



Freedom Motors Technology & Engines

Freedom Motors was formed in 1997 as the engine division of Moller International. It was organized as a corporation in the state of Nevada, USA.

In 2001, all physical assets and intellectual property related to the rotary engine technology held by **Moller International (MI)** and the following companies were acquired by **Freedom Motors (FM)** when it became an independent corporation.

General Motors Corporation (GMC)

GMC developed a rotary engine for two models of their automobiles. Unfortunately, around 1975, it was hit with two crises. One was the lack of fuel at that time, and the rotary engine was less fuel efficient than the piston engine. The second was the emphasis being placed on emissions, and the rotary engine had higher emissions than the piston engine. GMC had spent over \$500 million (well-documented at that time) on R&D and tooling to produce their proprietary rotary engine. Faced with the above two problems, GMC decided to drop the program. GMC's tooling was supplied by Gleason Machine Works. In FM's recent contact with Gleason Machine Works, its manager stated that the three major machines that FM acquired, which are essentially new, would cost over \$7 million if we needed additional machines. This equipment allowed FM to be the only company outside Mazda Motors to completely overhaul Mazda rotor housings.

Outboard Marine Corporation (OMC)

The OMC general manager of the rotary engine program stated that OMC spent about \$250 million developing rotary engines for their snowmobile and the outboard motor markets. OMC was the largest manufacturer of outboard motors in the world. The snowmobile engine went into production. The outboard engine was about to be produced when the company was acquired by Bombardier in Canada. Bombardier was a major producer of engines and saw no need to produce rotary engines. As a result, FM was able to acquire the complete production manufacturing details and rotary engine inventory held by OMC. FM is the only supplier of rotary engine parts for the OMC snowmobiles.

Infinite Engine Company (IEC)

IEC gave FM a \$2 million contract to develop a rotary engine for an unmanned aerial vehicle (UAV) client. FM's contract with IEC exclusively licensed engine production and required IEC to meet certain sales levels. IEC mismanaged the program with their major client, General Electric Aerospace. As a result, IEC was not able to meet the sales level they were obligated to meet. FM was able to show in court that IEC was guilty of mismanagement and as a result, IEC, a public company, was forfeited to FM. It is estimated that IEC spent approximately \$25 million putting FM's designed engine into production.

Using these acquisitions as the basis and foundation, FM further developed the engine technology and made it commercially viable. FM and its technology licensor, MI, together hold numerous mechanical patents, design patents and many other technological patents making up to 49 in total. Patents are under Dr. Paul S Moller's name. FM has many trade secrets and 6 patents in process.

Features:

Fewer Moving Parts

- Only 2 moving parts in a single rotor 4-stroke Rotapower® engine. Compares to 7 parts for 2-stroke and 25 parts for a 4- stroke piston engine with a similar instantaneous output torque.
- Charge or air-cooled rotor design eliminates many engine components typical of existing rotary engines.
- Can be disassembled and reassembled in less than 30 minutes.
- Fewer moving parts means longer life and lower direct and indirect cost.

Reduced Fuel Consumption

- Specific Fuel Consumption ~0.4 lb./HP-hr. for the 4-stroke Rotapower engine with the potential to achieve 0.31 lb./HP-hr. from the 5-stroke version that extracts residual energy from the exhaust based on NASA predictions and test results to date.
- Compares to 0.45 lb./HP-hr. for the average commercial 4-stroke piston engine and ~ 0.35 lb./HP-hr. for the best 4-stroke gasoline fueled automotive engine.

Very Low Emission Levels

- Carbon Monoxide (CO) and unburned hydrocarbon (HC) emissions are two orders of magnitude better than 2-stroke, and one order of magnitude better than many industrial or commercial 4-stroke piston engines.
- NOx emissions much lower than 4-stroke piston engines.

Proven Multi-Fuel Performer

- Demonstrated on gasoline, natural gas, alcohol (methanol and ethanol) and propane, Spark-ignited diesel, kerosene, and jet fuel. Methanol and ethanol represent the ideal fuels for the Rotapower® engine, as to horsepower and torque output, cooling characteristics, fuel economy and environmental effects,
- Pre-production is underway of a hydrogen fueled version to fulfill FM's \$60+ million with OneH2

Low Vibration Levels

- Perfect radial balanced allows rigid mounting, which can become an integral part of the chassis.
- Instantaneous torque characteristics identical to 6 cylinders 4-stroke piston engine (two-rotor model).

Modular Design

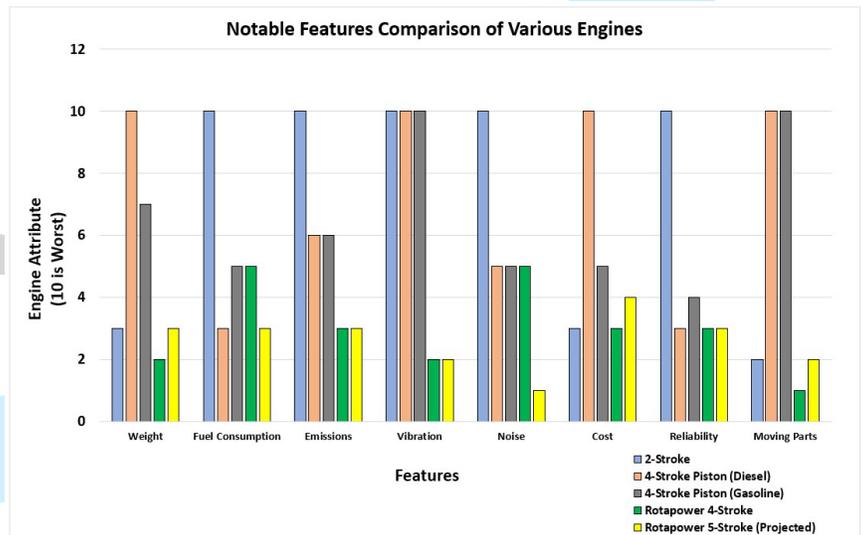
- Stacking rotors easily extends range of available power.

Fuel Consumption Comparison

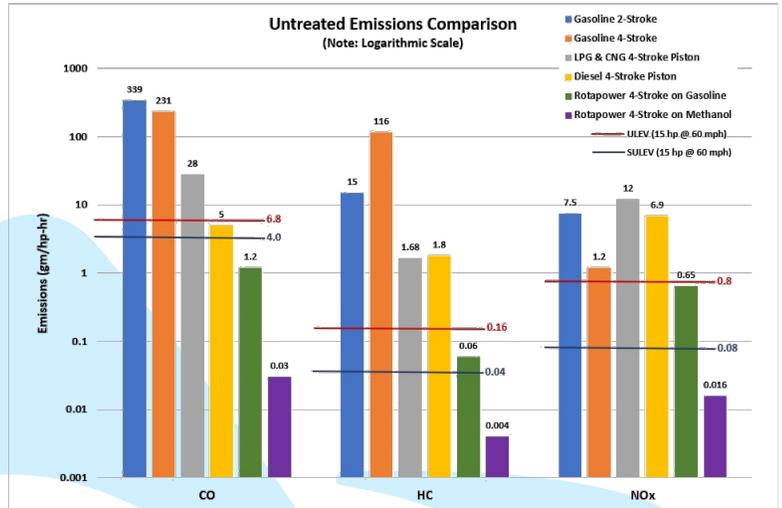
| Engine Type | Specific Fuel Consumption (SFC) | |
|---|---------------------------------|-----------------|
| | LB per hp-hr | Grams per kw-hr |
| 2-Stroke recreational piston engine | 0.65 | 395 |
| Mazda rotary engine | 0.52 | 316 |
| OMC rotary engine | 0.6 | 365 |
| 4-Stroke commercial piston engine | 0.45 | 274 |
| Rotapower engine – carbureted | 0.43 | 262 |
| Rotapower engine – direct fuel injection | 0.4 | 243 |
| Diesel fueled Audi 2.5 L TDI | 0.31 | 188 |
| Rotapower engine – 5-Stroke version (Projected) | 0.31 | 188 |

Rotapower® Improvements to Extend Engine Life

- Freedom Motors incorporated key patented improvements into its designs:
 - Parallel cooling for rotor (Patent #5413877).
 - Unique oil injection and lubrication system (Patent #6325603).
 - Complimentary cooling towers (Patent #6164942).
- Cooling approach eliminated end-loading the roller bearing and side-thrust on the rotor.



- Lubrication patent placed lubricating oil precisely where it was needed.
- Trade secrets to be implemented in production:
 - 20,000+ hour life seal and wear surface life.
 - Rotor housing grind finish eliminates need to lap housing.
 - Lower cost plasma coatings for rotor housing.
 - Lubricating oil uniquely able to address the needs of the Rotapower® engine.



Piston engine data from EPA report No. NR-0106
 Rotapower engine data verified by California Air Resource Board (CARB) and Dr. Andrew Burke of the Institute of Transportation Studies (ITS), University of California, Davis

Rotapower® Improvements to Reduce Fuel Consumption and Emissions while Increasing Power

- Unique intake port arrangement of fuel/airflow and airflow that leads to a 15% increase in power and a 4% reduction in fuel consumption in the 4-Stroke Rotapower® engine.
- Fuel/air intake timed by rotor position so that the charge enters the intake stroke near the leading edge of the rotor creating a stratified charge. Results in a 15% reduction in fuel consumption and near zero toxic emissions.
- A specific combination of engine displacement, engine RPM and brake mean effective pressure (BMEP) that allows the Rotapower® engine to operate on the Otto cycle while using diesel fuel.
- One-way airflow valve with very low-pressure loss.
- 5-Stroke version of the Rotapower® engine that increases power by up to 50%, reduces exhaust noise by over 90%, reduces exhaust temperature by nearly 50% and potentially reduces fuel consumption by up to 20%.

Rotapower® Engine Emissions

- Tests carried out in conjunction with the Institute of Transportation Studies (ITS) at the University of California at Davis and witnessed by members of the California Air Resources Board (CARB).
- The Rotapower® engine using gasoline as a fuel achieved hydrocarbon, carbon monoxide, and nitrous oxide emission levels well below those required to meet the Ultra-Low Emission Vehicle (ULEV) standards for California.
- This was accomplished without exhaust after-treatment (catalytic converter) which had not been previously achieved with any other engine technology.

- Using alcohol as a fuel resulted in toxic emissions that were well below the Super Ultra Low Emission Vehicle (SULEV) California standards again without exhaust after-treatment. Furthermore, using renewable fuels like hydrogen, methanol and ethanol resulted in carbon neutral performance.

Product Line

Rotapower® Engine Family

| Max Horsepower | Displacement | Configuration |
|----------------|--------------|---------------|
| 2.5 | 27cc | Single |
| 20 | 150cc | Single |
| 40 | 300cc* | 2-Rotors |
| 60 | 530cc | Single |
| 120 | 1060cc | 2-Rotors |
| 180 | 1590cc | 3-Rotors |
| 240 | 2120cc | 4-Rotors |
| 360 | 3180cc | 6-Rotors |
| 75 | 650cc | Single |
| 150 | 1300cc | 2-Rotors |

* Configuration that have not yet been tested by Freedom Motors.
cc = Cubic centimeter 1000cc = 1 Liter



□ Six primary components:

- End housings (2) – high silicon aluminum
- Rotor housing – high heat transfer aluminum
- Crankshaft – alloy steel
- Rotor – nodular iron
- Stationary gear – alloy steel

Intended Applications



Environmental Impact

- Methane mitigation
- Carbon reduction
- Renewable Fuels



The Future of Transportation

- Unmanned and manned AAM Aircraft
- AAM Aircraft with Range Extender
- EV with Range Extender



Reducing Battery Dependency

- Range Extender for AAM Aircraft
- Range Extender for EV
- 2 & 3 Wheeler EV
- Generators with Battery

Target Markets

The following markets are expected to include these targets, where FM will enjoy a significant addressable market and is planning accordingly:

- Powerhouse for Unmanned and Manned Advanced Air Mobility (AAM) Aircraft.
 - Reducing the dependency on batteries
 - Significantly increasing the flight time
 - Significantly increases the efficiency of the VTOL (Vertical Take Off & Landing)
 - Speeds of approximately 240 MPH can be achieved
 - Optimal for forest firefighting, rescue operations and military applications
- Range extension for battery powered cars, thus mitigating the range anxiety issue.
 - Particularly significant in countries where electric infrastructure is sub-par and cannot support EV charging at optimum capacity and speed.
 - Increasing the range of EV's so there is less stoppage for charging.
 - Reducing the cost of upgrading electricity infrastructure (per capita) to accommodate high speed charging.
 - Extremely small size of engine (approximately 1 Cu. Ft.), which can fit conspicuously in the trunk of the EV.
- Range extender for battery powered AAM aircraft.
 - This market is projected by Morgan Stanley to be between \$9 million by 2050. Without a range extender battery powered aircraft are shown to have a range between 10 and 40 miles.
- Generators
 - Rotapower® engines are excellent candidates for use in generators, due to their low emissions.
 - Extremely low maintenance. These rotary engines are highly reliable and have very few moving parts.
 - Modular design for scalability for required energy needs.
 - Excellent power-to-weight ratio of Rotapower® engines provides small form factor engines with more power. Thus, making the generators more compact and lightweight.
 - Extremely fast ramp rates. These engines can ramp up to 10,000 RPM in a matter of milliseconds.
 - Fuel independent. Can run on Hydrogen, Gasoline, CNG, NG, Biogas, Ethanol, Methanol (preferred).
- 2- and 3-wheelers market by replacing the piston engine with Rotapower® engines.
 - This will increase the volumetric area in the engine compartment thus enabling hybrid power and longer range.
 - It will make the vehicle potentially multi-fuel capable (may need a small tweak to the EFI or Carburetor).

- Power generation using Biogas.
 - Due to patented metered lubrication system, Rotapower® engines provides perfect alternative to oil cooled conventional engines, thus avoiding the acidic residue due to combination of engine oil and hydrogen sulfide in biogas.
 - Rotapower® engines can tolerate silica (prevalent in most biogas) by using chrome carbide wear surfaces and silicon nitride seals (9 Mohs versus 6-7 Mohs for silica). The rotary engine does not need or use valves, which could be damaged by silica deposits.
 - Rotapower® engines uses a stainless-steel rotor with a low thermal conductivity, as opposed to the aluminum used in many piston engines. This results in a rotor surface temperature of up to 900°F versus an aluminum piston at 400°F. This contributes to combustion of biogas with lower methane content.
 - Rotapower®, as distinct from a piston engine, has an intake chamber that is separate from the expansion chamber. This prevents the expansion chamber surfaces from being pre-cooled by the intake charge, which further aids in combustion.
 - Rotapower® engine has only three moving parts. By comparison, a two-cylinder piston engine typically contains over fifteen moving parts, with each subject to the corrosive effects of hydrogen sulfide.
 - The estimated capital cost for generator sets (“gensets”) powered by Rotapower® engines is substantially less than for those powered by either piston or microturbine engines.
- Power tools applications.
- Auxiliary Power Units (APU) for Airplanes
- Powerhouse for marine vehicles like speedboats, jet ski, and others. Potential for naval use in unmanned small vessels. The engine should be considered stealthy, in that its noise and vibration levels are extremely low (though it does emit infrared heat).
- Demand response applications with batteries to aid smart grid technologies to enhance wind and solar energy.

Market Potential

As the world moves towards renewable fuels and battery storage technologies, more emphasis has been placed on technologies to efficiently use fuel and charge battery systems. This renaissance is solely attributable to global warming and the threat to our environment and ultimately to humankind.

Industries where the Internal Combustion engines are poised to have CAGR gain are

1. Advanced Air Mobility (AAM)
2. EV Range extender
3. Industrial

4. Construction
5. Marine
6. Agricultural
7. Gardening
8. Generators
9. Motorcycles
10. Recreational Products
11. Automobiles/Trucks
12. Military

The (ICE) market is segmented on the basis of fuel, end-use and application. The growth amongst these segments will help analyze growth segments in the industries and provide a valuable market overview and market insights. The global internal combustion engine market size was estimated at 169,603.7 thousand units in 2021 and is projected to register a compound annual growth rate (CAGR) of 9.3% from 2022 to 2030. Demand for the product is increasing across industries such as agriculture, construction, mining, and power generation.

FM is focused on the small engines market which is expected to witness a global CAGR of more than 4% during the forecast period of 2022-2027. The majority of the growth is attributable to India, China, and the Asia Pacific (APAC) markets. The global small engine market was valued at US\$ 7,732.3 million in 2013 and is anticipated to be valued at US\$ 4,127.2 million by 2018 end. The small engine market is expected to grow at a substantial CAGR of 4.0% between 2018 and 2026 and is estimated to reach a global value of US\$ 5,628.2 million by 2026 end.

According to Morgan Stanley [Click Here], the Urban Air Mobility TAM base case to \$1 Trillion by 2040, but rolls out projections until 2050, when the TAM is projected to be \$9 Trillion.

Also, according to Deloitte, AAM market poised to grow sevenfold between 2025 and 2035.

1. By 2025 it will be \$17 Billion (\$13 Billion Cargo AAM and \$4 Billion in Passenger AAM)
2. By 2030 it will be \$47 Billion ((\$30 Billion Cargo AAM and \$17 Billion in Passenger AAM)
3. By 2035 it will be \$115 Billion ((\$58 Billion Cargo AAM and \$57 Billion in Passenger AAM)

The global demand for 2 and 3-wheeler engines is over 50 million per year and it is a very lucrative market that is projected to dominate mobility in emerging economies.

ENGINE TECHNICAL DETAILS

THE 4-CYCLE ROTARY ROTAPOWER® 27 ENGINE

The Power of Freedom

- Based on Wankel rotary engine design
- Fuel efficient, low emissions
- Very low vibration
- Low cost to maintain

Outstanding Compact Power

Power to weight is:

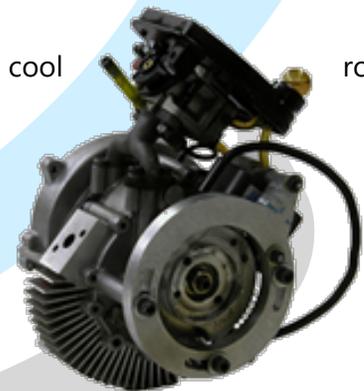
- 45% higher than a typical two-stroke piston engines
- 175% higher than a typical four-stroke piston engines
- 350% higher than a typical diesel engine

Durability

- Low vibration
- Rotary motion--No reciprocating motion
- Dynamically balanced
- Simplicity
- Low moving part count
- No timing chain, valves, camshaft, push rods, connecting rods, etc.
- Charge-cooled rotor eliminates costly and complex components to cool
- Air-cooled housing eliminates water pump and heat exchanger

Superior Emissions Performance

In tests witnessed by Dr. Andrew Burke from the Institute of Transportation Studies (ITS), UC Davis, and the CARB (California Air Resources Board) emissions from the Rotapower engine on gasoline were substantially below Ultra Low Emissions Vehicle (ULEV) standard for California. In recent tests on ethanol the emissions were below the Super Ultra Low Emissions Vehicle (SULEV) standard.

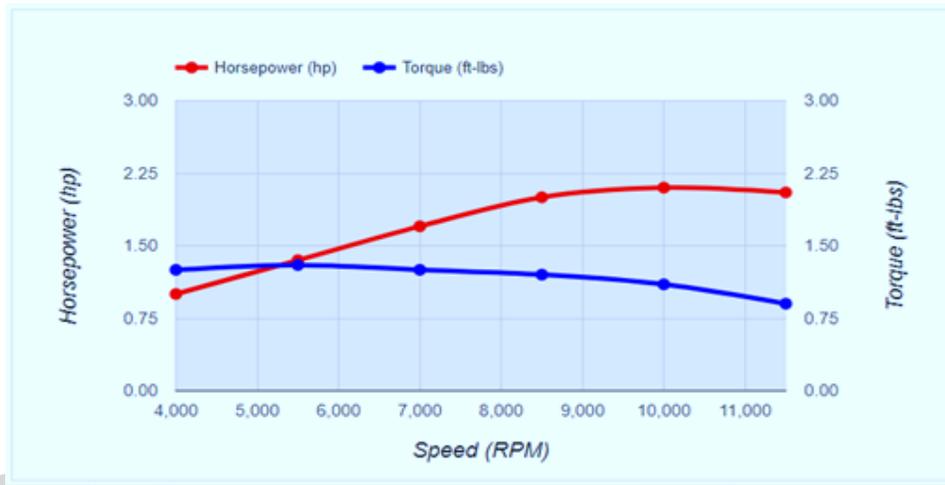


rotor

the

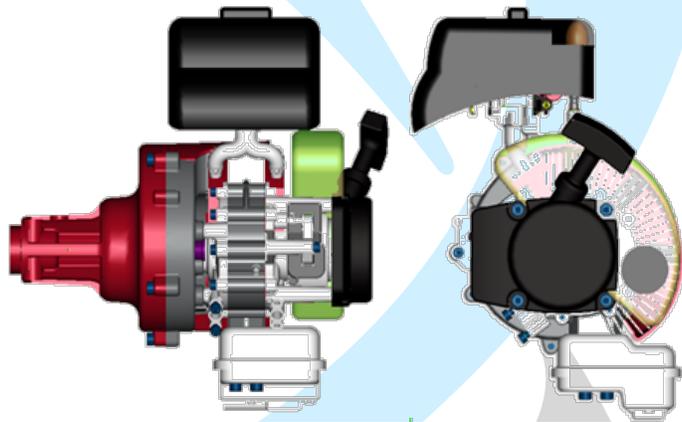
27cc size compared with a ruler

Rotapower 27cc Maximum Power Sweep RPM Test

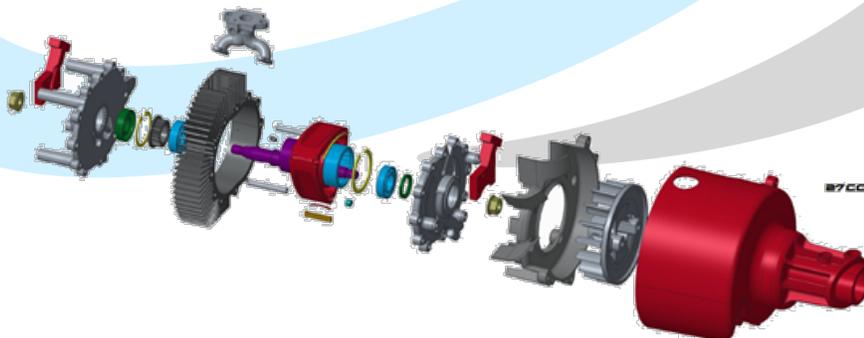


Specifications

- Single rotor, 27cc displacement
- 2 HP @ 9,000 RPM (Gasoline)
- 4 lbs
- 5" L x 5" W x 4" H
- Gasoline carburetor (standard)*
- Recoil starter
- Spark ignition
- Includes exhaust muffling
- Metered oil lubrication system
- Metric standard design



27cc configured for power tools applications



27cc exploded

THE 4-CYCLE ROTARY ROTAPOWER® 150 ENGINE

The Power of Freedom

- Based on Wankel rotary engine design
- Fuel efficient, low emissions
- Very low vibration
- Low cost to maintain

Outstanding Compact Power

Power to weight is:

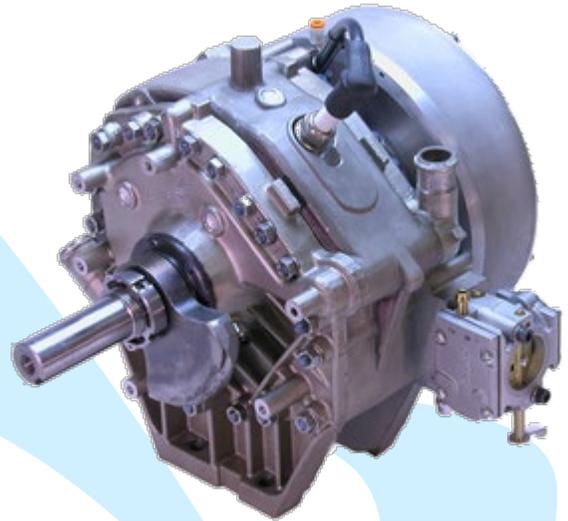
- 45% higher than a typical two-stroke piston engines
- 175% higher than a typical four-stroke piston engines
- 350% higher than a typical diesel engine

Durability

- Low vibration
 - Rotary motion--No reciprocating motion
 - Dynamically balanced
- Simplicity
 - Low moving part count
 - No timing chain, valves, camshaft, push rods, connecting rods, etc.
- Charge-cooled rotor eliminates costly and complex components to cool rotor

Superior Emissions Performance

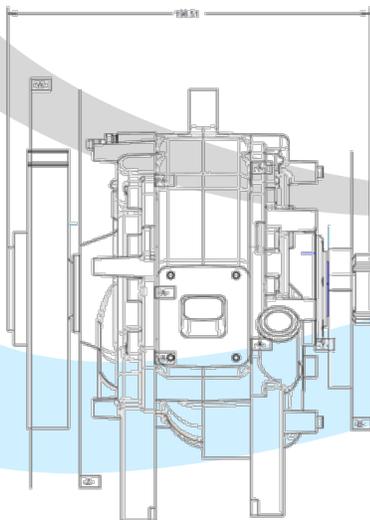
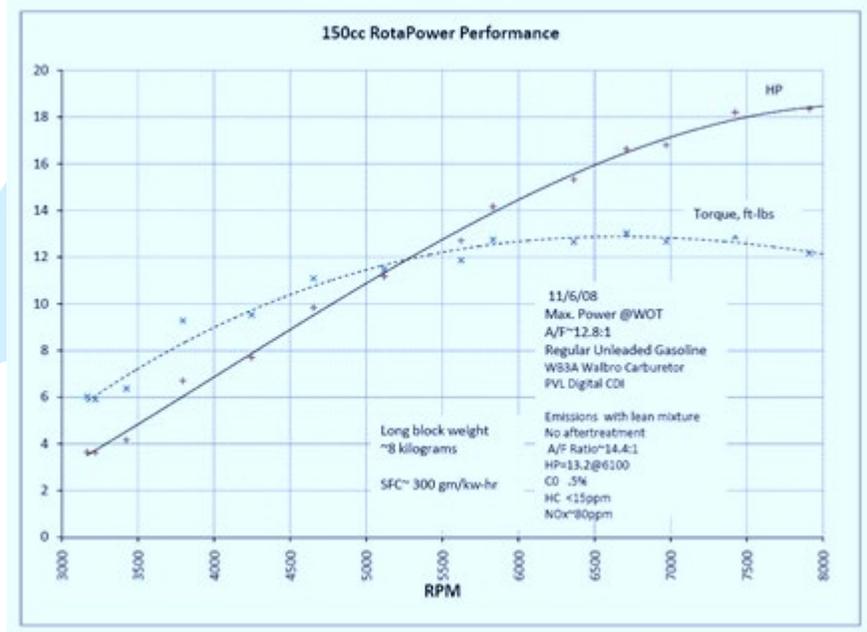
In tests witnessed by Dr. Andrew Burke from the Institute of Transportation Studies (ITS), UC Davis, emissions from the Rotapower engine on gasoline were substantially below the Ultra Low Emissions Vehicle (ULEV) standard for California. In recent tests on ethanol the emissions were below the Super Ultra Low Emissions Vehicle (SULEV) standard.



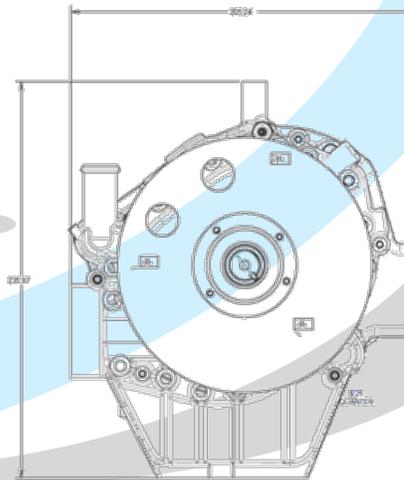
Specifications

- Single rotor, 150cc displacement
- 15 HP @ 6,000 RPM (Gasoline)
- 25 lbs
- 18cm L x 18cm W x 18cm H (7" L x 7" W x 7" H)
- Gasoline carburetor (standard)*
- Fuel injection (optional)
- Electric starter
- Spark ignition
- Coolant pump
- Metered oil lubrication system
- 32 Amp generator coil (standard)
- Specifications for battery, exhaust and cooling system provided
- Metric standard design

Rotapower® 150cc Maximum Power Sweep RPM Test



Rotapower® 150cc side view



Rotapower® 150cc end view

THE 4-CYCLE ROTARY ROTAPOWER® 530 ENGINE SERIES

Features

- Displacement of 530cc per rotor, with configurations of one, two, three and four rotors
- Four-stroke combustion process
- High performance and small size
- Liquid cooled aluminum housings
- Reliability
- High power-to-weight ratio
- Low vibration
- Ultra-low emissions
- Low fuel consumption



| | |
|---|--|
| <p>Low pollution and fuel consumption</p> <p>The Rotapower® engine uses a four-stroke combustion process with low combined hydrocarbon and carbon monoxide emissions (less than 1% of two-stroke levels). The lower emissions also reflect the more efficient four-stroke combustion process leading to much lower fuel consumption than the two stroke. The Rotapower's lower peak combustion temperature produces very little nitrous oxide much like the two-stroke. An oil metering system eliminates any need for fuel/oil mixing and further reduces the pollutants emitted.</p> | <p>Power-to-weight</p> <p>The Rotapower® engines are very compact resulting in a high power-to-weight ratio. Four-stroke engines produce approximately one half horsepower per pound of engine weight while two-stroke engines are capable of producing approximately one horsepower per pound. The Rotapower® produces well over one horsepower per pound of engine weight in typical applications and has the potential of up to two horsepower per pound in high-performance applications. This is important in applications requiring high power in small space along with low weight such as mini-jet boats, Jet Ski's, etc.</p> |
| <p>Reliability</p> <p>With two moving parts (single rotor), the Rotapower® engines are durable and simple to service (no timing chains, valves, camshaft, push rods, connecting rods, etc.)</p> | <p>Charge or Air-cooled rotor</p> <p>Using a charge or air-cooled rotor eliminates costly and complex components. This includes high volume oil pump, regulator, seals, plumbing and heat exchanger required by an oil-cooled rotor.</p> |
| <p>Low vibration</p> <p>The Rotapower® engines are virtually vibration-free since the few moving parts are dynamically balanced. All moving parts rotate, rather than the reciprocating motion found in piston engines. With minimal vibration, the Rotapower® engine can be hard mounted or used as part of a vehicle's structure.</p> | |

Specifications for 530 series engines

| | |
|----------------------------|---|
| Engine Type: | Rotary |
| Displacement: | 530cc/rotor |
| Fuel: | Multi-fuel capable (gasoline, diesel, alcohol, natural gas, biogas) |
| Fuel System: | Carburetion or fuel injection |
| Ignition System: | Magneto/C.D. |
| Alternator/Starter: | 12V DC |
| Lubrication: | Metered oil to bearings and engine seals (lost oil system). Uses synthetic, biodegradable oil. |
| Bearings: | Anti-friction roller bearings, thrust bearing. |
| Cooling: | Liquid cooled housings, charge or air-cooled rotor. |

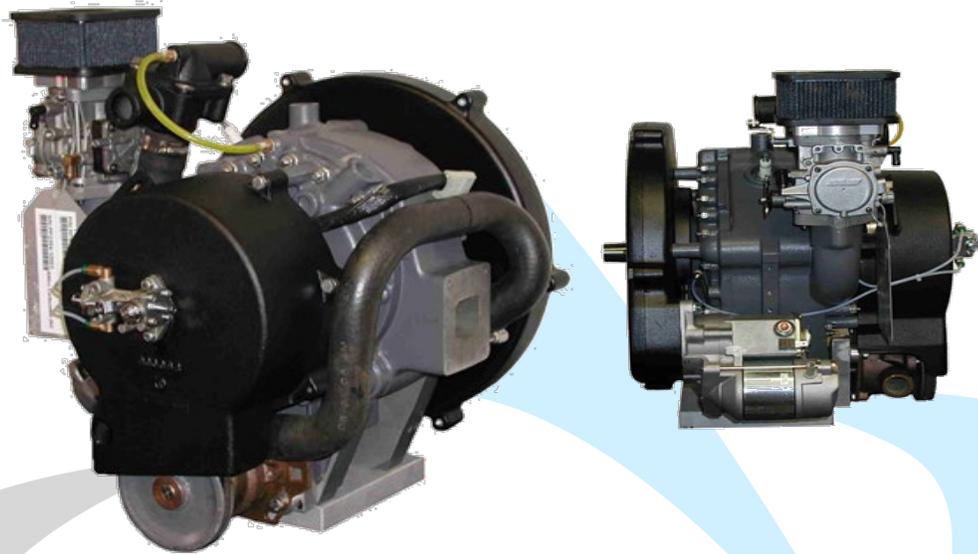


| | 530 SERIES | | | |
|--|------------------|------------------|------------------|------------------|
| No. Of Rotors | 1 | 2 | 3 | 4 |
| Displacement | 530cc | 1060cc | 1590cc | 2120cc |
| Housing Cooling | Liquid or Air | Liquid | Liquid | Liquid |
| Rotor Cooling | Charge or Air | Charge or Air | Charge or Air | Charge or Air |
| Max. Power (Industrial/Gasoline) | 60 HP | 120 HP | 180 HP | 240 HP |
| Rated Power (Industrial/Gasoline) | 40 HP | 80 HP | 120 HP | 160 HP |
| Rated Speed (Industrial) | 4500 RPM | 4500 RPM | 4500 RPM | 4500 RPM |
| Max. Speed (High Performance) | 7500 RPM | 7500 RPM | 7500 RPM | 7500 RPM |
| S.F.C. at Rated Speed (Industrial)† | .4 LB/HP-HR | .4 LB/HP-HR | .4 LB/HP-HR | .4 LB/HP-HR |
| Engine Weight* | 60 LBS | 90 LBS | 115 LBS | 140 LBS |
| Dimensions L, W, H** | 10 x 13 x 11 in. | 16 x 11 x 11 in. | 21 x 11 x 11 in. | 26 x 11 x 11 in. |

† Depending on fuel used *Includes starter, alternator, lubrication, fuel and ignition systems (no exhaust)

**Long block (includes flywheel)

THE 4-CYCLE ROTARY ROTAPOWER® 650 ENGINE



The Power of Freedom

- Based on Wankel rotary engine design
- Low emissions
- Fuel efficiency
- High power to weight ratio
- Very low vibration
- Low cost to maintain

Durability

- Low vibration
 - Rotary motion--No reciprocating motion
 - Dynamically balanced
- Simplicity
 - Low moving part count
 - No timing chain, valves, camshaft, push rods, connecting rods, etc.
- Charge-cooled rotor eliminates costly and complex components to cool rotor
- Liquid cooled housings provide efficient heat removal

Outstanding Compact Power

Power to weight is:

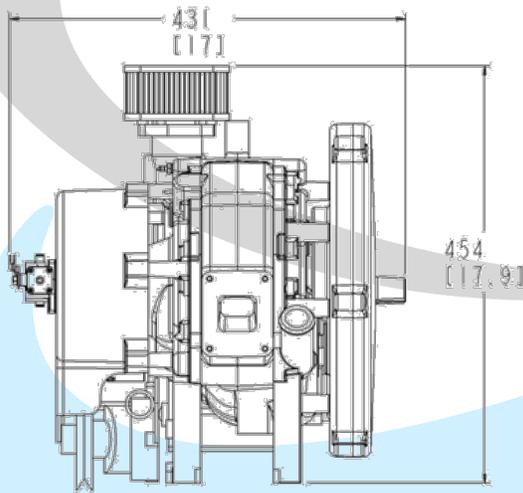
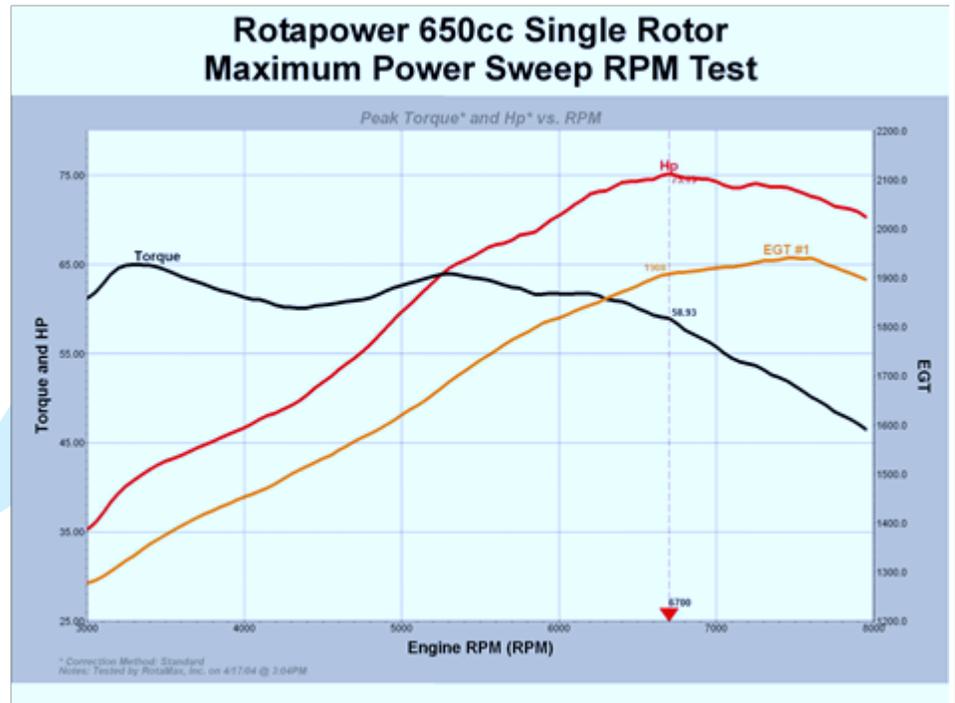
- 45% higher than a typical two-stroke piston engines
- 175% higher than a typical four-stroke piston engines
- 350% higher than a typical diesel engine

Superior Emissions Performance

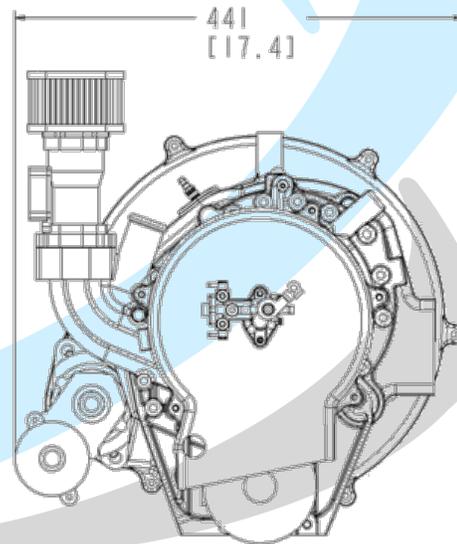
- Tested by California Air Resources Board
- Less than 25% of two-stroke engine emissions
- Substantially less emissions than a four-stroke piston engine when operating at higher RPM.
- Meets EPA guidelines without catalyst

Specifications

- Single rotor, 650cc displacement
- 80 HP @ 6,700 RPM (Gasoline)
- 110 lbs
- 431mm L x 441mm W x 454mm H (17"-L x 17.4"-W x 17.9"-H)
- Gasoline carburetor (standard)*
- Fuel injection (optional)
- Electric starter
- Spark ignition
- Coolant pump
- Metered oil lubrication system
- 32 Amp generator coil (standard)
- Specifications for battery, exhaust and cooling system provided
- Metric standard design

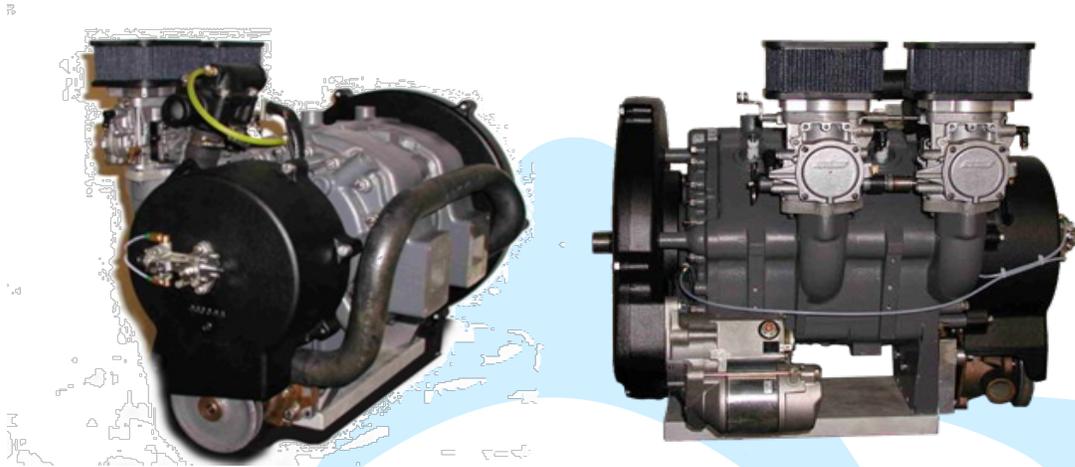


Rotapower® 650 side view



Rotapower® 650 end view

THE 4-CYCLE ROTARY ROTAPOWER® 1300 ENGINE

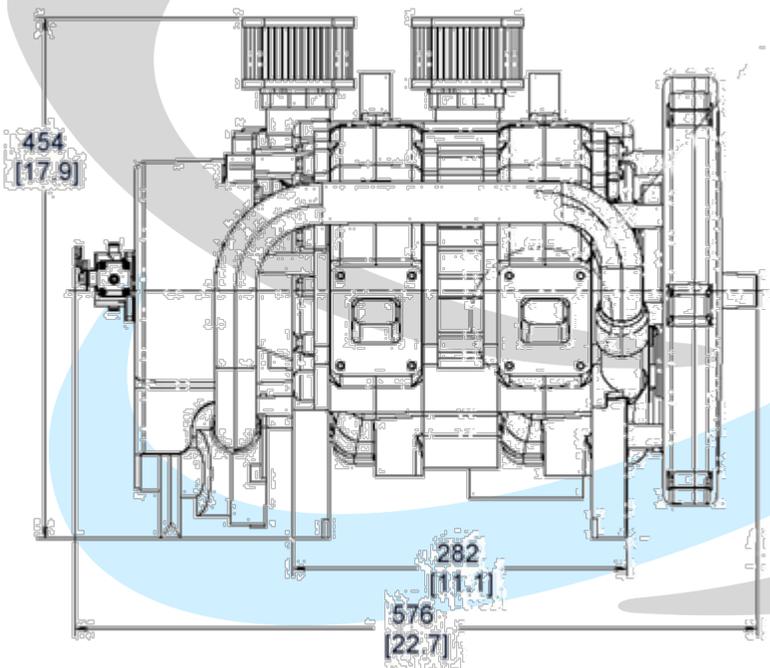
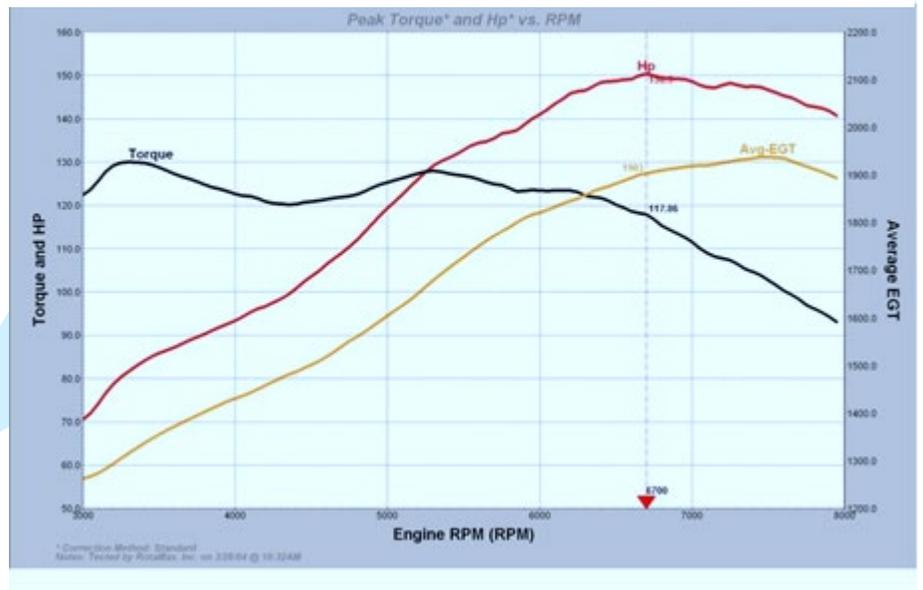


| | |
|---|--|
| <p style="text-align: center;">The Power of Freedom</p> <ul style="list-style-type: none"> • Based on Wankel rotary engine design • Low emissions • Fuel efficiency • High power to weight ratio • Very low vibration • Low cost to maintain | <p style="text-align: center;">Durability</p> <ul style="list-style-type: none"> • Low vibration <ul style="list-style-type: none"> • Rotary motion--No reciprocating motion • Dynamically balanced • Simplicity <ul style="list-style-type: none"> • Low moving part count • No timing chain, valves, camshaft, push rods, connecting rods, etc. • Charge-cooled rotor eliminates costly and complex components to cool rotor |
| <p style="text-align: center;">Outstanding Compact Power</p> <p>Power to weight is:</p> <ul style="list-style-type: none"> • 45% higher than a typical two-stroke piston engines • 175% higher than a typical four-stroke piston engines • 350% higher than a typical diesel engine | <p style="text-align: center;">Superior Emissions Performance</p> <p>In tests witnessed by Dr. Andrew Burke from the Institute of Transportation Studies (ITS), UC Davis, and the California Air Resource Board, emissions from the Rotapower engine operating on gasoline were substantially below the Ultra Low Emissions Vehicle (ULEV) standard for California. In recent tests on ethanol the emissions were below the Super Ultra Low Emissions Vehicle (SULEV) standard.</p> |

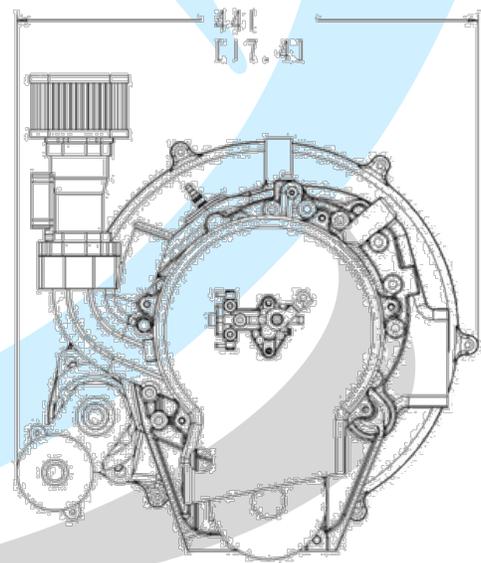
Specifications

- Dual rotor, 1300cc displacement
- 160 HP @ 6,700 RPM (Gasoline)
- 153 lbs
- 893mm L x 441mm W x 454mm H (22.7"-L x 17.4"-W x 17.9"-H)
- Gasoline carburetor (standard)*
- Fuel injection (optional)
- Electric starter
- Spark ignition
- Coolant pump
- Metered oil lubrication system
- 32 Amp generator coil (standard)
- Specifications for battery, exhaust and cooling system provided
- Metric standard design

Rotapower® 1300cc Twin Rotor Maximum Power Sweep RPM Test



Rotapower® 1300cc side view



Rotapower® 1300cc end view

Rotapower® Engine Overview

Rotapower® engines run on any fuel, provide high power-to-weight ratios, generate low vibration and harmful emissions, and are cheaper to buy and maintain as compared with conventional engines****.

| Rotapower Model → | | 27 SERIES | 150 SERIES | | 530 SERIES | | | | 650 SERIES | |
|--------------------|--------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|------------------------|
| No. of Rotors | | 1 | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 |
| Displacement | | 27cc | 150cc | 300cc | 530cc | 1060cc | 1590cc | 2120cc | 650cc | 1300cc |
| Moving part count | | 2 | 2 | 3 | 2 | 3 | 4 | 5 | 1 | 2 |
| Engine Weight* | | 4 lb | 25 lb | 35 lb | 48 lb | 70 lb | 92 lb | 114 lb | 110lb | 154lb |
| | | 2 kg | 11 kg | 16 kg | 22 kg | 32 kg | 42 kg | 52 kg | 50 kg | 70 kg |
| Starter system | | Recoil | Recoil and/or starter | Recoil and/or starter | Recoil and/or starter | Starter | Starter | Starter | Starter | Starter |
| Fuel system | | Carburetor | Carburetor or EFI | Carburetor or EFI | Carburetor or EFI |
| Housing Cooling | | Air | Liquid or Air | Liquid | Liquid | Liquid | Liquid | Liquid | Liquid | Liquid |
| Rotor Cooling | | Charge | Charge or Air | Charge or Air | Charge or Air |
| Dimensions L,W,H** | | 5 x 5 x 4 in. | 7 x 7 x 7 in. | 10 x 7 x 7 in. | 10 x 11 x 11 in. | 16 x 11 x 11 in. | 21 x 11 x 11 in. | 26 x 11 x 11 in. | 17 x 17.4 x 17.9 in. | 22.7 x 17.4 x 17.9 in. |
| | | 13 x 13 x 9 cm | 18 x 18 x 18 cm | 25 x 18 x 18 cm | 25 x 28 x 28 cm | 41 x 25 x 25 cm | 53 x 28 x 28 cm | 66 x 28 x 28 cm | 66 x 28 x 28 cm | 43 x 44 x 46 cm |
| Standard | Max Power | 2.5 hp | 20 hp | 40 hp | 60 hp | 120 hp | 180 hp | 240 hp | 80 hp | 160 hp |
| | | 1.8 kW | 15 kW | 30 kW | 45 kW | 95 kW | 135 kW | 180 kW | 60 kW | 120 kW |
| | Rated Power | 2 hp | 15 hp | 30 hp | 40 hp | 80 hp | 120 hp | 160 hp | 60 hp | 120 hp |
| | | 1.5 kW | 11 kW | 22 kW | 30 kW | 60 kW | 90 kW | 120 kW | 45 kW | 90 kW |
| | Rated Speed | 9,000 rpm | 6,000 rpm | 6,000 rpm | 4,500 rpm | 4,500 rpm |
| | Rated S.F.C. | .45 lb/hp-hr | .45 lb/hp-hr | .45 lb/hp-hr | .4 lb/hp-hr | .4 lb/hp-hr | .4 lb/hp-hr | .4 lb/hp-hr | .4 lb/hp-hr | .4 lb/hp-hr |
| 274 g/kWh | | 274 g/kWh | 274 g/kWh | 244 g/kWh | 244 g/kWh |
| High Performance | Max Power | 3 hp / 5 hp*** | 20 hp / 35 hp*** | 40 hp / 70 hp*** | 60 hp / 125 hp*** | 120 hp / 250 hp*** | 180 hp / 375 hp*** | 240 hp / 500 hp*** | 80 hp / 150 hp | 160 hp / 300 hp |
| | | 2.2 kW / 3.8 kW | 15 kW / 26 kW | 30 kW / 52 kW | 45 kW / 94 kW*** | 90 kW / 188 kW*** | 135 kW / 281 kW*** | 180 kW / 375 kW*** | 60 kW / 113 kW*** | 120 kW / 225 kW*** |
| | Max Speed | 12,000 rpm | 9,000 rpm | 9,000 rpm | 7,500 rpm | 7,500 rpm | 7,500 rpm | 7,500 rpm | 6,700 rpm | 6,700 rpm |

* Includes pull starter, alternator, lubrication, fuel and ignition systems (no exhaust)

**Long block (includes flywheel)

***When running on **methanol** or **ethanol** (Gasoline is default). When operating on **hydrogen** or **natural gas**, the engines produce 70% of rated power for gasoline. Additional rotor cooling provisions are required.

**** Meets EPA guidelines without a catalyst