CREATING
POWER
SOLUTIONS

HATZ

Flywheel-Integrated Permanent Magnet Generators

Hatz Systems Solutions

HATZ QUALITY · PRODUCTION STANDARDS · TRADITION SINCE 1860 · KNOW HOW · GERMAN

The Extremely Compact Way of High-End Power Generation

The vision behind Hatz products has never changed: enable others to be more efficient by fusing professional expertise and the spirit of innovation into reliable, easy-to-use power solutions. The flywheel-integrated permanent magnet generator (fiPMG) — for use in hybrid systems, as power outage backup or for continuous power supply — proves this once again.

Flexibility and Freedom in Action
The fiPMG generates electricity when you need it. As an onboard battery charger, this DC generator guarantees that machines always have enough power, wherever they are being used. This ensures that every job can be reliably completed, regardless of the battery's charge status. Thanks to the intelligent CAN connection to machines' battery management systems, the DC generator only charges batteries when machines really need it.

More Performance With No Compromise
Engines equipped with fiPMG are only slightly larger and heavier than normal engines. Compared to conventional flange-mounted generators, the integrated fiPMG saves on 85 percent of the weight and almost 90 percent of the installation space. The power take-off shaft, which is still available, makes the machine even more flexible in its design. If the generator is used purely as an engine, a hydraulic pump, for example, can be conventionally flange-mounted using just four screws.

Less Fuel Consumption, Fewer Emissions
The fiPMG contributes to emission reduction by allowing for longer machine operation in battery-electric drive mode. Machines can also be operated in emission-free mode where necessary. This reduces the avtice operation time of the combustion engine and protects the environment. When operated in hybrid mode, machines can save up to 40 percent on fuel, making a significant contribution to curbing emissions.

Ready for the Internet of Things (IoT)
Thanks to integrated Hatz E1 technology, the fiPMG can be integrated into fleet management systems and cloud environments via mobile communications. Operators are able to remotely access the most important operating parameters and monitor the condition of the drive. The fiPMG also allows geofencing and the implementation of future business models such as pay-per-use.

Limitless Operation
The 1B30E and 1B50E engines with fiPMG are the only engines on the market today certified as both Stage V and Tier 4 final across their entire speed range. Machine manufacturers benefit from less component variability and are able to develop units that can be operated in both the EU and the US, including California, without any adjustments to the engine.

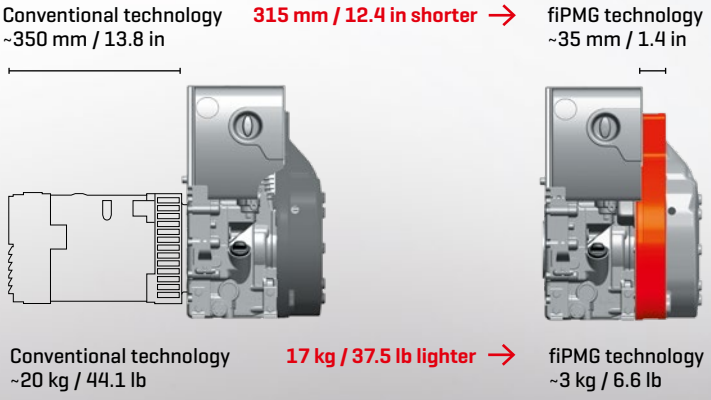
Always Ready for Use
The fiPMG shows its strengths in applications where maximum reliability is required. Thanks to onboard battery charging, there is no risk of safety-relevant devices failing. This ensures that machines always remain ready for use regardless of their battery's charge status or the availability of an external power supply. This is particularly important for construction infrastructure, like electric road signs and lighting systems, for example.

The Benefits to You

- **Load-dependent speed**
  Quieter operation, fewer emissions, less wear and fewer maintenance costs
- **Double certification: US Tier 4 final & EU Stage V**
  Meeting the world's various emission standards with one product
- **Extremely compact and lightweight design**
  Easy integration, even into existing machine architecture
- **E1 technology**
  Ready for IoT connectivity and fleet management solutions
- **Main power take-off shaft freely available**
  Connection of additional power take-offs possible such as a hydraulic pump
- **Nearly pure sine wave for AC versions**
  High voltage and frequency quality
- **Pre-assembled and pre-tested drive package**
  Less assembly and testing for machine manufacturers
- **Battery charger with automatic start/stop function**
  Extremely energy-efficient and self-sufficient operation

fiPMG

Conventional vs. Permanent Magnet
Compared to the conventional design of the engine/generator unit, the flywheel-integrated permanent magnet design is 315 mm / 12.4 in shorter and 17 kg / 37.5 lb lighter. The contactless PMG system has a high degree of efficiency at over 85 percent.



fiPMG with 1B50E engine

fiPMG with 1B30E engine

Always Ready for Use Thanks to the Backup Solution From Hatz

Battery-electric machines operated without a power infrastructure are always at risk of losing their battery charge before work operations are complete. For such applications, the fiPMG reliably supplies batteries with power even under the most adverse circumstances. Whether it's solar powered units operating at night or machines being used in the field: the fiPMG ensures that the necessary power is always available.

Battery Charger for Large Cranes
In order to protect the main engine unit of large cranes and avoid idling operation, Hatz has developed a 28 Volt DC / 100 A battery charger. This ensures that the battery of the additional drive is always charged. The drive supplies the machine's auxiliary consumers when the main engine is stopped.

Battery Electric Lifting Platform
Rented lifting platforms are subject to a wide variety of both indoor and outdoor application scenarios. If lift platforms are used separate from power infrastructure, in agricultural applications such as fruit harvesting for example, batteries with a low charge can cause problems. Using the fiPMG from Hatz as an onboard charger prevents these problems from occurring.

Solar-Powered Road Signs and Light Towers
Mobile, solar-powered LED road signs indicating dangers further down the road protect lives. Light towers provide the necessary lighting at construction sites. In the event of snowfall or a defect in the solar panels, things can get dangerous. fiPMG-equipped engines can be used as emergency units to bridge gaps in supply, thus increasing safety on the road.

Battery-Powered Electric Agricultural Robots
Agricultural robots remain in near continuous operation while working in the fields, but usually do so without available electricity infrastructure. The fiPMG ensures that operations can be successfully completed in the fields without running out of battery charge. Thanks to its hybrid drive, it also saves up to 40 percent fuel. A fiPMG driven machine is thus the optimal solution for the agricultural business.

Telecommunications Masts
Antennas are powered by batteries with a voltage of 56 V DC. For devices located in rural areas, uninterrupted power supply is essential. The fiPMG offers the required reliability for this area of application. For large communications providers, fleet management is also of the utmost importance when it comes to centrally monitoring all connected antennas. The fiPMG completely satisfies both requirements.

Protection Against Power Failures
The fiPMG provides reliable power supply in situations where there is an increased likelihood of power failure, such as frequent storms, insufficient sunlight for solar-powered devices or no wind. Even with regionally insulated buildings and appliances being operated away from the power grid, thanks to its fuel consumption of only half a liter per hour, the fiPMG safely bridges longer phases without an external power supply. This can include lighthouses, telecommunications antennas and ecological multi-source power plants.

Secure the Mission of Critical Appliances
Numerous applications benefit from the advantages of Hatz fiPMG. This includes among others:

- mobile lighting towers
- solar and conventional mobile road signal equipment
- mobile communications infrastructure
- electrical lifting equipment
- motor homes
- agricultural robots
- trade show trailers
- range extender for full battery driven equipment
- auxiliary power units in construction machinery
- ecological power plants

fiPMG Battery Chargers and Generators

Hatz fiPMG technology can be combined with the reliable and robust 1B30E and 1B50E single-cylinder engines. The generator-engine combinations are available in vertical and horizontal versions. As the generator can be integrated into an engine's flywheel, the fiPMG is only three kilograms or 6.6 pounds heavier and 35 millimeters or 1.4 inches longer than the engine alone. Conventional flange-mounted generators are about 350 millimeters or 13.9 inches long and weigh around 20 kilograms or 44.1 pounds. This means that engines with fiPMG can be flexibly integrated into almost any machine, as no major design changes are required. Furthermore, with an average efficiency of 85 percent, permanent magnet generators are extremely efficient.

Thanks to E1 technology and electronically controlled injection, the engines are operated depending on load and with variable speed. The drive and generator have additional start/stop functionality. If a battery is empty, the generator starts automatically. Once it is fully charged, the generator stops the charging process automatically.
Thanks to speed-dependent operation, efficiency increases while noise levels, emissions, wear and maintenance costs decrease.

Engines are also available in mechanically controlled versions. Generators can additionally be designed for direct current (DC) or for alternating current (AC), depending on the customer's preference.

Battery Chargers

Type	PMDC-28-100	PMDC-28-200	PMDC-56-55	PMDC-56-100
Max. power @ cos(ϕ) 1.0 [kW]	2.8	5.6	3.0	5.6
Max. current [A]	100	200	55	100
Voltage [V]	28	28	56	56
Type of voltage	DC			
Generator	flywheel-integrated Permanent Magnet Generator (fiPMG)			
Inverter output accuracy acc. ISO 8528-5	class G4			
Total electrical efficiency [%]	85.5			
Engine	1B30E	1B50E	1B30E	1B50E
Speed range [rpm]	1800 – 3100, full variable according to load			
Start system	electric, 12 V			
Emission certificate	dual type plate: EU Stage V + US EPA/CARB Tier 4 final			
Noise level at 7 meters [dB(A)]	72 @ 2300 rpm	76 @ 2300 rpm	72 @ 2300 rpm	76 @ 2300 rpm
Fuel consumption @ ¾ load [l/h / gal/h]	0.7 / 0.18 @ 2300 rpm	1.2 / 0.31 @ 2300 rpm	0.7 / 0.18 @ 2300 rpm	1.2 / 0.31 @ 2300 rpm
Dimensions L x W x H [mm / in]	331 x 410 x 430 13.03 x 15.14 x 16.93	357 x 440 x 480 14.05 x 17.32 x 18.89	331 x 410 x 430 13.03 x 15.14 x 16.93	357 x 440 x 480 14.05 x 17.32 x 18.89
Weight [kg / lb]	59 / 130	75 / 165	59 / 130	71 / 157

fiPMG

fiPMG with horizontal shaft engine

All fiPMG models with 1B30E (horizontal shaft engines) are also available with vertical shaft engines (1B30VE).

Options 1B30E and 1B50E Engines

- Additional fuel filter with water separator and support for machine mounting
- Additional oil sump with more capacity for longer maintenance intervals
- Hydro supported rubber mounting – ideal for variable speed
- Oil drain valve for easy maintenance in case of enclosure
- Additional oil sump for 1B30VE with 3 litres capacity including oil filter

Generators

Type	PMAC-230/5-3,0 PMAC-120/6-1,5	PMAC-120/6-3,0
Max. power @ cos(ϕ) 1.0 [kW]	3.0 | 1.5	3.0
Max. current [A]	13	25
Voltage [V]	230 | 120	120
Frequency [Hz]	50 | 60	60
Type of voltage	AC	
Generator	flywheel-integrated Permanent Magnet Generator (fiPMG)	
Inverter output accuracy acc. ISO 8528-5	class G2	
Total electrical efficiency [%]	87.4	84.6
Engine	1B30E	
Speed range [rpm]	1800 – 3100, full variable according to load	
Start system	electric, 12 V	
Emission certificate	dual type plate: EU Stage V + US EPA/CARB Tier 4 final	
Noise level at 7 meters [dB(A)]	70 @ 2000 rpm	68 @ 1500 rpm
Fuel consumption @ ¾ load [l/h / gal/h]	0.7 / 0.18 @ 2000 rpm	0.5 / 0.13 @ 1500 rpm
Dimensions L x W x H [mm / in]	331 x 410 x 430 13.03 x 15.14 x 16.93	331 x 410 x 430 13.03 x 15.14 x 16.93
Weight [kg / lb]	59 / 130	59 / 130

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