

Vibration Energy Harvester Development Kit

User Instructions

The Development Package (Figure 1) has been compiled to assist with your evaluation of Perpetuum's energy harvesting microgenerators.

THEORY OF OPERATION

The alternating current in ac induction motor magnetic circuits cause tiny vibrations in the motors case. Perpetuum's vibration energy-harvesting microgenerators convert these vibrations into useable electrical energy to power sensors, microprocessors and RF systems.

In most applications the ac output of the Vibration Energy Harvester needs to be rectified into dc and smoothed before it can be used by the electronics in most sensor systems. The test box achieves this in a package designed to facilitate easy, rapid appraisal. See Figure 2.

The 2.2 mF smoothing capacitor included in the test box also acts as an energy storage capacitor. This is useful where the peak requirements of the sensor system are greater than the generator output. Energy can be stored until there is sufficient to perform the task required. The amount of energy stored in the capacitor is calculated using:

$$E = \frac{1}{2} CV^2$$

Where E is the stored energy in a capacitor of size C (2.2 mF) and V is the potential across the capacitor (<16 V).

The peak output voltage of the generator is clamped internally to 11.06 V peak absolute maximum.

The aluminium electrolytic capacitor is polarity sensitive, please ensure the correct polarity is observed at all times to prevent damage to the capacitor.

Perpetuum has extensive knowledge of interfacing sensor systems to Vibration Energy Harvesters. Perpetuum is pleased to offer this expertise to assist in your system design. Please contact Perpetuum to discuss your requirements in detail.

Figure 1. Kit Contents



- PMG17 Vibration Energy Harvester
- Magnetic mount
- Bridge rectifier and capacitor test box
- Connecting Cables
- USB memory stick containing data sheets and application notes
- Protective carry case

INSTRUCTIONS FOR USE

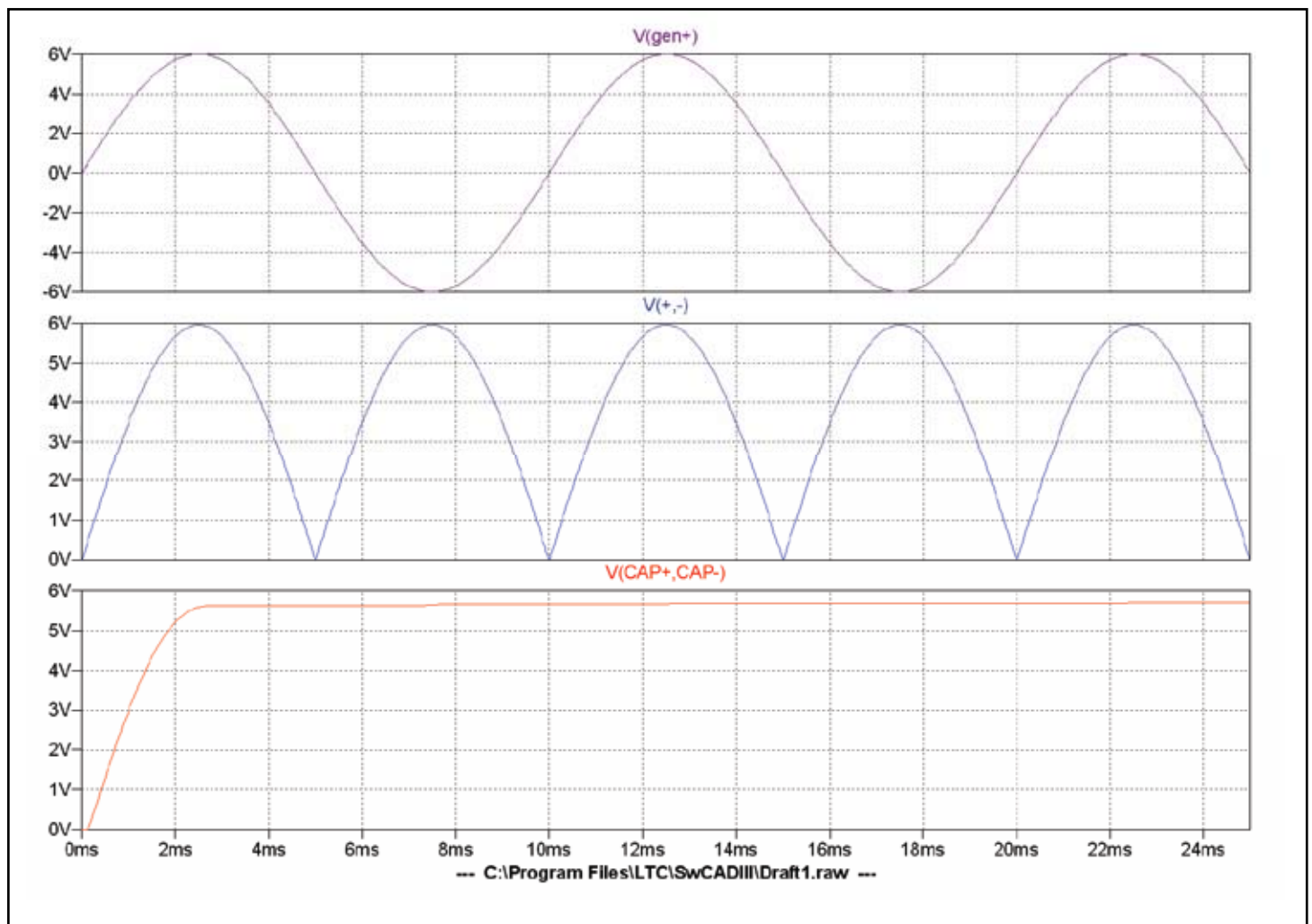
The supplied magnetic mount is shipped with keeper attached, remove this prior to use. When the mount is not in use replace the keeper.

Using the magnetic mount, attach the PMG17 to the induction motor under investigation. Typically the non drive end of the motor yields good results in harvested power.

Connect the generator to the ac terminals (blue) of the test box using the supplied lead. If required, connect the smoothing/storage capacitor across the rectified output using standard 4mm test leads. Charging rates can now be investigated. Depending on the vibration source the peak voltage may reach 11.06V. Ensure any equipment connected to the generator is suitably rated.

Two versions of the Development Package are available, one for geographic regions with a 50 Hz ac mains supply (Perpetuum part number: 26047) and one for 60 Hz mains supply (Perpetuum part number: 26048) areas. Please ensure you have the correct kit for your region.

Figure 2. Generator output (top trace), rectified output (middle) and rectified and smoothed output (bottom)



Perpetuum provides global leadership in vibration energy harvesting and a ready source of information for all those interested in the practical application of this successful technology. Perpetuum will continue to lead industry toward realizing the full potential of vibration energy harvesting in sensing and low power wireless communications.

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