

PRECISION MACHINING & FINISHING

PremaDia

SUPERIOR GRINDING PERFORMANCE

——— *Synthetic diamond wheel grit products specifically developed for applications in metal, electroplated, resin and vitrified bond tools.*



elementsix[™]
a De Beers Group Company



elements six
Premadiala
Type: PDA
Coal #: 35
Gross Cts: 2222
Lot No.: 17

elements six
Premadiala
Type: PDA
Coal #: 35
Gross Cts: 2222
Lot No.: 17

elements six
Premadiala
Type: PDA321N65
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EXTREME PERFORMANCE SYNTHETIC DIAMOND GRITS

The PremaDia range encompasses synthetic diamond wheel grit products specifically developed for applications in metal, electroplated, resin and vitrified bond tools. The product range extends from PremaDia PDA999, which is a high strength crystalline abrasive suitable for demanding applications and high

production rates, to the micro-chipping PremaDia PDA321 and PDA211, 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 CHART											
	PARTICLE STRENGTH ROOM TEMP.				PARTICLE STRENGTH HIGH TEMP.				PARTICLE STRUCTURE		
	Friable		Strong		Friable		Strong		Micro chipping	Sharp	Crystalline
PREMADIA PDA999	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA989	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA878	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA768	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA657	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA446	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA433	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA321	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA311	■	■	■	■	■	■	■	■	■	■	■
PREMADIA PDA211	■	■	■	■	■	■	■	■	■	■	■

The PremaDia chart and the PremaDia Indicator System are in copyright of Element Six.

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: particle strength at room temperature, particle strength at high temperature and particle structure. Each is assigned a value 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 PDA999, which has been assigned the room temperature Indicator Value of 9.

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 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. Friable, micro-chipping products, typically used in resin bonds, have been assigned a value of 1.

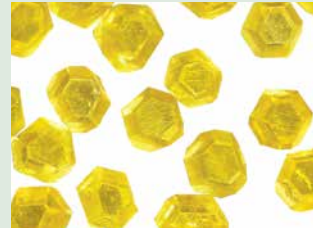
THE PRODUCT RANGE

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

PRODUCT

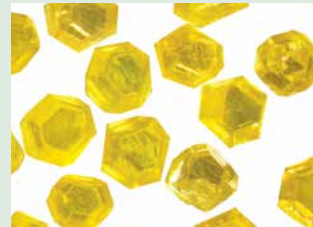
PDA999

PremaDia PDA999 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.



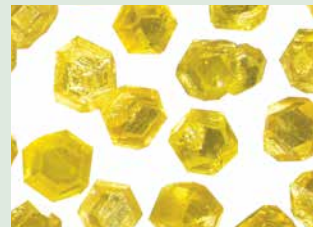
PDA989

Designed for use in high-productivity metal bond grinding applications. PDA989 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.



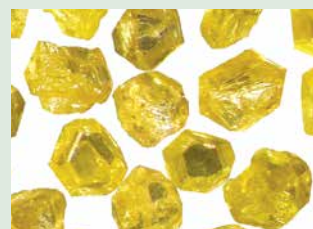
PDA878

PDA878 is a high performance metal bond abrasive. It 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.



PDA768

This is a strong well shaped synthetic diamond with a combination of sharp and blocky crystals. The physical characteristics of PDA768 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.



PDA657

PDA657 is an abrasive with a consistent but irregular crystal shape. It is suited for use in less demanding applications where sharp cutting characteristics are important. The nickel clad form PremaDia PDA657NX55/NX30 is ideal for grinding combinations of tungsten carbide and steel.

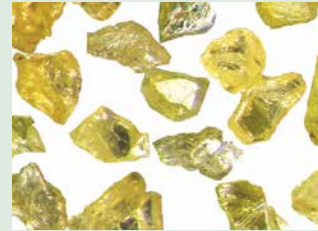


PREMADIA FOR MULTIPLE APPLICATIONS

PRODUCT

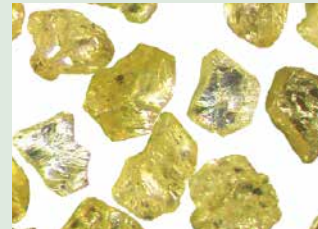
PDA446

PDA446 has 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 PDA446NX55 for use in some resin bond applications.



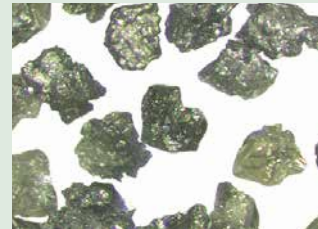
PDA433

PDA433 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 diamond toolmakers an economical abrasive of guaranteed high quality.



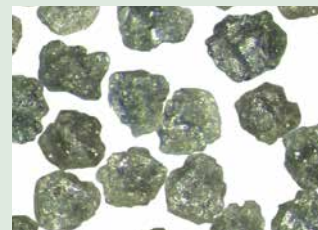
PDA321

PDA321 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.



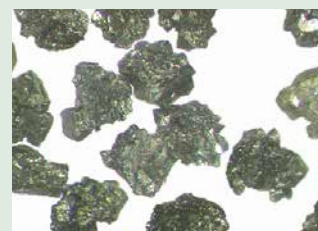
PDA311

PDA311 is a friable wheel grit product and is primarily designed for use in resin bond tools. It can also be used as a general purpose abrasive in other bond systems.



PDA211

PremaDia PDA211 is more friable than PDA321. 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.



METAL CLAD ABRASIVE FOR RESIN BONDS

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:

STANDARD CLADDING OPTIONS

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

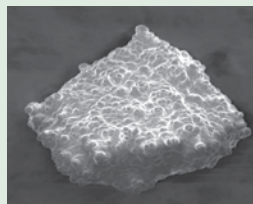
STANDARD CLADDING OPTIONS				
	NX30	NX55	P60	C50
PremaDia PDA657				
PremaDia PDA446				
PremaDia PDA433				
PremaDia PDA321				
PremaDia PDA311				
PremaDia PDA211				



Electroless nickel cladding.

ELECTROLESS NICKEL CLADDING – NX55 AND NX30

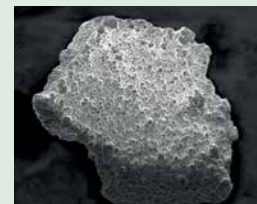
Electroless nickel cladding is deposited chemically. The cladding process is initiated and controlled to ensure optimum adhesion between the nickel and the diamond, and the chemical composition of the metal alloy is designed to prevent embrittlement caused by the thermal cycling encountered during machining. The inherently designed roughness of the NX cladding ensures maximum retention and wetting is achieved, between the resin and clad diamond particles in demanding applications. Two standard specifications are available, NX30 which is a 30% cladding by weight and NX55 which is 55% by weight.



Electrolytic nickel cladding.

ELECTROLYTIC NICKEL CLADDING – P60

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.



Electroless copper cladding.

ELECTROLESS COPPER CLADDING – C50

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.

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

PROPERTIES OF PREMADIA

PHYSICAL PROPERTIES

PRODUCT	DENSITY (g/cm ³)	CLADDING WEIGHT (%)
UNCLAD	3.52	n/a
CLAD		
with NX30 cladding	4.2	30
with NX55 cladding	5.2	55
with P60 cladding	5.45	60
with C50 cladding	4.9	50

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 PDA989E.

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.

SIZE AVAILABILITY

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
PDA999	•	•	•	•	•	•	•	•	•	•
PDA989	•	•	•	•	•	•	•	•	•	•
PDA878	•	•	•	•	•	•	•	•	•	•
PDA768	•	•	•	•	•	•	•	•	•	•
PDA657	•	•	•	•	•	•	•	•	•	•
PDA446	•	•	•	•	•	•	•	•	•	•
PDA433	•	•	•	•	•	•	•	•	•	•
PDA321		•	•	•	•	•	•	•	•	•
PDA311		•	•	•	•	•	•	•	•	•
PDA211		•	•	•	•	•	•	•	•	•

ELEMENT SIX

Element Six is a synthetic diamond supermaterials company and a member of the De Beers Group of Companies.

Element Six designs, develops and produces synthetic diamond supermaterials, and operates worldwide with its head office registered in Luxembourg, and primary manufacturing facilities in China, Germany, Ireland, Sweden, South Africa, US and the UK.

Element Six supermaterial solutions are used in applications such as cutting, grinding, drilling, shearing and polishing, while the extreme properties of synthetic diamond beyond hardness are already opening up new applications in a wide array of industries such as optics, power transmission, water treatment, semiconductors and sensors.

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