



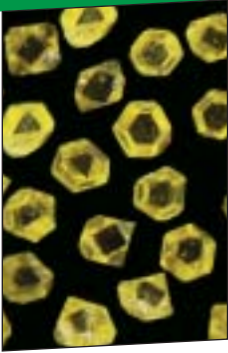
PremaDia



DIAMOND ABRASIVES

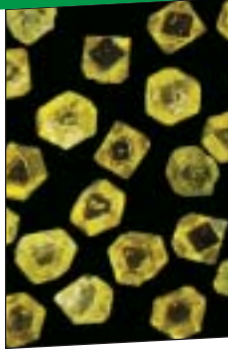
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The PremaDia Range



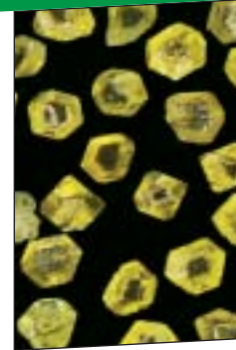
PDA 999

PremaDia PDA 999 is a highly crystalline synthetic diamond product with a high impact strength, thermal stability and uniform particle shape. It is designed to withstand the high dynamic loads encountered in very demanding metal bond applications.



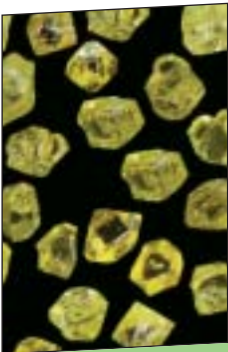
PDA 989

Designed for use in high-productivity metal bond grinding applications. The synthetic material PremaDia PDA 989 performs particularly well in applications requiring a high strength abrasive. It is a blocky, crystalline material with a high impact strength and high thermal stability.



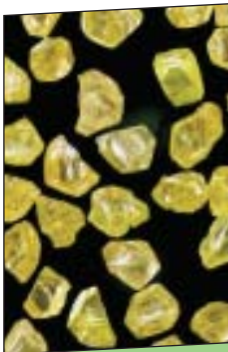
PDA 878

With properties between those of PDA 989 and PDA 768, PDA 878 is a high performance metal bond abrasive. This product is a crystalline material with a good impact strength at both room and high temperatures and is designed to give good performance over a variety of metal bond applications.



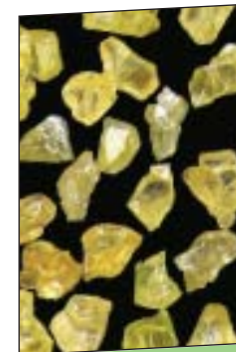
PDA 768

This is a strong well shaped synthetic diamond with a combination of sharp and blocky crystals. The physical characteristics of PDA 768 are designed to ensure that it is a versatile abrasive suitable for use in the broad spectrum of metal bond diamond tools utilised for example in the wide range of machining applications in the glass and ceramics industries.



PDA 657

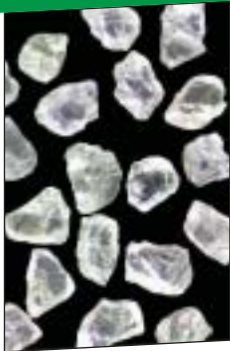
A processed synthetic diamond abrasive with a consistent but irregular crystal shape. PDA 657 is suited for use in less demanding applications where sharp cutting characteristics are important. The nickel clad form PremaDia PDA 657N55 is ideal for grinding combinations of tungsten carbide and steel.



PDA 446

PremaDia PDA 446 is an engineered synthetic diamond abrasive with a sharp particle shape to ensure good free-cutting characteristics. The average particle strength is controlled to make it suitable for use in metal bond tools where low abrasive strength is required. This degree of friability also makes it suitable in metal clad form as PDA 446N55 for use in some resin bond applications.

The PremaDia range encompasses both natural and synthetic diamond wheel grit products specially developed for applications in metal, electroplated, resin and vitrified bond tools.



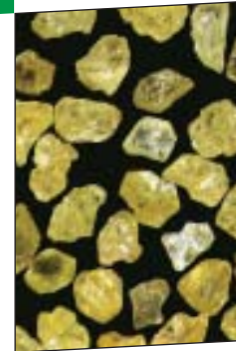
PDA 665

A premium natural diamond material consisting of engineered, blocky, well shaped particles. Being natural diamond exposure to elevated temperatures has little significant effect on the strength of the crystal and PremaDia PDA 665 is therefore suited to many grinding applications. In addition its characteristics make it highly suitable for use in electroplated tools.



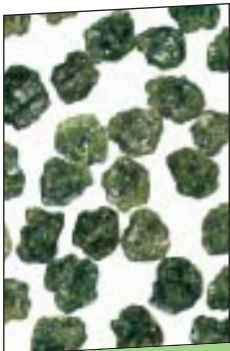
PDA 555

PremaDia PDA 555 is a natural diamond abrasive consisting of engineered particles which are more friable and irregular in shape than PremaDia PDA 665. It has the high thermal strength and sharp cutting characteristics of natural diamond.



PDA 433

PremaDia PDA 433 is a friable abrasive suitable for use in a wide range of standard resin bond applications and is offered with the full range of metal claddings. It is recommended for use in general purpose applications and offers the diamond toolmaker an economical abrasive of guaranteed high quality.



PDA 321

PremaDia PDA 321 has a micro-chipping structure which ensures the degree of friability required for high quality resin bond tools. In the unclad form it is suitable for use in vitrified bonds and special resin bond applications. It is available in the full range of metal claddings for use in resin bond tools.



PDA 311

PremaDia 311 synthetic diamond abrasive is a friable wheel grit product available from Element Six. This product is primarily designed for use in resin bond tools and, in addition, may be used to satisfy the needs of a general purpose abrasive in other bond systems.



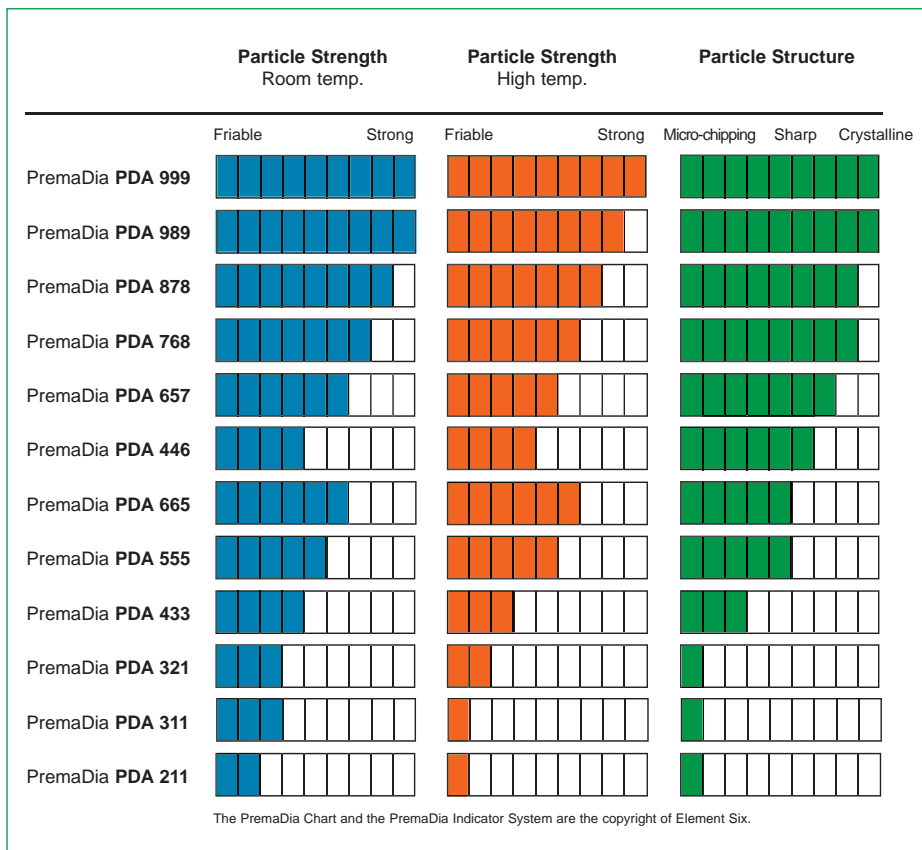
PDA 211

PremaDia PDA 211 is more friable than PDA 321. This abrasive combines the desirable properties of friability with a micro-chipping crystal structure making it a highly efficient abrasive for machining cermet and ceramic workpieces with low grinding forces and good tool life. It is available in both clad and unclad forms.

The metal claddings applied to PremaDia products have been specifically developed for tools using resin bonds.

The Product Range

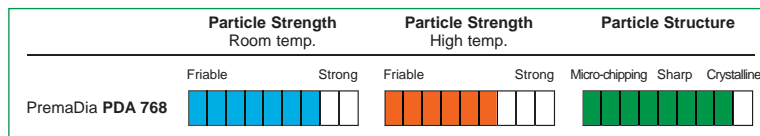
The PremaDia range from Element Six encompasses diamond wheel grit products specifically developed for applications in metal, electroplated, resin and vitrified bond tools. The product range extends from PremaDia PDA 999, which is a high strength crystalline abrasive suitable for demanding applications and high production rates, to the micro-chipping PremaDia PDA 321 and PDA 211, particularly suitable for grinding cemented tungsten carbides and hard ceramics. The products are ranked in terms of their relative particle characteristics in the PremaDia Indicator Chart.



The PremaDia Indicator System

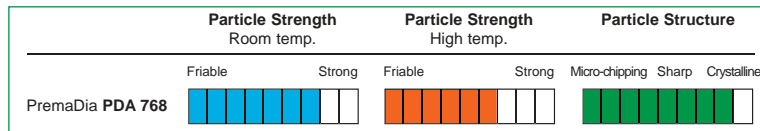
The PremaDia Indicator System has been developed to assist with product selection. Each abrasive is described in terms of three important diamond particle characteristics, each of which has been assigned a ranking or Indicator Value. The Indicator Value extends from 1 to 9 and is a relative ranking between the products in the range. The three Indicator Values make up the product designation and act as a simple way of comparing product characteristics and hence make product selection easier.

Particle strength at room temperature



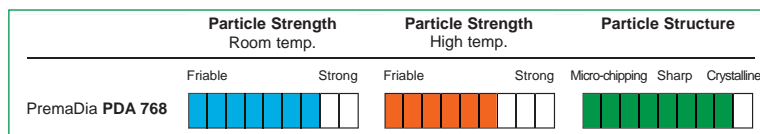
The first Indicator Value and initial digit of the Product Designation relates to the average particle impact strength measured at room temperature. The strongest product in the PremaDia range is PDA 999, which has been assigned the room temperature Indicator Value of 9. The other products in the range are ranked progressively below this according to their particle strength at room temperature.

Particle strength at high temperature



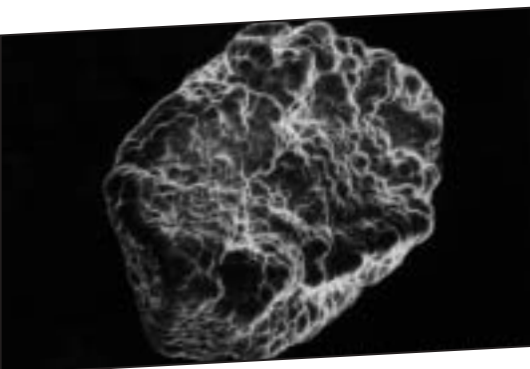
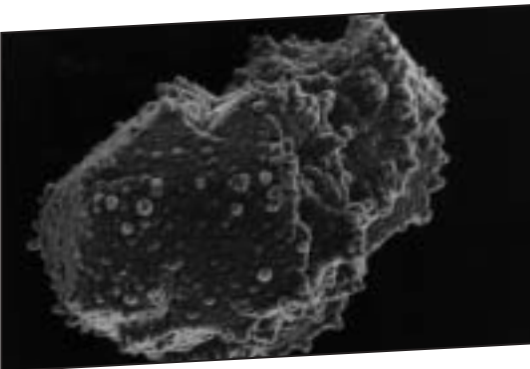
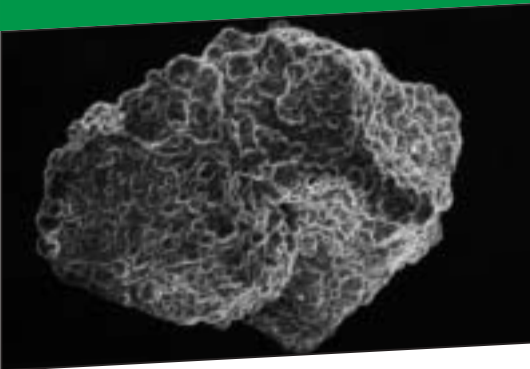
All diamond is subject to some chemical reaction when exposed to high temperatures in the presence of oxygen for a period of time. The strength of synthetic diamond can also be affected to some degree, the strength of natural diamond is not significantly affected. The second Indicator Value is the relative ranking of the impact strength of the PremaDia products after exposure to high temperature, the highest strength ranked 9 and the other products in the range ranked below.

Particle structure



To achieve and maintain optimum and consistent cutting behaviour throughout the life of the tool, it is important that the diamond particles used fracture in a way which is compatible with the combination of workpiece material and machining conditions. Highly crystalline products with good internal integrity and regular shape fracture progressively under impact to form effective cutting surfaces. These products have been assigned an Indicator Value of 9. Processed natural diamond particles are more irregular in shape, have a sharper cutting action and have been assigned a value of 5. Friable, micro-chipping products, typically used in resin bonds, have been assigned a value of 1, and the PremaDia products have been ranked within this framework.

Metal clad abrasive for resin bonds



Standard cladding options

Resin bond diamond tools are used extensively in the machining of cemented carbides and are finding increasing popularity in applications such as stone polishing and the grinding of advanced engineering ceramics. The metal claddings applied to diamond particles have been found to provide the distinct advantages in resin bond tools of improving heat dissipation and particle retention in the bond. The metal claddings applied to PremaDia products have been specifically developed for tools using resin bonds, ranging from the widely used phenolic resins to the high performance advanced resins, such as polyimide.

Products in the PremaDia range are offered with three types of cladding:

Electroless cladding PremaDia PDA 321N55

Electroless Nickel Cladding

Electroless nickel cladding is deposited chemically. The cladding process is initiated and controlled to ensure optimum adhesion between the nickel and the diamond, and the chemical composition of the metal alloy is designed to prevent embrittlement caused by the thermal cycling encountered during machining. Two standard specifications are available, N30 which is a 30% coating, by weight, and N55 which is 55% by weight.

Electrolytic cladding PremaDia PDA 321P60

Electrolytic Nickel Cladding

The electrolytic cladding system used by Element Six results in a metallic nickel cladding with a high level of chemical purity. This 60% by weight metal cladding, designated P60, provides a mechanically tough coating and can be used in polyimide bond applications. The nickel coating has a very rough surface, aiding diamond retention in the bond under severe grinding conditions.

Copper cladding PremaDia PDA 321C50

Electroless Copper Cladding

Copper-clad diamond in a resin bond has been found to be particularly effective in the dry grinding of cemented carbides. The electroless copper cladding, designated C50 (50% by weight metal), has a higher thermal conductivity than nickel, improving the transfer of heat from the grinding zone when acting in conjunction with bonds with enhanced thermal properties.

To cater for the widest possible range of resin bond applications, a range of metal cladding options is available.

	N30	N55	P60	C50
PremaDia PDA 657				
PremaDia PDA 446				
PremaDia PDA 555				
PremaDia PDA 433				
PremaDia PDA 321				
PremaDia PDA 311				
PremaDia PDA 211				

Physical properties

Product	Density (g/cm ³)	Cladding Weight (%)
Unclad	3.52	n/a
Clad		
with N30 cladding	4.2	30
with N55 cladding	5.2	55
with P60 cladding	5.45	60
with C50 cladding	4.9	50

Size availability

The sizing of all standard PremaDia products is carried out under strictly controlled conditions in accordance with the ANSI/FEPA international sieving specifications. The table below shows the standard range of sizes available. Other sizes can be supplied on special request. In the case of clad products the size refers to the unclad particle.

US Mesh	60/80	80/100	100/120	120/140	140/170	170/200	200/230	230/270	270/325	325/400
FEPA	D252	D181	D151	D126	D107	D91	D76	D64	D54	D46
PDA 999	•	•	•	•	•	•	•	•	•	•
PDA 989	•	•	•	•	•	•	•	•	•	•
PDA 878	•	•	•	•	•	•	•	•	•	•
PDA 768	•	•	•	•	•	•	•	•	•	•
PDA 657	•	•	•	•	•	•	•	•	•	•
PDA 446	•	•	•	•	•	•	•	•	•	•
PDA 665	•	•	•	•	•	•	•	•	•	•
PDA 555	•	•	•	•	•	•	•	•	•	•
PDA 433	•	•	•	•	•	•	•	•	•	•
PDA 321		•	•	•	•	•	•	•	•	•
PDA 311		•	•	•	•	•	•	•	•	•
PDA 211		•	•	•	•	•	•	•	•	•

E-Treatment of synthetic diamond products

A slightly roughened surface on the diamond particle aids retention of the abrasive in the bond system. The special E-treatment further enhances the plating characteristics of the particle and, in addition, can improve its retention in this way. All PremaDia synthetic diamond products with a Particle Structure Indicator value of 7 or higher are available with E-treatment, e.g. PremaDia PDA 989E.

Further literature available from Element Six

This publication is one of a series on Element Six diamond and cubic boron nitride products and their applications. For details of availability and to obtain other publications in the series, please contact your local supplier of Element Six products, or any Element Six office.

PremaDia, PDA, the Indicator System are Trade Marks of Element Six.