requires an investment. To get the most out of it, take the necessary steps to keep your system running properly; doing so can mean the difference between a generator that fails when you need it most and one that reliably provides backup power for years."

## Living with a Backup Generator

### Types of Portable Generators

**Traditional** – These generators create and export AC power through an alternator. This is a simple system but with some important shortfalls. This AC power is generally unstable and is definitely not suitable for sensitive high-end electronics like computers and flat screen televisions which could be damaged with unstable AC power. Otherwise, there are similar issues with high-end refrigerators and any other system that rely on remote internet-based controls. However, these generators are comparatively less expensive and are very basic machines that run on gasolene or a portable propane tank.

**Inverter** – These generators also create AC power but convert it to DC power and then wash it through an inverter that creates stable AC power for export. Needless to say, these generators are more expensive but do accommodate the high-end electronics that rely on stable AC current. These generators are smaller, lighter, and quieter because there is no alternator requiring the machine to run at full power full time. They require the same sources of fuel as traditional generators but generally are more efficient.

### Non-Portable Generators

**Standby** – These are larger, fixed in place, provide stable AC power through an inverter and are installed with automatic transfer switches to activate the generator whenever there is a disruption from grid power. They are generally powerful enough provide uninterrupted electricity for an entire household with no action required to provide contiguous power.

But, there are downsides. These are much more expensive, require a foundation and shelter, and must be professionally installed. They also run on a reliable continuous supply of fuel—propane or natural gas. If this is disrupted, like with an earthquake or flood, the generator is useless. Finally, to be sure the generator will always work as designed, routine maintenance will be required and often with professional expertise.

## How Generators Work

Generators have two main components: a motor to spin a shaft and magnets to produce electric current.

**Motor** – This is the same as any motor that works from a fuel source. For home use, these are small engines similar to a lawn mower—four-stroke overhead valve systems with a carburetor to mix fuel and air for combustion through a spark plug. The motor is attached to a shaft that rotates inside a contained area that houses magnets surrounded by copper wire.

**Magnets** – These have two opposing poles, often identified as north (+) and south (-). There are two separate magnets inside a generator—north and south. As the shaft spins across these magnets, electric power is produced and transferred to the copper wire. This is called electro-magnetic power.

**Alternator** – The combination of a motor spinning a shaft across magnets of alternating north and south polarity are the main components of the alternator. This produces alternating current (AC).

**Voltage Regulator** – Raw electric produced by the alternator is useless for powering devices which are designed to operate at specific voltages. Common is 120 volts for most household systems, like lights, and 240 volts for high-end systems like stoves. Before raw electric can be used, it must be controlled through a voltage regulator which is part of every generator.

### Making Use of Backup Power

Once the power is created by the generator it needs to get to where it can be used. Basically, there's two ways to accomplish this: with simple with extensions cords or complex with cables and transfer switches. Which is best depends on your situation and willingness to hire professional expertise.

It's important to realize that everything powered with grid electricity cannot be powered by a generator. This means deciding what's essential and what's superfluous. Everything will not automatically turn on—including heat and air conditioning. That is, of course, unless you have a large standby generator.

### Plan for a Loss of Grid Electric

When the grid goes down, local or massive, it's too late to get ready. When all is good with grid power, decide what will be essential without it. Refrigeration is obvious, but in a cold winter area, ambient outdoor temperature is the same as a freezer. if you live in a desert, keeping cool can be life-saving. Then there's water if you rely on a pumped supply from a well. Then there's cooking, eating, and sanitation.

## Basic Electricity – Watts, Volts, and Amps

When evaluating a home generator setup, it's important to understand these three terms.

### Watts

These are the units of power an electric device needs to run and varies per product. An average LED bulb, for example, only requires 10 watts, while a window air conditioner needs anywhere from 500 to 1,500 watts. Some of these devices also have a starting wattage, which is how much they draw when turning on before dropping to the running wattage. An average refrigerator may have a starting wattage of 1,200 watts, but drop to 300 watts shortly after. Running watts are the most helpful in determining how many devices you can connect to a generator.

### Volts

A volt is the force of the electric current. Most devices in your home run on either 120-volts or 240-volts for appliances like dryers, water heaters, furnaces, and well pumps. If you need to power 240-volt devices, you'll need a generator and connection equipment that facilitates this higher voltage.

### Amps

Amps are a unit of electric current flow. The higher the amp, the larger the flow of power. You can find generators with amp outputs of up to 20, 30, and 50 amps, but if needing to power multiple devices in the home, including 240-volt equipment, you'll likely need a setup with at least 30-amp output at 240 volts.

## Evaluate Your Power Needs

### Weather

Where you live can have a significant impact on your power needs. Heat, cold, and calamity are the main culprits affecting contiguous electrical power.

**Heat** – Power plants can only produce and distribute a limited amount of electricity across the grid. When there's too much demand, as in deserts, brown-out's occur. This protects heavy duty transmission wires from overheating and causing fires. When temperatures top 90 to 100$^{o}$F, this can become life threatening.

**Cold** – Similar high-volume power demands can occur when blizzards and ice storms descend. Electric furnaces are running overtime and power lines can come down. If you live with lake-effect snow or just east of the Rocky Mountains, cold-weather grid failure is all too common. In addition to the actual furnace, also include the separate air-handling system in your needs.

**Calamity** – When hurricanes, tornados, floods, and fires occur, the location of the problem can be many miles from the impact on the grid. The southeast knows when it's hurricane season, central plains know when it's tornado season, the southwest knows about fires, and just about everybody knows about floods. Emergency preparedness means having everything ready now because later is too late.

### Wattage

Key is how much power you'll need when the generator is the source. This will be in watts and should be on labels or in manuals for all of the required devices—simply add these up and be thorough. If you can't find the exact numbers, you can use an online calculator but these are based on an average and won't be as accurate as specific numbers. You might also want to add up the starting wattage to see if that's a significant number affecting what the generator can produce.

Your generator does not have to power everything. If you just want to power just a few critical appliances, such as a refrigerator, heat, and some lights, then a mid-size generator offering 5,000 to 7,500 running watts should be able to do the job or you can go higher with a 10,000-watt model. If that's still not enough, a professionally installed automatic backup system (sometimes called whole-house generators) may be an appropriate investment.

## Maintaining the Generator

All generators require routine maintenance to function when needed. This cannot be ignored or the unit simply won't work for a right-now situation. Put it on your calendar.

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| **Check the Fuel Level** | Without fuel, your generator is useless—gasoline or propane.<br><br>**Action**: Check your fuel tank levels once a week. Gasoline can degrade over time needing to be replaced and propane can leak from an improperly maintained tank. Make sure you have enough fuel before an outage occurs. If running on natural gas, this relies on the integrity of pipelines which can be disrupted by floods, soil heaving, and earthquakes. |
| **Inspect the Battery Status and Charge Rate** | If your system starts or runs on a battery, it's essential to monitor your battery levels and charge rate. The magic number is 80 percent. When it dips below an 80-percent charge rate you'll likely need a new battery—about every five years.<br><br>**Action**: Check on your battery levels once a month, especially during cold winters, to stay up to date on the status of your generator charge. |
| **Perform a Test Run** | Consider performing your test when there's plenty of sunlight. That way, you can take your time, see every step you need to take clearly, and ensure that your generator runs properly.<br><br>**Action**: Perform bimonthly exercise runs to be sure the generator starts. Once or twice a year do full-outage tests. Turn off grid power, start the generator, and connect the appliance and devices you want to run on the system. These test runs are known to extend the life of generators. |
| **Take Care of the Engine** | The manual should outline when and how often maintenance is required.<br><br>**Action**: At least once a year, perform preventive maintenance on the engine by replacing the oil and examining the filters. |
| **Getting Help** | You can hire a professional to inspect the generator for you and ensure it can handle an outage when it arises.<br><br>**Action**: If you live in an area prone to hurricanes, tornados, and flooding, get in line early with an appointment. Ask around for recommendations and try to keep your service call local within your community. |

## Safety with Generators

**Location**

**Avoid Carbon Monoxide** -- Generators must be at least 20 feet from windows, doors, or vents because the motor emits exhaust with carbon monoxide. It's dangerous to run them in a garage—even with the door opened—or on a porch or inside a shed. Position the exhaust port so it blows away from the house with prevailing wind. As weather changes, reposition the generator.

**Place on Level Ground** – This is for proper circulation of the engine oil. Generators are also quite heavy with wheels so you don't want them to tip or roll away. When it comes to the weather, uneven ground may expose one end of your generator to the wind and rain or place it in the path of runoff water. Level concrete or gravel pads can protect against muddy ground conditions.

**Clear Snow and Debris** – Remove snow, leaves, and brush 3 to 4 feet from around the generator to avoid blocking vents or the exhaust port. Also clear the top of a running cover or other enclosure.

**Avoid a Fire –** Generators get hot—do not locate next to a wood pile, vinyl siding, trash cans, or mechanical equipment. If not a least 5 feet from the outside walls of a structure, you're inviting potential damage or fire. Running them in a shed or an outdoor enclosed space without ventilation is risking a fire.

## Connecting a Generator to Your House

### No Jerry Rigging

Any method that connects to your main electric panel should be performed or at least checked by a licensed, professional electrician. It's easy to miss small details that can cause big problems later, and insurance companies won't cover damage if they find out you wired things improperly. Understanding the basics of backup power and the equipment that allows you to connect it to your home can be essential before calling the electrician—know what's going on and ask knowledgeable questions.

#### Backfeeding

This involves connecting your generator to your electric system through an outlet to deliver power to the home with a homemade male-to-male extension cord. Doing this can result in electrocution, fire, and property damage and insurance won't cover any damage if connected this way. This type of connection can also send electric surges back into the grid that could injure or kill line workers conducting repairs. For all these reasons, backfeeding is illegal in many U.S. jurisdictions.

### Wiring

The smaller the number = the thicker the wire = the electric power that can safely move through the wire. If the wire is too small for the amount of electrical power, increased resistance will cause the wire to get hot and possibly catch fire.

All wiring, including extension cords, must be rated to match or exceed the power moving through those wires. With extension cords, 12-gauge would be the smallest but larger 10-gauge is much better. The same goes for the cable that carries the amperage from the generator. Ultimately, it's always best to hire a professional for a full installation or to double-check any installation you completed yourself.

## Making the Connection

There are three ways you can safely deliver backup power to your house: connecting directly to your critical appliances with extension cords, using a manual breaker interlock switch on your main electric panel, or installing an automatic transfer switch subpanel. Each has advantages and disadvantages.

## Using Extension Cords

This is the simplest method. Many mid to large portable generators will have options with 120V/20A, 120V/30A, and 240V/30A outlets. Using proper extension cords (10-gauge), you can directly plug in a refrigerator or a space heater, as well as a few lamps. You could also install a through-the-wall kit that connects a 30-amp outlet on the outside to several 120-volt outlets on the inside.

Long extension cords are required. The extension cord must be long enough to reach inside the structure from the generator. Any exposed connections where water could intrude could easily short out the whole system and possibly damage the generator. Wrapping a connection in a plastic bag is useless because water will leak in and accumulating water vapor would be the same as not having any protection at all.

**Advantages**

Extension cords are the least expensive option and can limit you to only powering essential items if you wish to stay conservative about backup power usage. If you don't have frequent power outages and just really want to keep a refrigerator running, using a properly-rated extension cord may be the right option.


**How to connect directly to a generator:**

1. Start the generator first.
2. Connect the cords to the generator.
3. Plug the appliances into the cord.
4. When shutting down, follow those steps in reverse order.

**Disadvantages**

Not all extension cords are built the same nor are they appropriate for all devices. Using a long 12-gauge extension cord to power some lamps or charge a laptop or phone is fine, but to safely run a higher-powered device like a microwave or a space heater, you'll probably want to stay under 25 feet and only use a larger, 10-gauge extension cord. Also, voltage can diminish over distance and if your appliance isn't getting enough power it can be damaged. This means you may need to move appliances physically closer to a window or door which isn't easy if that happens to be a full-size refrigerator.

Also, if you want to run critical 240-volt devices, such as a well pump, HVAC system, or electric water heaters, using extension cords may not be possible because they are likely to be hard-wired to the electrical panel on their own 240-volt circuit.

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## Cable from Generator to House

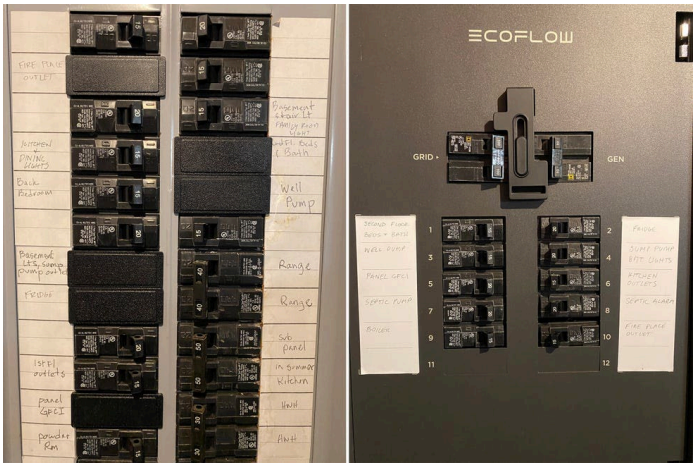
This is not an extension cord—it's a cable from the generator to the electric panel. The cable has special fittings that plug in and are held securely in place by twisting at the generator and in a receptacle box mounted on the outside of the house. This is then wired to a transfer switch inside the house and connected to the main electric panel. It can also be wired to separate indoor outlets.

## Using a Transfer Switch

These can be used with either a portable generator or a fixed-placement standby generator. This is not a simple installation and likely requires professional expertise. Transfer switches flip from grid power to generator power but only on specified circuits. This involves a secondary subpanel that connects to the main electric panel, so when the electricity goes out, you can turn on your generator to run power to these designated circuits.

In a transfer switch setup, critical circuits can be moved from the main service panel to the subpanel so they can be isolated and powered by the generator. This prevents backfeeding. Through the subpanel, you choose the designated circuits that can receive electric power. If the electricity goes out, you can turn on your generator and switch the power over to these circuits individually or altogether, depending on the capabilities of your generator.

These switches can be manual or automatic, though the latter tends to be associated with higher-end backup systems. They connect to your generator using a cable that matches the amperage of your generator. If using a fuel-based generator, you'll connect through an inlet box outside the house. If you're relying on a battery-based powered generator, you could safely place it inside the house.




**Manual Switch** – This is obvious, so long as you're available when needed. If you're away for an extended time, the results will be obvious. This is also known as a breaker-interlock switch.

**Automatic Switch** – Like the name implies, when the grid blinks the generator kicks in. No switch to manipulate and especially when you're not there to flip the switch.

**Advantages**

A transfer switch gives you a certain amount of control because you can isolate the circuits that would unnecessarily use generator power during an outage. If too much power is demanded from the generator for safety it will trip its internal circuit breaker and shut down the generator. Meanwhile, since you don't need to turn off the main power to use a transfer switch, when utility power returns, anything not connected to the transfer switch will go back on without affecting the generator which will shut down. Some transfer switches have a voltage meter to know what's being put into the subpanel from your generator. Some also have amp meters.

**Disadvantages**

The biggest is cost—prices are high as is their installation. They also often require permits to install so there will be municipality guidelines for proper installation. Some homeowners may also find that limiting certain circuits to generator power makes this setup inflexible if their needs change, ultimately resulting in rewiring circuits.

### Using a Breaker Interlock Switch

In this setup, a breaker for your generator is added to the electric panel, as well as a sliding metal plate called a breaker interlock. The new breaker connects to an inlet box connected from the generator with a 30- or 50-amp twist-lock generator cord.

The breaker interlock prevents the generator breaker from switching to the on position while the main grid breaker is on. When the power goes out, turn off the main breaker, slide the metal plate, and the protection is reversed, allowing the generator breaker to turn on while preventing the main from being turned on at the same time. Neither can be on at the same time, eliminating any backfeed problems.

**Advantages**

Because this is a somewhat less complicated setup than a full transfer switch, the cost of installing a breaker interlock is lower. Because circuits are not being isolated on the electric panel, as with a transfer switch, you have more overall flexibility when picking and choosing the circuits you want to run on generator power. It allows you to change your setup without having to rewire anything.

**Disadvantages**

This type of setup is prone to human error. Since you need to turn everything off that you don't want to use before turning on the generator, it's easy to accidentally leave too much on or forget to turn off automated systems like an HVAC or a well pump. You could inadvertently draw too much power and trip the generator circuits. If you're in a remote area, you might not know when the power comes back on because you're keeping the main power connection off.

Installation is not as simple as it sounds. The interlock has to be matched for your type of panel. You can't just put on a generic interlock and they also may require special permits, depending on where you live.

## Make a Plan and Test Often

Once you have your generator connection of choice installed, have a plan in place for when the power goes out. For example, if you have a transfer switch installed, know what breakers you want to turn on, mark them, and make a list. Formalize this list and put it next to the panel.

Test your generator setup before an emergency happens. This means turning off grid power, powering the generator, and connecting everything you want to run from it. Choose a nice, sunny day, when you can take your time and figure it all out; not when it's dark and you really need it. For instance, you want to make sure you know what power your refrigerator draws before it's a problem.

## Protecting the Generator

Exposing generators to rain or snow creates an unsafe scenario with the potential for electrocution, never mind that it can cause damage to the unit. As such, keeping it under cover is essential. That said, when the generator is operating during inclement weather you can't simply throw a tarp over it because heat and exhaust can create hazards like fire or the buildup of deadly fumes. Whatever is protecting a running generator must be fire-retardant and allow for proper ventilation. There are several ways to accomplish this while it's working from framed covers to customized boxes to homestead-built enclosures.

## Running Covers

These would protect the generator while it's running. Storage covers that typically come with generators are not suitable for use during operation because they don't allow for proper ventilation and heat dissipation and they are not intended to hold up in heavy winds and precipitation.

Running covers are widely available and affordable, often costing between $100 and $200 and generally come in two styles: flat-top and dome. They're simple to install with basic tools. The most important considerations is to be sized correctly and compatible with your type and size generator. As you might expect, generator brands sometimes also make their own running covers.

The downside of running covers is that they may not be suitable for extremely disruptive weather events, such as flash flooding or hurricane-level winds. Most act as canopies to deflect water coming from above, not rushing in from below.

Look for brands that comply with safety guidance from organizations like UL Solutions (UL), the National Fire and Protection Association (NFPA), and the Portable Generator Manufacturers' Association (PGMA).

## Customized Boxes

As large portable generators become more popular, demand for built-to-order enclosures has grown that include automated ventilation, heat dissipation, and noise reduction —generators can be quite loud in a neighborhood.

These are sturdy metal enclosures with more weather protection than a running cover. As you might expect, they are expensive, often exceeding $1,000, and can be more than the generator itself.

This is an example of a well-built enclosure. There's top and side ventilation with maintenance panels on all sides. The big question is how this would be put in place when a portable generator is rolled out of storage.

Photo: Zombie Box

## Homestead-Built Enclosures

The whole point to an enclosure is that it would stay in place during the most extreme weather events so it can't just sit on the ground or on a fixed pad. Otherwise, it will likely blow away. Then it also needs adequate ventilation to dissipate heat and release carbon monoxide. Then there's access for maintenance. These enclosures require careful forethought for the most extreme events and for simplified maintenance.

**Ventilation** – This can be incorporated into the generator system with a motorized vent that activates with the generator. When the generator turns on, the vent kicks in automatically.

**Heat Dissipation** – This means the enclosure, likely made from wood, needs to be large enough to provide about two-to three feet of clearance on all sides and top. The roof must be fire proof metal.

**Foundation** – The generator needs to be as level as possible. This can be gravel, pavers, or concrete. The benefit of gravel would be to allow runoff water to flow through while not affecting the generator, but there must also be some way to contain the gravel. Because of operating heat, the generator cannot be on a wood deck while working.

**Maintenance** – Assuming that this would be for a portable generator, even if heavy, the system must be positioned where the generator can be easily removed from the enclosure. This means removable access panels and possibly the roof so that a human can manipulate the machine into and out of the enclosure.

**Design** – As with all homestead-built structures, simple is always better. A slant roof on sturdy ground-contact 4x4 posts anchored in the ground with concrete (like with fence pickets) is preferred. The sides can be cut from panels or built up from cedar fence pickets. Position the enclosure to counter normal prevailing winds to keep side-blowing rain out while allowing for ventilation and heat dissipation.

**Weather** – This gets regional. If in tornado country, stout is paramount. If in hurricane country, blowing rain protection is required. If in snow country, clearing drifts from around the structure is important. But, if in more moderate environs, the most likely calamity will be falling tree branches. Consider the worst that could happen and build accordingly.

## Examples of Generators

These are simply a sampling of the many generators available on the market. There is no endorsement for any of these products.

When making decisions, always check the lowest ratings first and ascertain why the low rating. If the same problems show up multiple times, this is a warning sign. Then look for photos supplied with reviews. The good news is that most of the top suppliers of generators are of top quality, but always invest in quality over price. There is no implication of quality in any of these examples.


**Honda EU 2200i / Inverter**


**Champion / Traditional**

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**Generac iQ5200DF / Inverter**


**DuroMax XP1300HX / Traditional**