

# 6200 Series

## DC Alternators

Polar Power has designed the Model 6200 Series DC Alternator incorporating state-of-the-art technologies and all new tooling to meet the increased performance demand for:

**Telecommunications**  
**Systems without batteries**  
**and sensitive loads**  
**APU's**  
**Cogeneration and CHP**  
**Cathodic Protection**

### Advantages

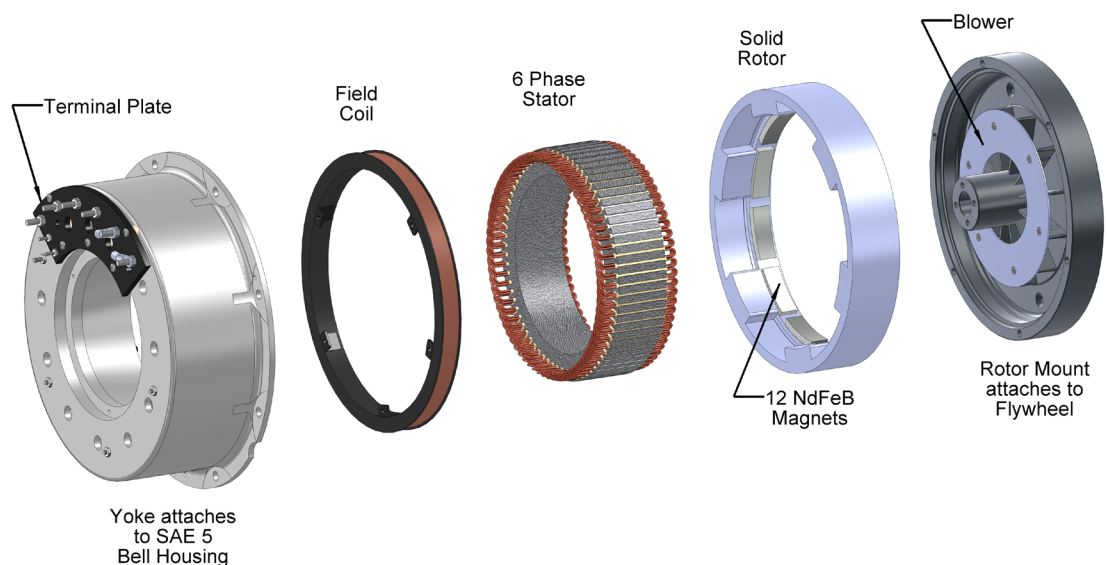
- No Maintenance
- No Mechanical Adjustments
- Very High Quality Electrical Output
- Light Weight
- High Efficiency
- Wide Temperature Operation Range (-50° to 145°)
- Adjustable Power Outputs via Engine RPM

### Hybrid Homopolar (PMHH) Technology

Polar Power first tested its DC Alternator using its Permanent Magnet Hybrid Homopolar (PMHH) technology in 1992. Since then numerous organizations have performed extensive testing on Polar's generators, including the US Military.

Polar Power has met these performance goals through an integrated engineering effort involving detailed analysis of engine, voltage regulation electronics, field coil, magnet, stator, rotor, and diode effects on the generators output voltage, current, and electrical quality.

Polar Power selected and optimized the 6200 series alternator using our PMHH technology because it does not require brushes, slip rings, rotating fields, exciters, or field flashing. Its small and compact design allows the use of a bearing-less pancake design.



## Hybrid Homopolar (PMHH) Technology

The permanent magnet alternator being the simplest, most efficient, and reliable of all the technologies, and the homopolar alternator providing the output regulation. The permanent magnetic portion produces the majority of the power, while the homopolar portion boosts the power produced by the permanent magnet and provides a means of voltage regulation. The system provides excellent voltage regulation in response to load transients. The homopolar alternator has the fastest response to load transients among the brushless alternator technologies.

The PMHH technology uses a solid rotor with magnets revolving around a stationary stator and field coil. The construction is extremely simple and requires no maintenance or replacement parts.

To reduce ripple and improve output harmonics, Polar Power incorporates a 6-phase stator with each phase rotated 60 degrees in a 12 pole configuration. To further improve electrical quality, the Supra controller energizes the field coil to provide a “clean” proportional output. Most other voltage regulators simply turn the field on.

The 6-phase bridge rectifier assembly is custom engineered and manufactured by Polar Power. We incorporate the most efficient Schottky diodes mounted on a large heat sink for improved cooling and installed off the alternator to reduce the negative effect on engine vibration on diode life.

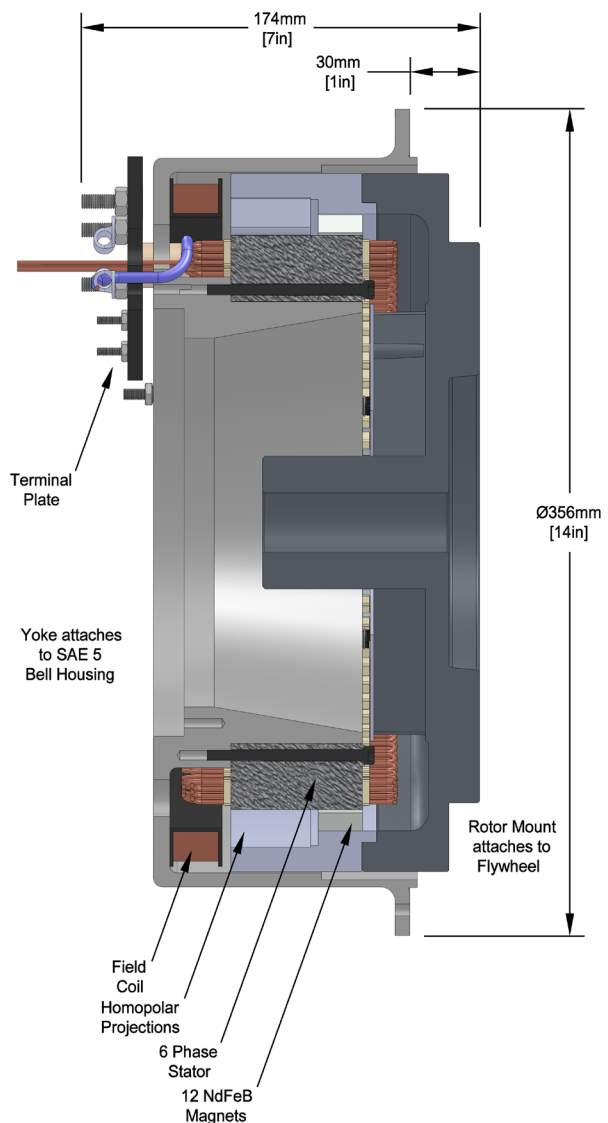
Engine performance under electrical load is greatly improved due to the 12 poles, 6 phases, and proportional output voltage regulator. Under these favorable conditions, the engine steel laminations are bonded and have a smooth and even torque requirement over the 360° flywheel rotation.

## Low Maintenance and High Reliability

1. The unique alternator design allows us to operate the engine at low speeds, thereby extending engine life and reducing engine noise.
2. Polar Power’s PMHH alternator has no bearings, couplings, brushes, slip rings, or rotating fields. There are no alternator parts to wear out.

3. The entire stator assembly is varnished dipped and baked with a polyester coating. Resistance to salt fog is very high. The coatings also protect the stator from particle abrasion and vibration.

4. There are no electronic parts (diodes, etc.) nor electrical connections inside the alternator. There is nothing to short or vibrate loose inside the alternator.



5. The alternator is almost impossible to damage electrically. The outputs can be shorted for a short duration without damage.

6. The alternator with a Polar Power controller is thermally protected; a sensor on the yoke can alert the operator of a high temperature condition. If no action is taken, the regulator automatically reduces the output current, so the alternator will run cooler.

7. The Model 250 Voltage Regulator monitors the output current through a current transducer mounted on the Diode bridge. The voltage regulator has a programmable current limit on the output. It is virtually impossible to overload the alternator or stall the engine on a properly calibrated system.

8. The Diode Bridge Assembly is separate from the alternator diodes. The power loss through our 6 phase bridge is less than half that of other DC generators.

9. Polar Power's PMHH alternator is designed have an MTBF the field coil. exceeding 100,000 hours, as there are no parts which rub, off at lower frequencies, which creates ripple on the wear, or overheat under normal operating conditions.

10. Corrosion is the prime reason most standby generators fail. Polar's alternators are ruggedized for marine and agricultural applications. All components are constructed of corrosion resistant: stainless steel fasteners, hard anodized aluminum rotor mount, nickel plated magnet ring, and zinc plated yoke. Steel laminations are bonded in each layer to prevent voids. A clear coat of varnish then covers the parts for enhanced corrosion resistance.

11. The alternator's rotor is dynamically balanced to Class 3 for Low Maintenance and High Reliability

### Very High Quality Electrical Output

Low EMI emissions are designed into the system. There are no brushes or slip rings. The Field Coil is powered with a clean DC current to virtually eliminate conducted and radiated EMI.

1. The 6-phase stator, with each set of phases placed 60°

part, reduces the amplitude of the current waveform.

2. The 12-pole design also reduces the amplitude of the voltage and current waveforms. The combination of high alternator frequency and multi-phasing reduces ripple and improves output harmonics.

3. The relatively large iron and copper mass in conjunction with a fast responding voltage regulator reduces the load transient response time to under 200 milliseconds from no load to full load and vice versa.

4. The voltage regulator maintains the voltage drift of less than 1.5% during a change in ambient temperatures of 60° F over 8 hours.

5. Output ripple is less than 300 millivolts RMS without filter capacitors and without battery. With filter capacitors the ripple is less than 100 millivolts. With battery the ripple is less than 30 millivolts.

6. Voltage regulation from no load to full load is less than 1.5%.

7. Voice frequency noise is less than 40 dBmC as measured on the battery.

8. The Model 250 Voltage Regulator has a bi-polar power supply driving the field coil. This feature prevents a voltage rise transient after a sudden change from full load to no load by reversing the magnetic field in the rotor, thereby forcing the output voltage to stay constant. The 15% voltage transient caused by a sudden change from full load to no load does not last longer than 200 milliseconds.

9. Alternators are available in nominal voltages of 12, 24/28, 36, 48, 120, 144, and 300 Vdc.

10. Power ratings from 2 kW to 13 kW based on engine speed and stator winding style. Low EMI emissions are designed into the system. There are no brushes or slip rings. The 32-pole design reduces the amplitude of the

### Light Weight

The Model 6250 Alternator weighs 83 lbs., including the Diode Bridge assembly. This is a weight savings of more than 160 lbs over other alternators used in Military APU'S. The light weight can be attributed to the high energy Neodymium-Iron-Boron magnets, high frequency, and "pancake" design.

### Low Fuel Consumption

The PMHH alternator has an efficiency of between 75% to 85% versus 45% to 70% for other DC alternators. Efficiency is dependent on speed and load.

### Low Acoustic Noise

Improving alternator efficiency reduces the horsepower demand on the engine, which reduces the engine noise. The engine can also operate at slower speeds further reducing acoustic noise.

| Model # | Power Range | Voltage     | Weight        |
|---------|-------------|-------------|---------------|
| 6250    | 2-9 KW      | 12V-300V    | 45 lb 20.5 kg |
| 6255    | 8-14 KW     | 24/28V only | 55 lb 25 kg   |

\* Maximum power is rated at 3600 RPM. Weights are approximate and do not include Controls and Diodes Fluid cooling adds 3.5 lb (1.6 kg)

## Product Comparison

#### 6200 Series Profile

- Available in one size covering the power range of 2 to 14 kW
- Voltage and current regulation is independent of engine speed
- Fixed speed or variable speed operation
- Engine speed can be manually or automatically adjusted over a 1,000 RPM range to meet load requirements
- Fast voltage and current regulation

#### 8000 Series Profile

- Available three sizes covering the power ranges of 1 to 34 kW

- Variable speed operation over a 500 RPM range is required to maintain voltage and current regulation
- Higher efficiency
- Very compact and light weight
- Lower cost

#### When to select the 6200 series over the 8000

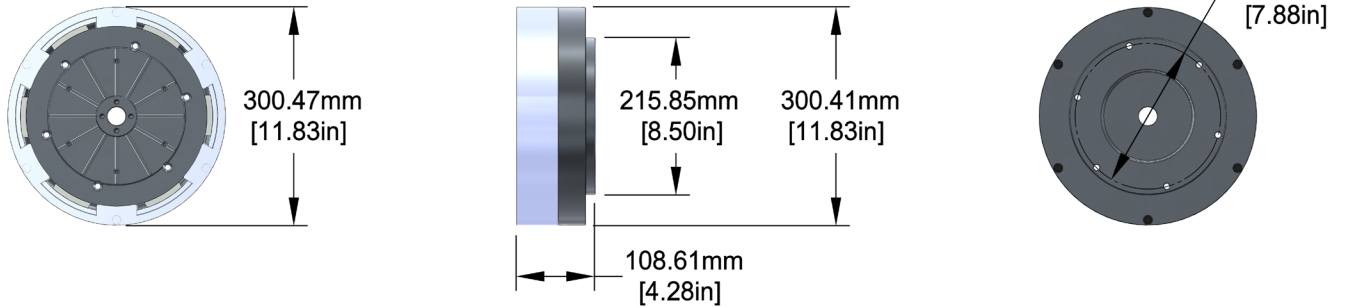
- Engine is fixed speed
- The engine needs to operate over a wide speed range
- Engine is driving other devices that take priority in speed control
- Alternator is powering loads that require very fast voltage regulation
- The load is less than 8 kW for all voltages except for 28.
- The 28 Vdc load is less than 13 kW

#### When to select the 8000 series over the 6200

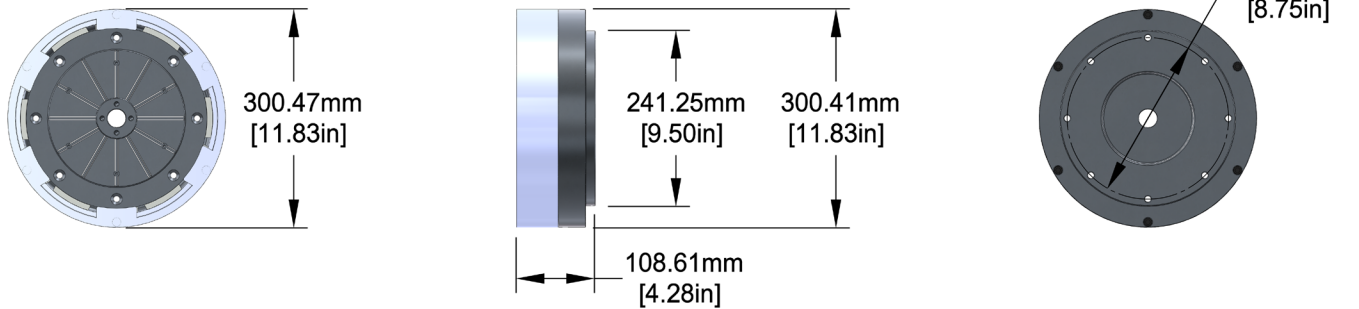
- Loads exceed 10 kW
- Engine speed can be controlled
- Small size and light weight are desired

### Rotor Configuration

1 - Rotors with 6 hole configuration use screw: Flat Head Socket, 5/16-18 x 1-1/2



2 - Rotors with 8 hole configuration use screw: Flat Head Socket, M8 x 1.25MM x 30MM





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### Limited Warranty

Polar Power Inc. (hereinafter "Polar"), hereby warrants goods manufactured and sold by it to be free from defects in material and workmanship for 24 months after the date of shipment.

The warranty is limited to repair or replacement at 249 E. Gardena Blvd, Carson, CA 90248 or other point designated by Polar of such parts as they appear to Polar, upon inspection, to be defective in material or workmanship. This warranty is extended to the first user only and no warranty is made or authorized to be made assignable on resale by the first end user.

The above warranty includes a pass-through warranty from the engine and controller manufacturers for whatever period and warranty is in effect by the manufacturer at that time. The above warranty only extends to applications and installations which are approved by mutual agreement between Polar and the first end users.

To obtain performance of any obligation under this warranty, contact must be made with Polar in writing at 249 E. Gardena Blvd, Carson, CA 90248. Submission of a claim does not obligate Polar to accept such claim in full or in part.

No bills for service, labor or other expenses that have not been previously approved and authorized by Polar will be allowed.

No goods or materials may be returned until authorized in writing by Polar and, where the return of the material is authorized, it shall be F.O.B. to whatever point Polar designated within the U.S.A.

Repairs or alterations made to the goods without Polar written concurrence or the operation of the goods in excess of rated capacity will invalidate this warranty.

There is no implied warranty or condition of merchantability. There is no other warranty or condition expressed or implied, statutory or otherwise, except such as is expressly set forth herein. Neither Polar nor manufacturers will be liable for any general, consequential or incidental damages, including without limitation any damages for loss of use or loss of profits, for any breach of warranty or condition or for negligence; Polar's and manufacturer's liability and the buyer's exclusive remedy being expressly limited to the repair or replacement of the goods sold by polar as provided herein.