

## THERMOELECTRIC POWER GENERATOR

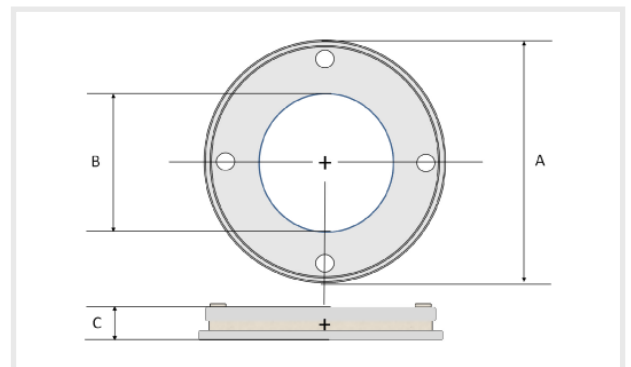
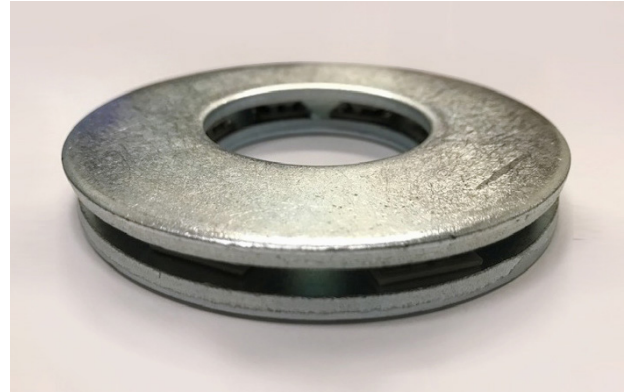
# MPG PowerRing10 Series 200 Beta

## Description

MPG PowerRing (PR) Series 200 products are solid state thermoelectric systems that convert heat to electricity in extreme operating temperatures at high efficiencies. The system consists of MicroPower Series 200 modules built with high performing PbTe and TAGS base materials. PowerRing systems are ideal for personal and humanitarian applications where a metal cup or cooking pot can be placed on the hot side of the system and act as the cooling heat exchange mechanism.

## Features

- Produces up to 10 watts at  $\sim 400^{\circ}\text{C } \Delta T$
- Operates in extreme temperatures – see notes
- Maximum Power potential up to 20 watts
- Rugged and durable encasement
- Sealed with high temperature ceramic
- Designed and manufactured in the USA

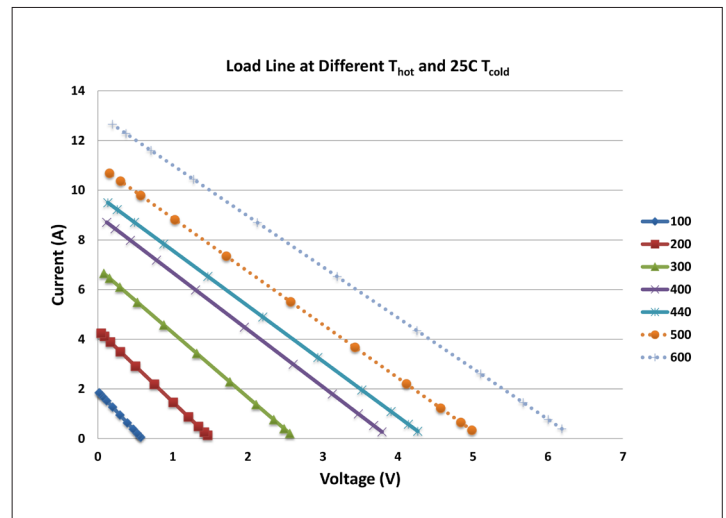
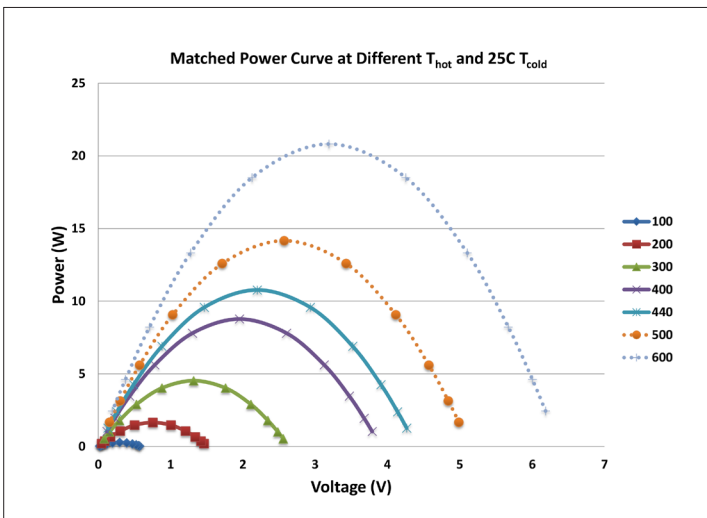


A (cm)	B (cm)	C (cm)
6.5	3.5	2.1

## Applications

- Portable power generator
- Cooking appliances
- Camp stoves
- Personal Heaters
- Fireplaces, stoves and furnaces
- Cathodic protection
- Power Beaming
- Water Heaters
- Vehicle Engine Heaters
- Engine exhaust powered alternator replacement
- Industrial waste heat recovery in refineries, foundries, glass, steel and cement plants
- Power generation from bio waste and trash incinerators
- Thermoelectric solar power generators
- Wood burning stoves
- Geothermal

Parameter	Conditions	Typical	Units
Power	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$ @ matched load	10	Watts
Voltage	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$ @ open circuit	4.3	Volts
	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$ @ matched load	2.2	Volts
Internal Resistance	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$	5.0	Ohms
	$T=25^{\circ}\text{C}$	0.3	Ohms
Current	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$ @ matched load	4.8	Amps
	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$ @ short circuit	9.5	Amps



Topic	Notes
Testing and Validation	<ul style="list-style-type: none"> <li>• PowerBlocks have received bench testing consisting of resistance and mechanical checks.</li> <li>• Test modules have received bench testing consisting of temperature cycles to <math>300^{\circ}\text{C T}_{\text{hot}}</math> at <math>25^{\circ}\text{C T}_{\text{cold}}</math></li> <li>• Base material chips have received bench testing to <math>440^{\circ}\text{C T}_{\text{hot}}</math> at <math>25^{\circ}\text{C T}_{\text{cold}}</math></li> <li>• High temperature performance based upon empirical test data</li> <li>• High temperature electrical connections (up to <math>700^{\circ}\text{C}</math>) are implemented providing better performance stability over multiple heat cycles and sustained high temperatures</li> </ul>
Mechanical Interface	<ul style="list-style-type: none"> <li>• Stainless steel on hot side, other materials may be used, i.e., carbon composite, titanium, copper and others</li> <li>• Modules' hot side should not be exposed to temperatures of <math>&gt;600^{\circ}\text{C}</math></li> <li>• Aluminum on cold side, various heat exchange mechanism may be used, i.e., heat sink, liquid cooled block and others</li> <li>• Maximum cold side temperature should not exceed <math>120^{\circ}\text{C}</math></li> <li>• Orientation: External connectors tied to cold side</li> <li>• Positive normal compression required at all times with stress relief at temperature</li> <li>• Hot Side: Recommend use of high temperature interface (e.g. Grafoil sheet)</li> <li>• Cold Side: Recommend use of thermal paste</li> </ul>
Electrical Connection	<ul style="list-style-type: none"> <li>• High temperature wire with male quick connect terminals</li> <li>• All terminals attached on cold side plates</li> <li>• Recommend attaching large interconnect wire (No. 3 or larger)</li> <li>• Fixed support for stress relief</li> </ul>

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