

FEATURES

- Designed to power high performance Wireless Sensor Nodes.
- High power output up to 27.5mW
- High reliability design, including hermetically-sealed stainless steel case.
- Intrinsically Safe for use in Hazardous Areas: ATEX, IECEx, FM and cFM Certifications.
- Stabilized harvesting frequency and bandwidth over full industrial temperature range -40 to +85 °C.
- Two-pin IEC-standard connector.
- Two standard voltage outputs, nominally 5V and 8V.
- Current drive output independent of load up to nominal voltage.
- Center thru-hole for straightforward installation, with other mounting options available.



Vibration Energy Harvester

1. Performance

1.1. Power output

	Description	5V Model	8V Model
1.1.1	Maximum	5.5 mA (27.5mW)	3.0 mA (24mW)
1.1.2	Minimum @ 0.050g RMS, nominal frequency	0.840 mA (4.2mW)	0.525 mA (4.2mW)
1.1.3	Minimum @ 0.050g RMS, 2Hz bandwidth	0.600 mA (3mW)	0.375 mA (3mW)
1.1.4	Minimum @ 0.025g RMS, nominal frequency	0.240mA (1.2mW)	0.150mA (1.2mW)

1.2. Physical

	Description	5V and 8V Model	Notes
1.2.1	Temperature range, storage & operation	-40°C TO +85°C	Applies to all parameters
1.2.2	Outer envelope	See section 6	
1.2.3	Case material	316L Stainless steel	
1.2.4	Mass	1.030 ± 0.040 kg	
1.2.5	Environmental sealing	Hermetic < 1X10 ⁻⁸ cc/s He	IEC60664-1 pollution degree 2
1.2.6	Central thru-hole	6.5mmØ x 65mm	BOLT ¼"x2¾" OR M6x70
1.2.7	Mean-time-to-failure	892 years	Life expected > 20 years
1.2.8	Vibration at resonant freq (continuous)	0.5g RMS	
1.2.9	Vibration at resonant freq (overload)	5g RMS, 10 minutes	IEC 60068-2-6:2007
1.2.10	Maximum total vibration	10g RMS, 100Hz – 10kHz	
1.2.11	Shock	50g, 11 ms ½-SINE, x3	IEC 60068-2-27:1987

2. Ordering Information

2.1. Model Variants: 66001 - [F][V][S][H] - Generic Harvester.

	Description	Part number
2.1.1	Harvester for 60Hz mains region, twice line frequency	66001[120][V][S][H]
2.1.2	Harvester for 50Hz mains region, twice line frequency	66001[100][V][S][H]
2.1.3	Harvester for 60Hz mains region	66001[60][V][S][H]
2.1.4	Harvester for 50Hz mains region	66001[50][V][S][H]
2.1.5	Harvester for 60Hz mains region, half line frequency	66001[30][V][S][H]
2.1.6	Harvester for 50Hz mains region, half line frequency	66001[25][V][S][H]

2.2. Output voltage

	[V]	Open circuit voltage
	05	5.25 ± 0.25 V
	08	8.25 ± 0.25 V

2.3. Customer specific requirements

	[S]	Description
	S	Standard, 2 Pin M12 connector

2.4. Hazardous area certification

	[H]	Description
	U	Uncertified
	A	ATEX- IECEx zone 0 certified intrinsically safe.
	F	FM -cFM certified

2.5. Accessories

	Description	Part number
2.3.1	Multimeter cable	#66562
2.3.2	Socket head cap bolt, 316SS, 2¾"x ¼"-28 UNF	#54051
2.3.3	Socket head cap bolt, 316SS, M6x70mm	#54052
2.3.4	Installation cable (X=1 to 5m)	#66564-XM
2.3.5	ATEX user instructions	66066 sheet 5

3. Output

3.1. Connector

	Name	Specification	Note
3.1.1	Output connector type	IEC61076-2-101, MALE, 2 PIN "A" coding	'M12' connector
3.1.2	Recommended mating connector	IEC61076-2-101, STYLE LF, 2 PIN "A" coding	'M12' connector
3.1.3	"GND" pin	Ground	Not connected to case
3.1.4	"PWR" pin	Main current output	See section 5

3.2. Vibration input frequency

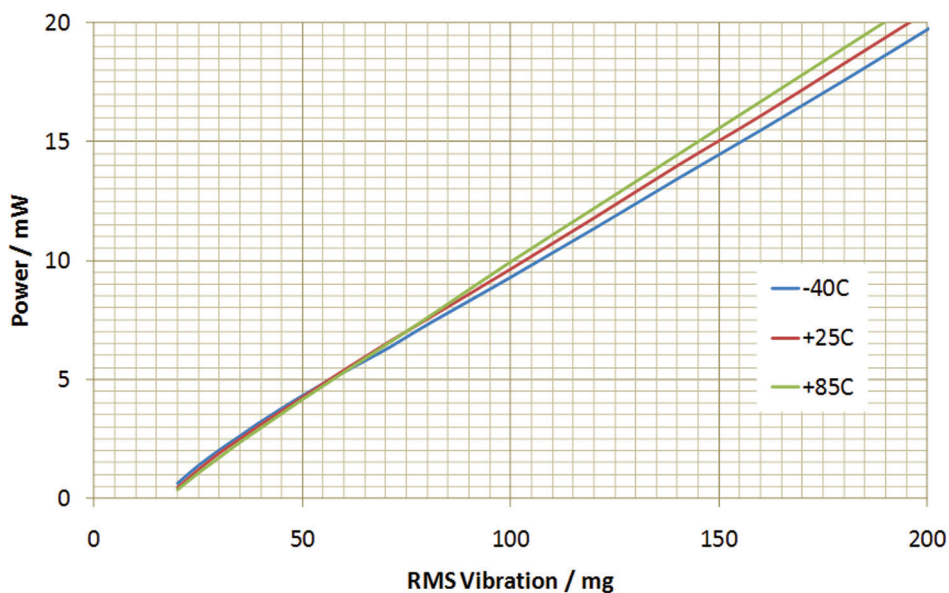
	Nominal resonator centre frequency	Actual resonator centre frequency	50% Current bandwidth at 25mg RMS
3.2.1	120 Hz	119.50 ± 0.2 Hz	1.6 ± 0.1 Hz
3.2.2	100 Hz	99.50 ± 0.2 Hz	1.6 ± 0.1 Hz
3.2.3	60 Hz	59.75 ± 0.2 Hz	1.6 ± 0.1 Hz
3.2.4	50 Hz	49.75 ± 0.2 Hz	1.6 ± 0.1 Hz
3.2.5	30 Hz	29.75 ± 0.2 Hz	1.6 ± 0.1 Hz
3.2.6	25 Hz	24.75 ± 0.2 Hz	1.6 ± 0.1 Hz

3.3. Output voltage

	Nominal resonator centre frequency	Actual resonator centre frequency	50% Current bandwidth at 25mg RMS
3.3.1		5.25 ± 0.25V	'5V' version
3.3.2		8.25 ± 0.25V	'8V' version

3.4. Characteristics

Figure 1. Minimum power at nominal frequency & voltage



4. Compliant Directives

4.1. Equipment for explosive atmospheres (ATEX, IECEx). (94/9/EC.)

4.1.1	Protection method	Intrinsic safety, IEC60079	Certification drawing 66066 ATEX
4.1.2	Zone classification	Zone 0	
4.1.3	Example product markings	<p>Sira 11ATEX2162 IECEx SIR 11.0075 Ex ia IIC T4 Ga Ex ta IIIC T114°C Da -40°C to +85°C</p> <p>Uo=10.5V, Io=0.016A, Po=0.048W, Co=2.41 uF, Lo=1mH, Ui=10.5V, Ci=0uF, Li=0mH</p> <p>IP68</p>	

4.2. Equipment for explosive atmospheres (FM-cFM)

4.2.1	Protection method	Intrinsic safety	Installation must be in accordance with drawing number 66567
4.2.2	US Marking (FM)	<p>Class I, II, III Division 1, Groups ABCDEFG T4 Class II Division 1, Groups EFG T4 Class III Class I, Zone 0 AEx ia IIC T4 Zone 20 AEx ta IIIC T114°C</p>	
4.2.3	Canadian Marking (cFM)	<p>Intrinsically Safe and Securite Intrinseque Ex ia Class I, II, III Division 1, Groups ABCDEFG T4 Class II Division 1, Groups EFG T4 Class III Class I, Zone 0, Ex ia IIC T4</p>	

4.3. Electromagnetic Compatibility (EMC) 2004/108/EC

4.3.1	Generic standards – Immunity for industrial environments	EN 61000-6-2:2005	
4.3.2	Generic standards – Emission standard for industrial environments	EN 61000-6-4:2007	
4.3.3	Generic standards – Emission standard for residential, commercial and light-industrial environments	EN 61000-6-3:2007	
4.3.4	Electrical equipment for measurement, control and laboratory use – EMC requirements	EN 61326:2006	

4.3. Compliant FCC regulations

4.3.1	Radio frequency devices	Part 15	
-------	-------------------------	---------	--

4.4. Environmental directives

4.4.1	Waste Electronic and Electrical Equipment (WEEE)	Full compliance	DOC 2002/96/EC
4.4.2	Reduction of Substances Hazardous to Health (RoHS)	Full compliance	DOC 2002/95/EC

5. Connections and output measurement

Figure 2. Pin designations looking into the unit's connector

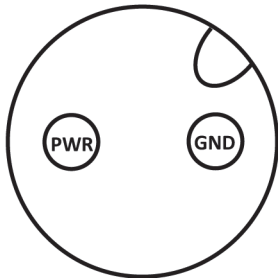


Figure 3. Schematic of internal circuitry

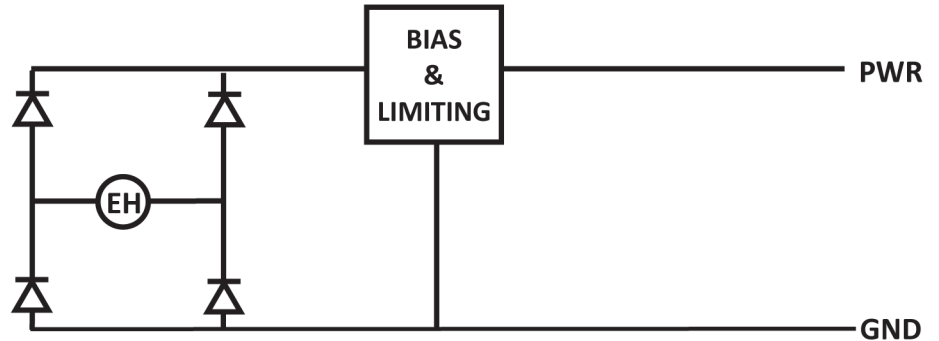
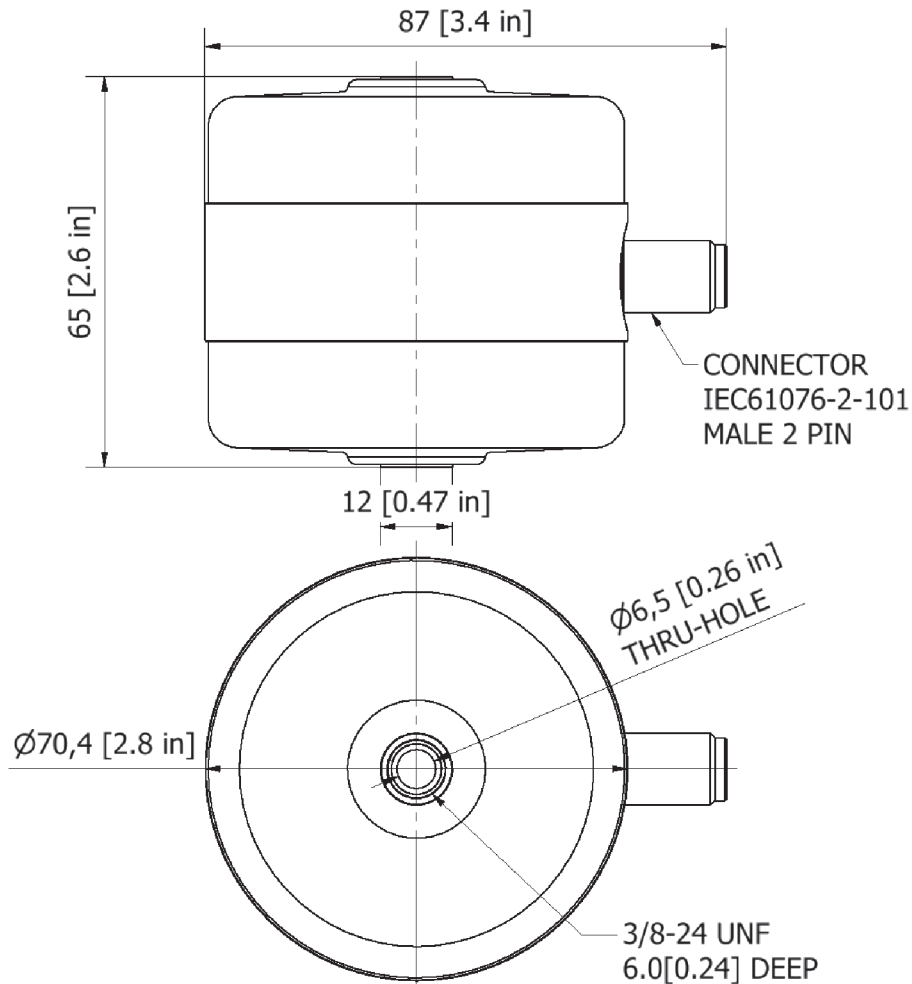


Figure 4. Measurement of output current during installation (use multimeter cable #66562)



6. Mechanical drawing

Figure 5.



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.

Perpetuum Ltd

Epsilon House | Southampton Science Park
Southampton SO16 7NS
Telephone: +44 (0)23 8076 5888
Fax: +44 (0)23 8076 5889

Visit our web site at www.perpetuum.com

VEH Technical Datasheet
21-Oct 2013 • 66000 - Rev 4.0