

UHV compatible Heaters

BORAELECTRIC® Heating Elements from MOMENTIVE™
inventing possibilities



Rectangular Heaters
 Standard HTR-1004, -1003, -1002, and -1001



Examples of custom made heaters
 Standard HTR-1001(right)



Examples of Post Heaters
 Standard HTR-01 (left) and HTR-1006 (right)



Examples of three dimensional heaters
 Standard HT-91 (right)

Momentive's PBN/PG heaters utilize PBN (Pyrolytic Boron Nitride) as an insulating ceramic substrate and PG (Pyrolytic Graphite) as resistive element. In non-oxidizing environments, this combination of unique materials delivers performance advantages not available in conventional thermal systems. PBN/PG heaters can operate at high temperature (e. g. 1.500°C and higher). They provide superior performance in ultra-high vacuum.

KEY FEATURES AND BENEFITS

- High temperature capability: 1.500+°C
- High power densities 35+W/cm²
- Vacuum compatibility (UHV compatible)
- Fast ramp rates up to 100+K/s
- High thermal uniformity
- Two or three dimensional custom design
- Long life time shock resistant materials
- Multiple zone and gradient layouts possible

They are also chemically inert to most corrosive gases and liquids, and are unaffected by most molten metals. With their long life, as well as their dimensional and electrical stability, PBN/PG heaters offer high resistance and may enable the use of low-cost power supplies.

Mechanically durable and thermally shock resistant, PBN/PG heaters are unaffected by vibration under most conditions and can be tailored to thermal gradients for specific requirements. PBN/PG heaters demonstrate a power output of 35+ watts/cm² (225+ watts/in²) and higher, therefore ultra-fast response along with low thermal mass

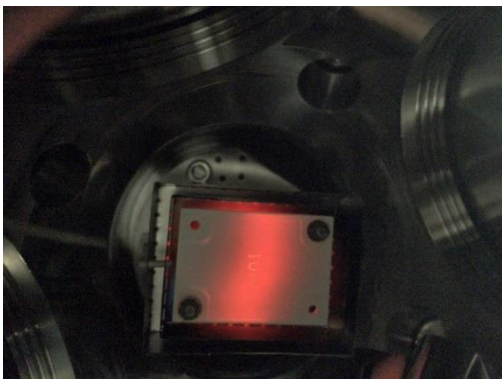
Momentive manufactures heaters as flat plates with surface electrical connections inside the heated area or located outside the heated area on tabs. Heaters can also be made as 3-D elements on CVD PBN crucibles and tubes. PBN/PG heaters have been made for parts as small as 5 mm in diameter, and as large as 800 mm. Multiple, independent zones can be incorporated for flexible thermal management.

Potential applications for Momentive heaters and heater assemblies include:

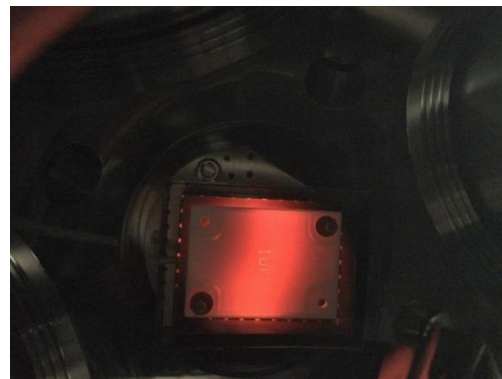
- Wafer Processing (Ion Implant, PVD, MOCVD, ALD, MBE, RTP, PE-CVD, Epi)
- High Temperature industrial and chemical processes
- Many R&D applications

Momentive manufactures PBN/PG heaters to customer specifications also.

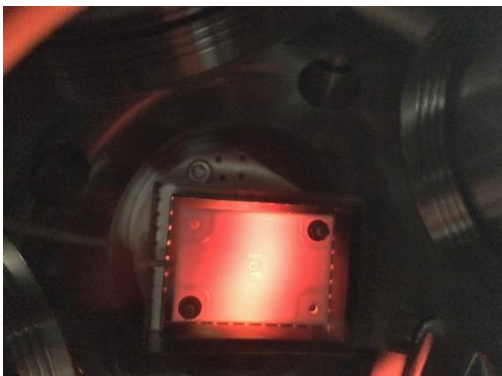
Example of an HTR-1001 during heat up



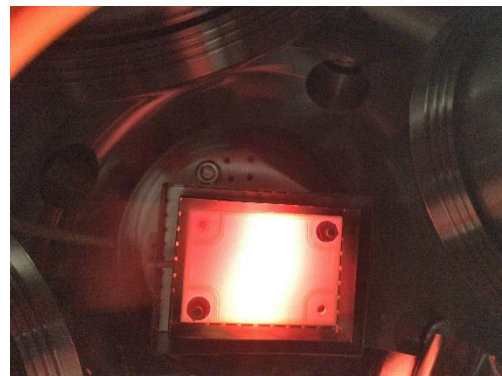
T ~ 600°C



T ~ 620°C



T ~ 700°C

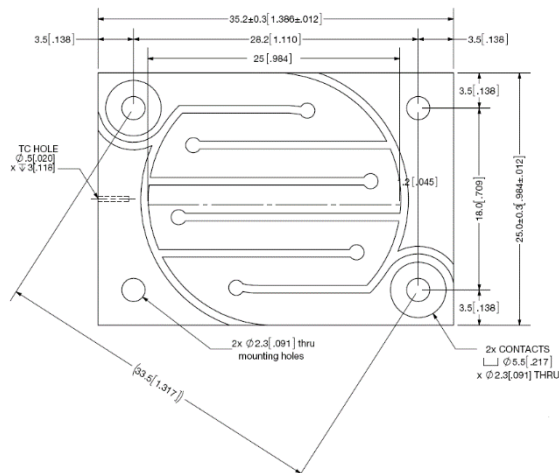


T ~ 800°C

A range of pre-engineered heaters is available for "off-the-shelf" use. Disc heaters provide a very simple form factor, they are also offered with tabs to move the electrical contacts out of the hot zone for improved thermal uniformity. Several rectangular format parts with mounting features are available as well.

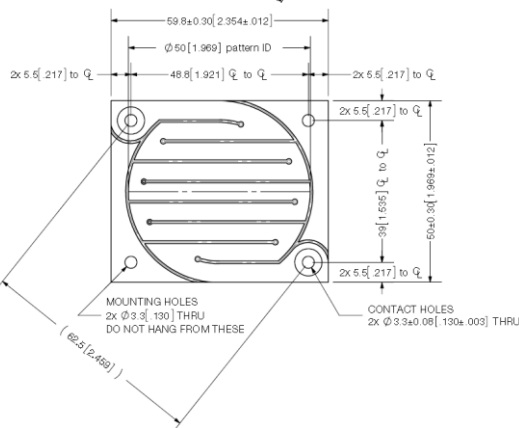
Standard Elements (rectangular)

HTR-1001



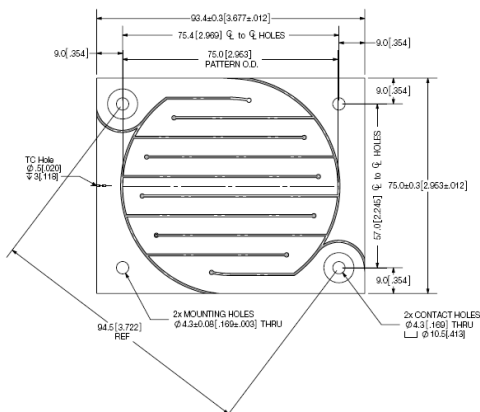
Outer Dimension:	Ca. 25mm x 35mm
Resistance @ RT:	7.4 – 10.1 Ohm
Voltage:	35 V
Typical Power:	220 W
Maximum Current:	8 A
Typical Thickness:	1.40 +/- 0.25mm
Typical Flatness:	1.0/100

HTR-1002



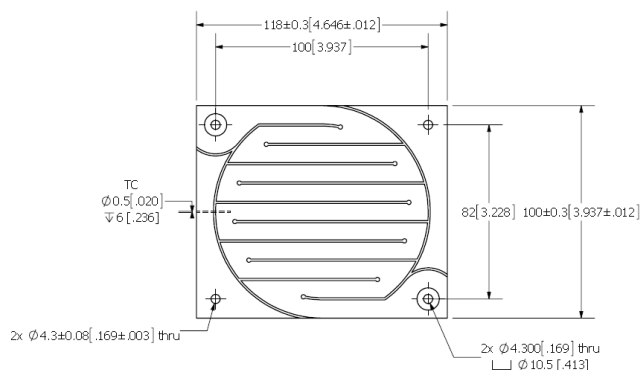
Outer Dimension:	Ca. 50mm x 60mm
Resistance @ RT:	11.1 – 15.3 Ohm
Voltage:	110 V
Typical Power:	1,440 W
Maximum Current:	16 A
Typical Thickness:	1.40 +/- 0.25mm
Typical Flatness:	1.0/100

HTR-1003



Outer Dimension:	Ca. 75mm x 94mm
Resistance @ RT:	16.1 – 22.2 Ohm
Voltage:	170 V
Typical Power:	2,300 W
Maximum Current:	17 A
Typical Thickness:	1.40 +/- 0.25mm
Typical Flatness:	1.0/100

HTR-1004

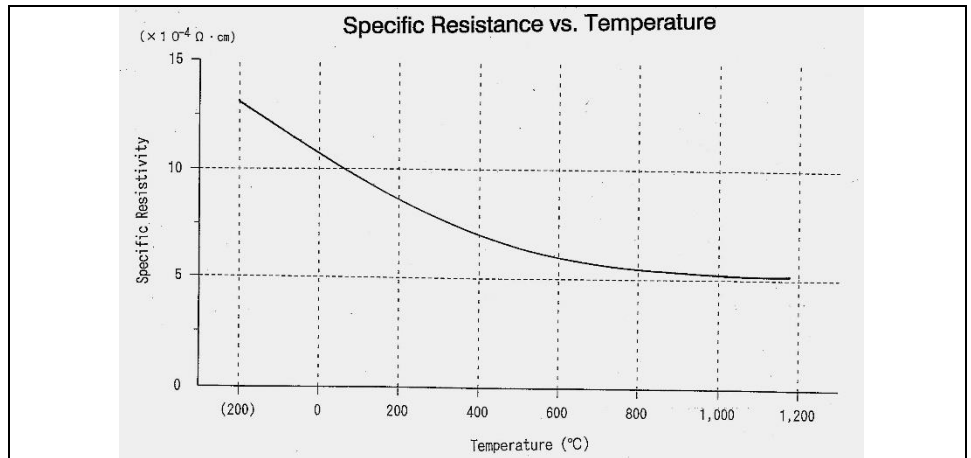


Outer Dimension:	Ca. 100mm x 118mm
Resistance @ RT:	16.0 – 22.0 Ohm
Voltage:	210 V
Typical Power:	3,500 W
Maximum Current:	26 A
Typical Thickness:	1.40 +/- 0.25mm
Typical Flatness:	1.0/100

*Drawings on request

SPECIFICATION

Heater Resistance as Function of Temperature



Heater Accessories

	Assembly Kit M2, M3, and M4
	Heat shield (standard: double, Niobium, others on request)
	Thermocouples type K (standard, others on request)
	Thermocouple/Electrical Feedthroughs
	Insulators

Power Supply

PID Controller	Yudian (standard), Eurotherm on request
Low Voltage output	Optional (for heaters running at <~ 40V)
Interface (Option)	RS232 or RS485

Options

	Fully designed heater stages and other options on Request

Please contact us for more Information.
We and our team behind us will be happy to help you!

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