



Polar Power, Inc. first tested its DC generator using its PMHH Alternator technology in 1992. Since then numerous organizations have performed extensive testing on our generators, including the US Army. Polar's DC generator sets (gensets) meets both Military and Belcore power applications. Test reports are available.

Polar assembles the genset to meet its' clients requirements by adding the appropriate diesel, gasoline, or gas (propane, butane, natural) engine to our DC alternators. The engines are available in either a liquid or air-cooled version. Polar has designed this DC alternator incorporating state-of-the-art technologies and all new tooling to meet the increased performance demand for:

- * Low Maintenance
- * Low EMI Emissions
- * Very High Quality Electrical Output
- * Light Weight
- * Low Fuel Consumption
- * Low Acoustic Noise
- * High and Low Ambient Operation (-40° to 125° F)

Polar Power has met these performance goals through an integrated engineering effort involving detailed analysis of engine, voltage regulator, field coil, magnet, stator, rotor, and diode effects on the system's output voltage and current.

Polar Generators

Diesel and Multifuel

- 5-8 kW Diesel Air Cooled
- 6-10 kW Diesel Water Cooled
- 1-3 kW Air Cooled
- 5-10 kW Water Cooled
- 5-10 kW Air Cooled

Propane, Natural Gas, & Gasoline

- 2kW-3.5kW Air Cooled
- 5kW-6.5kW Air Cooled
- 5kW-7kW Water Cooled
- 6-9 kW Water Cooled
- 1-4 kW Air Cooled
- 5-10 kW Water Cooled
- 3-5 kW Continuous Operation

Low Maintenance and High Reliability

1. The unique alternator design allows us to turn the engine at low speeds, thereby extending engine life.
2. The voltage regulator has automatic two step engine speed control. At high electrical load demands the regulator, through an external solenoid, automatically increases engine RPM; at low loads the engine speed is automatically decreased.
3. Polar Power's PMHH alternator has no: bearings, couplings, brushes, slip rings, nor rotating fields. There are no alternator parts to wear.
4. The entire alternator assembly is vacuum dipped and baked with a polyester coating. This seals off all metal surfaces from corrosion. Resistance to salt fog is extremely high.
5. There are no electronic parts (diodes, etc.) nor electrical connections inside the alternator. There is nothing to short or vibrate loose inside the alternator.
6. The alternator is almost impossible to damage electrically. The outputs can be shorted for minutes without damage.
7. The alternator is thermally protected; a sensor on the yoke can warn the operator of a high temperature condition. If no action is taken the regulator automatically reduces the output current so the alternator can run cooler.
8. The output current is monitored by the voltage regulator through a current transducer. The voltage regulator has an adjustable current limit on the output. It is virtually impossible to overload the alternator.
9. Polar Power's PMHH alternator should have an MTBF exceeding 100,000 hours. The diode bridge set is remote from the alternator and mounted on a large heat sink to keep cool. The voltage regulator has lightning and surge protection on both the input and output. All the electronic components within the voltage regulator are operated at less than 50% of their rated values.
10. The only normal wear the alternator experiences is the abrasion caused by the air being circulated around the stator coil and this effect is limited. Polar Power's PMHH alternator, because of its high efficiency, does not require a cooling fan. Air moved over the stator due to rotor effect is of low velocity. This is advantageous in sandy and dusty environments.
11. The engine is protected against: over-temperature, low oil pressure, over-speed, and over-cranking (during starting). There is a lockout protecting the engine against starter motor actuation while the engine is running.
12. Two stage cyclone air filters are used on the engines air intake in order to minimize the air media cartridge replacement.
13. The alternator's rotor is dynamically balanced to improve the engine's bearing life.
14. Fuel is filtered to stringent standards for water and particle separation before entering the engine.
15. Low EMI emissions are designed into the system. There are no brushes or slip rings. Field coil is isolated from the buss through fast diodes and capacitance. The voltage regulator does not strobe the field coil on and off. Proportional control reduces the back EMF produced by the field coil. The fuel stop and two speed solenoids are attenuated for voltage spikes as a result of turning on and off the solenoids field coil.





DC Generator

Low Fuel Consumption

The PMHH alternator has an efficiency of between 75 to 85% versus 55 to 70% for other DC alternators. The voltage regulators' two speed engine control can save up to 30% in fuel under light electrical loads.

Low Acoustic Noise

Improving alternator efficiency reduces the horsepower demand on the engine which reduces the engine noise. Eliminating the brushes, slip rings, and fan from the alternator reduces alternator noise.

High and Low Ambient Operation

During starting the regulator keeps the field current off. This feature coupled with the small light weight rotor provides a minimal load on the starter motor.

For low ambient temperatures (-40° to 10° F) cold starting aids are available.

Automatic two speed operation controlled by the voltage regulator keeps the oil warm in low ambient temperatures (reduces moisture contamination of the oil) and keeps the oil cooler in high ambient temperatures.

The higher alternator efficiency allows the engine to run cooler in high ambient temperatures. The increased alternator efficiency reduces the mechanical load on the engine which then reduces the engines cooling requirement.

System Advantages

1. No isolation relays are required. The voltage regulator and the 6 phase diode bridge isolates both the field coil and stator from placing a drain on the battery during the off state.
2. No warm-up relays and timers are required. After the set is started the engine remains in low speed operation with low power output until the engine warms up causing a thermostat to switch

on the voltage regulator. When the engine is warm it will adjust itself to meet the required load demand. If required, this feature can be removed.

3. Alternator System Condition Signals. The standard voltage regulator will provide the following alarm conditions:
 - a. Over-current
 - b. Over-temperature (stator)

Output currents and voltages are independently adjustable. Regulator will provide current output signal.

Options

Air Conditioning. The genset can conveniently support a 6,000 to 36,000 BTU air conditioning system without effecting the 6 kW output. Polar Power assembles a belt-driven automotive style compressor onto the engine. An electric clutch brings the air conditioning on line when required; when not required, there is no parasitic load on the engine.

Engine Styles.

- a. Diesel Engine: either air-cooled or water-cooled.
- b. Gasoline Engine: either air-cooled or water-cooled.
- c. Gas Powered: Propane, Natural gas, either air-cooled or water-cooled.

Automatic Temperature Compensation Module. The genset output, if used for charging batteries, can be temperature compensated for superior battery charging. A temperature sensor is placed on the battery which causes the regulator to adjust the output voltage to match the battery needs.

Automatic three step charging circuit consisting of bulk rate, overcharge (equalize), and float. This module includes temperature compensation and automatic start-up and shut-down (available mid 1993).