

## THERMOELECTRIC POWER GENERATOR

# MPG PowerBlock100 Series 200 Beta

## Description

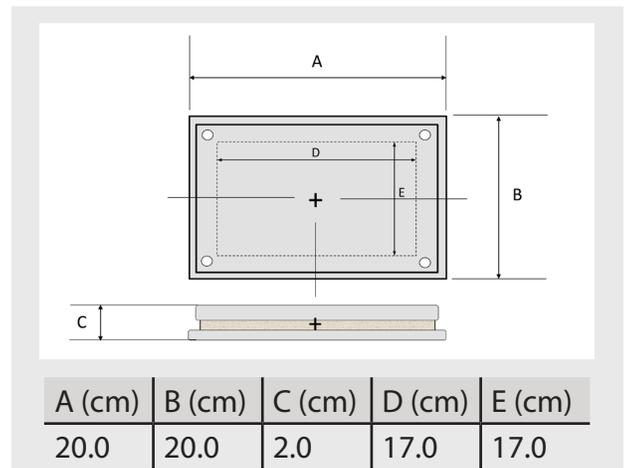
The MPG PowerBlock structure is designed and built as a solid state thermoelectric system to convert heat to electricity in extreme operating temperatures at high efficiencies of up to 12%. The system consists of MicroPower Series 200 modules built with high performing PbTe and TAGS based materials produced using MicroPower Global's proprietary crystal growth and device manufacturing technologies.

## Features

- Produces up to 100 watts at  $\sim 400^{\circ}\text{C } \Delta T$
- Operates in extreme temperatures – see notes
- Maximum Power potential up to 200 watts
- Rugged and durable encasement
- Sealed with high temperature ceramic
- Designed and manufactured in the USA



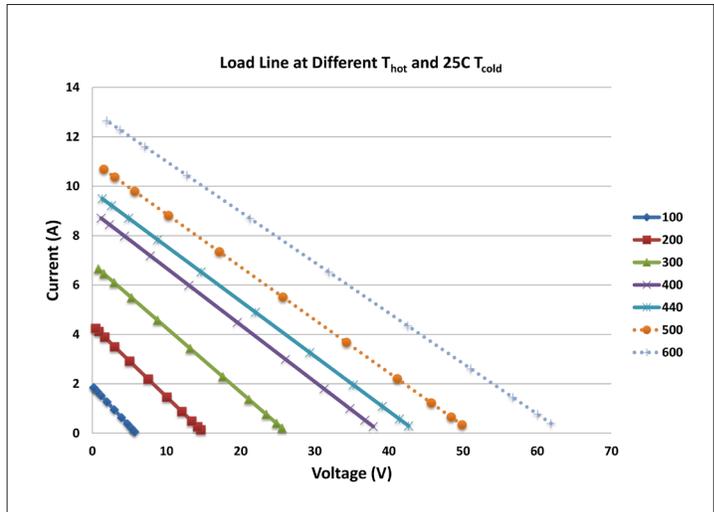
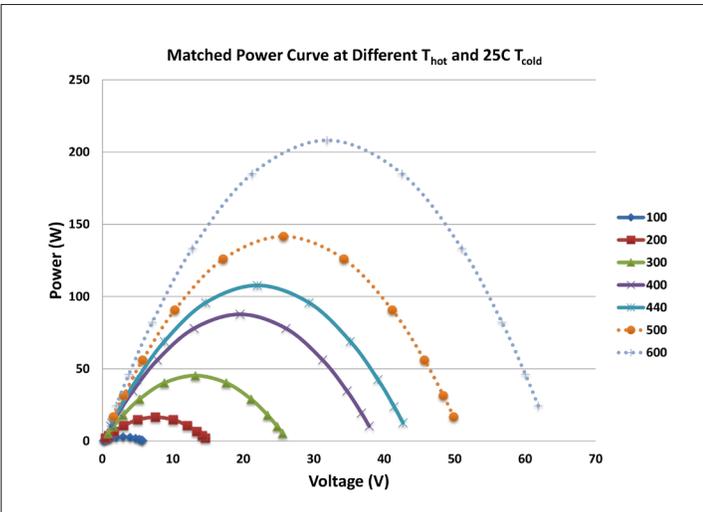
MicroPower PowerBlock with air-cooled exchange integrated



## 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	100	Watts
Voltage	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$ @ open circuit	43.0	Volts
	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$ @ matched load	21.5	Volts
Internal Resistance	$T_h=440^{\circ}\text{C}, T_c=25^{\circ}\text{C}$	5.0	Ohms
	$T=25^{\circ}\text{C}$	3.0	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>• Hot side exposure to radiant, conductive or convective heat source should be limited to the area defined in the size diagram as D and E boundaries</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> </ul>

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