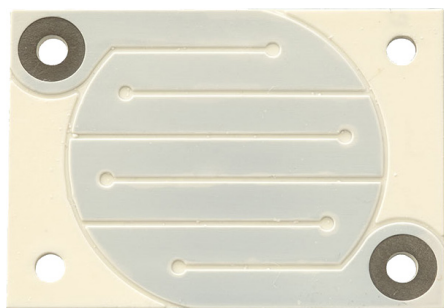


# neyco

HEF<sup>®</sup> PHOTONICS

TDS

PBN / PG HEATING ELEMENTS



## A Unique Combination

PBN/PG resistance heating elements combine the unique electrical, chemical, and thermal properties of PBN, a dielectric material, and Pyrolytic Graphite (PG), an electrical conductor, to produce a truly advanced heating system.

These non-brittle refractory materials owe their exceptional purity to the high temperature, chemical vapor deposition (CVD) production method. The high thermal conductivity and anisotropy of both materials result in excellent thermal uniformity.

## Performance Advantages

PBN/PG «printed circuit» heaters utilize PBN as an insulating substrate and Pyrolytic Graphite as the resistive element. In non-oxidizing environments, this combination of unique materials delivers performance advantages not available in conventional thermal systems.

- Operating temperatures to 1500°C and higher.
- Superior performance in ultra high vacuum.
- Chemically inert to most corrosive gases, liquids.
- Unaffected by most molten metals.
- Long life, dimensionally and electrically stable.
- High resistance for low cost power supplies.
- Mechanically durable, thermally shock resistant.
- Unaffected by vibration.
- Tailored thermal gradients for specific requirements.
- Ultra-fast response, low thermal mass.
- Power outputs to 35 watts/cm<sup>2</sup> (325 watts/in<sup>2</sup>) and higher.
- Dielectric, fully dense, ceramic surface.
- Often suitable for slightly oxidizing atmospheres.

## Design Versatility

We manufacture 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 chemical vapor deposited (CVD) PBN crucibles and tubes.

PBN/PG Heaters have been made as small as 5 mm diameter, and as large as 300 mm.

Location of the contact tabs provides design flexibility for enhanced thermal uniformity. Resistance patterns can be circular or diagonal, and can have varying web width to tailor local flux. Multiple, independent zones can be incorporated for flexible thermal management.

PBN/PG Heaters are made on either PBN plate and shape substrates, with an overall wall thickness of about 2 mm; or on a sealed graphite core substrate for the ultimate in robust, uniform design, with a thickness of 5-8 mm.

## Heater and Electrostatic Chuck Assemblies

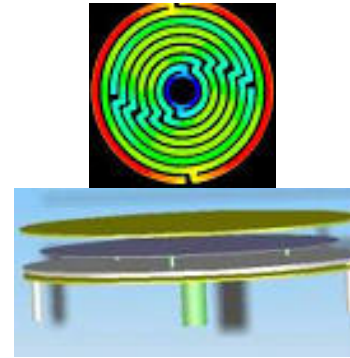
### PBN/PG Heaters & E-Chucks

Temperatures > 1500°C  
Ramp Rates up to 600°C/minute  
Thermal uniformity (<1%), tunable multiple zones  
JR and coulombic e-chucks



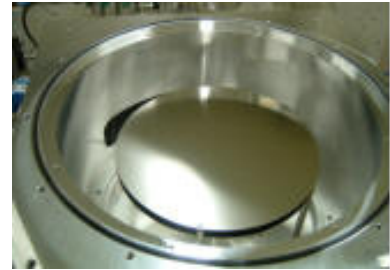
### Design & Build

3D solid modeling  
ANSYS™ and Fluent™ thermal/mechanical modeling  
Global quartz technology leadership  
Close customer engineering relationships for custom solution development



### Production Scale Chamber Solutions

Clean room ready modules  
Performance validation and testing  
Ongoing production and assembly  
Global support and supply



### Pre-Engineered Heater Solutions

Neyco's Pre-engineered Ceramic Heaters are demonstrated solutions with field-tested designs that offer outstanding thermal stability and performance in applications like epi wafer processing and high temperature process development. They offer the electrical, chemical and thermal properties of combining Pyrolytic Boron Nitride (PBN) and Pyrolytic Graphite (PG) in custom engineered solutions without the time and expense involved in refining and testing a new design.

These pre-engineered designs were once custom solutions. They have since been routinely manufactured to solve common challenges in demanding heating applications, allowing us to pass along a discounted price compared to custom-made heaters. We can also customize these ceramic heaters for your unique application or equipment.

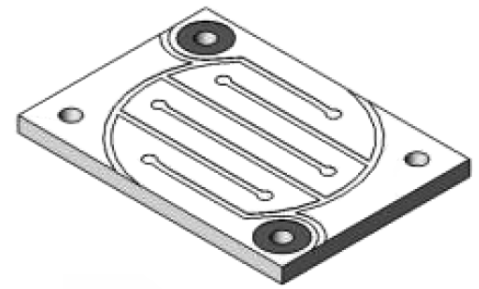
Please contact a sales or customer service representative with inquires regarding Performance Materials' Pre-engineered Ceramic Heaters.



*Disc Heater*



*Disc Heater with tabs*



*Rectangular Heater*

## Ordering information

### Disc Heaters :

P/N	Ø inch (mm)	R (Ohm)	V	A	M
PCPBNC10	1.00 (25.4)	10-16	40	8	300
PCPBNC15	1.50 (38.1)	10-16	70	10	700
PCPBNC20	2.00 (50.8)	15-25	110	15	1300
PCPBNC25	2.50 (63.5)	22-35	180	15	2000
PCPBNC30	3.00 (76.2)	22-35	208	20	3000

### Disc Heaters with tabs :

P/N	Ø inch (mm)	R (Ohm)	V	A	M
PCPBNP05	0.50 (12.7)	5-7	15	8	80
PCPBNC07	0.75 (19.0)	9-15	30	8	150
PCPBNC10	1.00 (25.4)	9-15	40	10	300
PCPBNC17	1.75 (44.5)	17-30	110	12	1000
PCPBNC20	2.00 (50.8)	15-25	110	15	1300

### Rectangular Heaters :

P/N	Ø inch (mm)	R (Ohm)	V	A	M
PCPBNR10	0.98 (25.0)	7-10	35	8	220
PCPBNC07	1.97 (50.0)	11-15	110	16	1440
PCPBNC10	2.95 (75.0)	16-22	170	17	2300

