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# **PRODUCT CATALOG**

## 产 品 说 明 书

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**Polycrystalline Diamond Compact**  
聚 晶 金 刚 石 复 合 片

**ASTRAL MATERIAL INDUSTRIAL CO., LTD.**

佛 山 市 中 徽 工 业 材 料 有 限 公 司



# Brief Introduction 公司简介

PDC Division PDC事业部

Since 2004



Corporate Member



Certificate No.U15Q2GZ664942R2S  
ISO9001 : 2008 Certified

Astral Material Industrial Co., Ltd. (AMI) has been serving for the industries of oil, solar energy, lithium battery, semiconductor, chemical, mining, ceramic, glass, metallurgy foundry, heat engineering for more than 12 years. We manufacture and supply composite super hard material, thermal ceramics and structural ceramics for the oil/gas exploitation and the working procedures of material process, material crushing, grinding and conveying, heat treatment and fine process in the industrial production. We are now supplying products through agent/distributors or direct sales to customers in more than 30 countries worldwide.

The Polycrystalline Diamond Compact (PDC) is the important application of the super hard materials on oil/gas exploitation. The PDC Division is the most important project of AMI. Based on the strong technical foundation on the super hard material, we have achieved the innovation on the imported advanced technology and produce series of PDC with excellent matched properties of wear resistance and shock resistance. According to different application, we emphasize particularly on wear resistance or shock resistance and developed different models for the oil/gas exploitation, geological exploration, coal and mine, and metal cutters. Our PDC has been supplied to the domestic customers and USA, Russia clients. AMI's mission is to provide products and service in high quality, stability and reliability. We try our best to achieve optimal cost performance, and assist customers improve their production efficiency and cost/energy saving, and gain benefit. Strictly quality control and trace, considerate and fast service, professional technical support and complete material supply solution, enable AMI the welcome and reliable business partner.

AMI aspire to be the reliable, responsible and international modern enterprise.  
We enjoy the together technical advancement and business development along with all the clients and partners.



佛山市中微工业材料有限公司 (AMI) 生产和经营复合超硬材料、热陶瓷和结构陶瓷, 应用于油气开采、物料粉碎研磨输送、热处理和产品精加工等领域。我们服务于石油、太阳能、锂电池、半导体、化工、采矿、陶瓷、玻璃、冶金铸造、热工等行业超过12年, 供应给全球超过30个国家和地区的客户。

PDC聚晶金刚石复合片是超硬材料在油气开采领域的重要应用, PDC事业部是我们重点发展的项目。我们依托在超硬材料方面的雄厚技术基础, 引入国外先进技术加以革新, 研发出耐磨和抗冲击性能良好配合, 各有侧重的系列PDC产品, 适用于油气开采、地质勘探、煤田矿山、加工刀具等, 供应给国内和出口美国、俄罗斯等国家。

我们的宗旨, 是提供优质、稳定、可靠、性价比高的产品和服务, 协助客户提高生产效率、节能和节约成本, 从而提高效益。严格的质量跟踪管理、周到快捷的服务、专业技术支持和完备的材料供应解决方案, 使我们成为客户欢迎和信赖的业务伙伴。

AMI致力于成为可信赖、有担当的国际化现代企业, 期待与业务伙伴携手并进, 共创技术进步和企业发展。



## Producing Line 生产线



Cubic Press  
六面顶压机



CNC Wire Cutting EDM  
电火花成型机



Laser Cutting Machine  
激光切割机



Linear Cutting Machine  
线切割机床

## Quality Control 质量监控

### ISO Certificate ISO质量管理体系证书



### Inspection Devices 检测仪器



X-Ray Diffractometer  
X射线衍射仪



Drop Weight Impact Tester  
落锤试验机



Scanning Electron Microscope  
扫描电镜



Atomic Absorption Spectrometer  
原子吸收光谱仪



Laser Granularity Tester  
激光粒度分布仪

# Polycrystalline Diamond Compact (PDC)

## 聚晶金刚石复合片 (PDC)



Polycrystalline Diamond Compact (PDC) is structurally compacted by two parts: polycrystalline diamond working layer and the cemented carbide substrate. It is produced through special technique by putting the polycrystalline diamond and cemented carbide substrate under high temperature (1500-1600°C) and super high pressure (about 7GPa) and then sintered at the same moment.

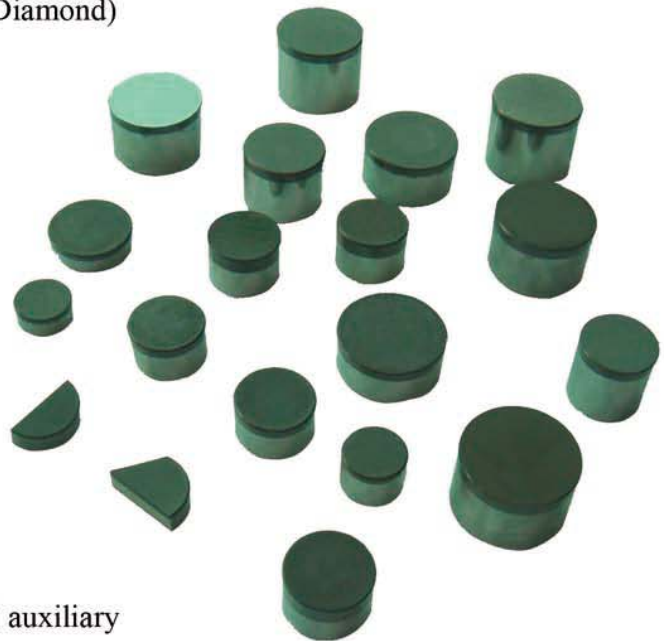
Because of the integrated D-D bond (Diamond-Diamond)

between the diamond crystals, the diamond working layer is with high impact ductility, high hardness, high strength, high wear resistance and good self-acumination.

Series tooth surface structure are applied to strengthen the fastness of integrating of the diamond working layer and the cemented carbide substrate, this remarkably increase the anti impact ability of the PDC. We have applied advanced surface

treatment process technique to remove the metal auxiliary during the sintering process, and increase the thickness of the pure diamond layer of the working surface, evidently improve the whole performance of the PDC.

PDC is mainly applied on the PDC drill bits for digging of stratum and terrane, the metal machining tools and the super hard super wear resistant parts. PDC Drill Bit is mainly used for the petroleum and gas exploitation, coalfield and mine excavating and geologic survey.



- Leading Technique
- High Intensity
- High Hardness
- Excellent Wear Resistant
- Good Self- Acumination
- High Toughness
- Good Thermal Stability
- Low Residual Stress
- 领先工艺
- 高强度
- 高硬度
- 高耐磨
- 自锐性好
- 高韧性
- 热稳定性好
- 低残余应力

# Polycrystalline Diamond Compact (PDC)

## 聚晶金刚石复合片 (PDC)



聚晶金刚石复合片(PDC)结构上由聚晶金刚石工作层和硬质合金基体两部分复合制成, 它是由聚晶金刚石粉末和硬质合金基体同时置于超高压(约7GPa)高温(1500-1600℃)条件下经特殊工艺烧结而成。

由于金刚石晶体之间是完整的D-D(Diamond-Diamond)键结合, 从而金刚石工作层具有很高的冲击韧性、高硬度、高强度、高耐磨和良好自锐性; 而金刚石工作层与硬质合金基体之间采用了各种齿形表面结构增强两者结合的牢固性, 大大提高了复合片的抗冲击能力;

我公司应用领先表面处理工艺, 用于消除产品烧结过程引入的金属助剂, 有效提高产品工作端面的纯净金刚石层厚度, 极大地改善了复合片的整体性能。

聚晶金刚石复合片(PDC)主要应用于地层岩层掘进用金刚石复合片钻头、金属加工工具、超硬超耐磨部件等等, 金刚石复合片钻头主要应用于石油天然气开采、煤田矿山采掘和地质勘探领域。



According to the experts' research conclusion and our test result, the "round convex plate" surface structure is with best impact resistance.

学者研究成果和我们的测试表明, “凸台”齿型界面结构的抗冲击性最好

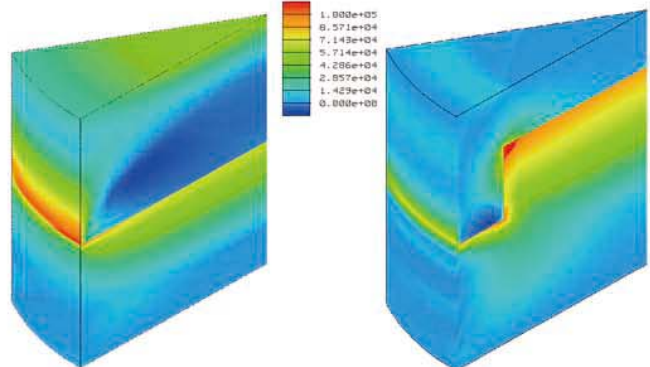
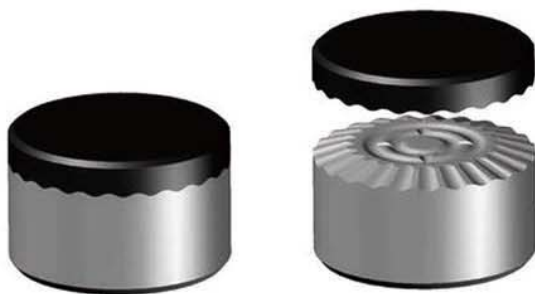
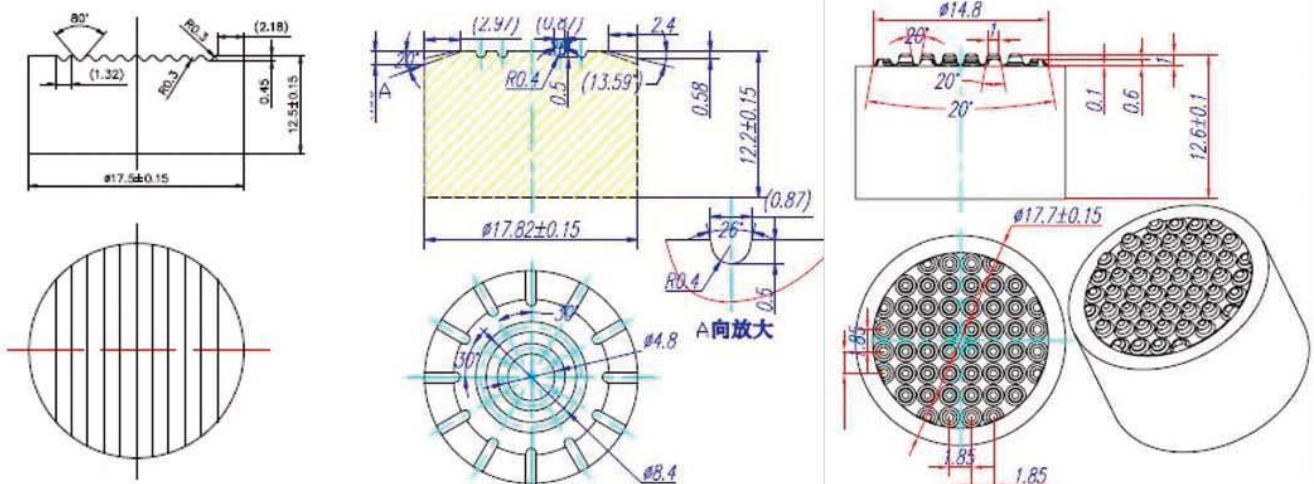


Fig. 5. Maximum tensile residual stress in 0.160-in thick diamond 1308 PDC cutters with a flat interface (left) and a non-planar hoop interface (right).

(From research conclusion of Ken Bertagnolli and Roger Vale)



# PDC for Petroleum /Gas Drill Bits

## 石油天然气钻头用金刚石复合片



Main Specification      常用规格

产品编号 Code	外径 OD mm	厚度 Thickness mm	工作层厚度 Working Layer mm
1008	$\Phi 10.00 \pm 0.02$	$8.00 \pm 0.03$	$1.5 \pm 0.2$
1313	$\Phi 13.44 \pm 0.02$	$13.20 \pm 0.03$	$1.7 \pm 0.2$
1613	$\Phi 16.00 \pm 0.02$	$13.20 \pm 0.03$	$1.7 \pm 0.2$
1616	$\Phi 16.00 \pm 0.02$	$16.00 \pm 0.03$	$1.7 \pm 0.2$
1913	$\Phi 19.05 \pm 0.02$	$13.20 \pm 0.03$	$1.7 \pm 0.2$
1919	$\Phi 19.05 \pm 0.02$	$19.00 \pm 0.03$	$1.7 \pm 0.2$

注：1、倒角尺寸：工作层  $0.4 \times 45^\circ$  基体  $0.5 \times 45^\circ$ ； 2、可按用户需要加工，异型产品

Re: 1. Chamfering: working layer  $0.4 \times 45^\circ$  substrate  $0.5 \times 45^\circ$ . 2. Customized design is accepted.

金刚石复合片钻头主要依靠剪切作用粉碎岩石，优于牙轮钻头和金刚石孕镶钻头。

PDC Drill Bit crush the rock by shearing action, it is much better than Toothed Roller Bit and Diamond Impregnated Bit.



# PDC for Petroleum /Gas Drill Bits

## 石油天然气钻头用金刚石复合片



### Performance Index (Technical Standard: Q/JX01-2003)

#### 产品性能指标（技术执行标准Q/JX01-2003）

Items 项目	Performance Index 性能指标	Inspection Method and Evaluation Standard 检测方式及评价标准
Appearance Quality  外观质量	Surface shall be flat, glabrous, no hole, pointedness and border clear, no crack, no metal zone, no defect or tipping. Cemented carbide substrate shall be no defect. All the dimensions match the drawing. 表面应平整光洁，无坑点，棱角边界清晰分明，无裂纹和明显的金属带及缺损崩刃现象，硬质合金基体无污点、无加工缺陷等。外形尺寸符合图纸要求，切面应垂直槽型方向，切面平整，边界清晰，无棱边。	Liquid fluorescent penetration test with III grade sensitivity.  进行液体荧光渗透检测，要求3级敏感度。
Wear Resistance  耐磨性能	Abrasion Ratio E= Weight Loss of the grinding wheel/ Weight Loss of PDC  磨耗比 E=砂轮的磨损重量/复合片磨损重量	Use Ceramic bonded grinding wheel (Tl.80#Z2) and PDC grinded each other and test the ratio of the weight loss. By this we can evaluate the wear resistance.  采用陶瓷结合剂砂轮(Tl.80#Z2)与复合片在一定条件下，相互磨削后两者重量损失的比值，评价金刚石复合片的耐磨性。 一级 : $E \geq 1.5 \times 10^5$ I Grade E 平均值 average $\geq 3.0 \times 10^5$ 二级 : $E \geq 3.0 \times 10^5$ I Grade E 平均值 average $\geq 5.0 \times 10^5$
Thermal Stability  热稳定性	Heated to the working temperature, the PDC keep its performance. The thermal stability of PDC will be affected by the difference of the coefficient of thermal expansion of the cemented carbide substrate and the diamond working layer, the difference of the coefficient of thermal expansion of the diamond crystal and the cobalt, the different producing technique. 加热到工作温度后，复合片性能基本不变。随着温度升高，复合片基体与金刚石工作层热膨胀系数的差异，及工作层内部金属钴与金刚石聚晶热膨胀系数的差异，不同的生产工艺，都会影响复合片的热稳定性。	Put the PDC into the carbon crucible and put them into the hearth in 800°C and keep 15 min. naturally cooling down to room temperature, then test by three level accuracy detection of fluorescence penetration, the PDC shall be no crack.  将复合片放入碳舟中，一起放入800°C的炉膛，保温15分钟，随出炉自然冷却，使用荧光渗透三级精度检测，复合片无裂纹。

# PDC for Petroleum /Gas Drill Bits

## 石油天然气钻头用金刚石复合片



### Performance Index (Technical Standard: Q/JX01-2003)

#### 产品性能指标（技术执行标准Q/JX01-2003）

Items 项目	Performance Index 性能指标	Inspection Method and Evaluation Standard 检测方式及评价标准
Thermal Shock Resistance 抗热震性	After cycles from room temperature to high temperature, the diamond working layer and the cemented carbide substrate do not separate. 反复经历室温到高温到室温，基体与金刚石工作层不分层。	Heat the PDC to 850 °C in the protective atmosphere and keep 3 min, then put it into water, the diamond working layer and the cemented carbide substrate do not separate. 保护气氛加热 850°C；3 分钟即可放入水中，要求基体与金刚石工作层不分层。
Impact Resistance 抗冲击性	PDC shall be with enough impact resistance. 金刚石复合片应具有足够的抗冲击韧性	The heavy punch freely fall and hit the PDC, test the times when the PDC destroyed, and multiplied by the work 3J/time, then get the Impact toughness of the PDC. 重锤自由落下冲击复合片，测试金刚石复合片破坏产生的次数，乘以单次 3J 冲击功，即为复合片的抗冲击韧性。 $I=N*E$ ，要求 $I \geq 600J$ 。 I: 复合片抗冲击韧性（焦耳） Impact toughness of the PDC (Joule) N: 抗冲击次数（次） Hit times. E: 单次冲击功。(3 焦耳) Work (3J)/time

### Quality Control 质检

Item 项目	Quality Control 质检要求
Appearance Quality 外观质量	100% inspect 100%全检
Wear Resistance 耐磨性能	Spot-check according to China Industrial Standard GB2828, applying the High speed sampling inspection, inspection level apply Special Inspection Level S-4, and the acceptable quality level AQL shall be 1.5%.
Thermal Stability 热稳定性	按照 GB2828 进行抽查，抽样的方法采用计数高速型抽样检查，检查水平采用特殊检查水平 S—4，合格质量水平 AQL 为 1.5%



PDC for Coalfield and Mine Excavating  
煤田及矿山用金刚石复合片



外径 OD mm	厚度 Thickness mm	工作层厚度 Working Layer mm
12.4	4.5	1.1-1.3
13.33	4.5	1.1-1.3
13.44	8.0	1.1-1.3

PDC for Geologic Survey  
地质勘探用金刚石复合片



外径 OD mm	厚度 Thickness mm	工作层厚度 Working Layer mm
10.4	4.5	1.1-1.3
12.4	4.5	1.1-1.3
13.33	4.5	1.1-1.3
13.44	8.0	1.1-1.3
16.05	8.0	1.1-1.3
19.05	8.0	1.1-1.3

PDC for Metal Machining  
金属加工用金刚石复合片



外径 OD mm	厚度 Thickness mm	工作层厚度 Working Layer mm
8.0	4.5	0.9-1.1
10.4	4.5	0.9-1.1
12.4	4.5	0.9-1.1
13.33	4.5	0.9-1.1
13.44	8.0	1.0-1.8
15.05	8.0	1.0-1.8
16.05	8.0	1.0-1.8



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