

# PD1005 / PD1010



## **DLC-Coated Inserts for Non-Ferrous Metals**

Welding and chipping resistant coated grades specialized for machining non-ferrous metals

- ▣ **Advanced DLC-Coated Grades**  
Maximized resistance to welding and wear of coating enables quality machining at high speeds
- ▣ **PD1005 / PD1010**  
Improved chipping resistance due to specialized grades for each workpiece



## Advanced DLC-Coated Inserts for Non-Ferrous Metals such as Aluminum and Copper

# PD1005 / PD1010



### PD1005

For continuous cutting of aluminum and copper



### PD1010

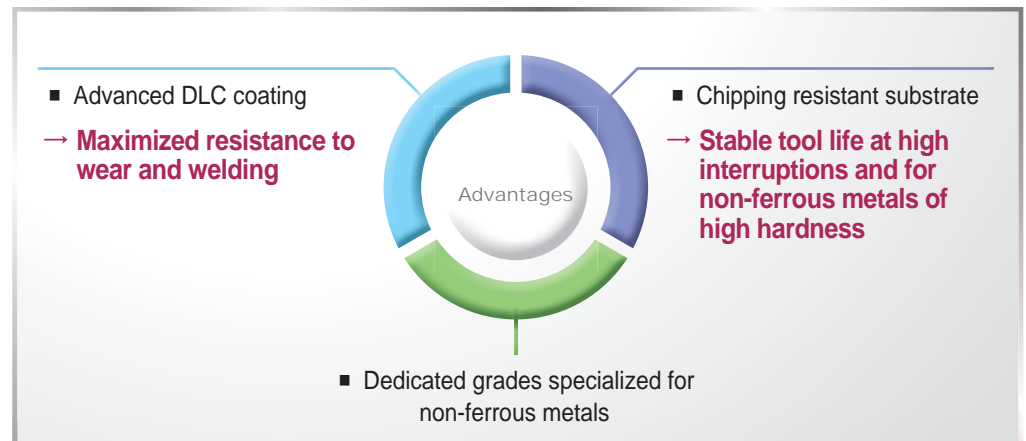
Interrupted machining of forged aluminum alloy, AISi (<8%)

Non-ferrous metals such as aluminum and copper have relatively low melting points, causing heavy welding on the tool edges during machining. The dulled cutting edges bring about poor surface finish of workpieces while high cutting load increases the chance of sudden chipping, resulting in unstable tool life.

To provide our customers with a satisfactory grade solution for non-ferrous metal machining, KORLOY has developed DLC (Diamond-Like Carbon) coated grades.

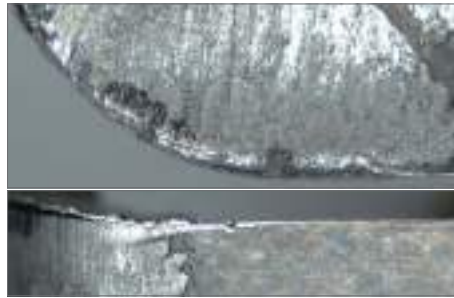
**PD1005** is a grade for workpieces made of aluminum or copper, and for continuous cutting. The latest DLC coating with maximized wear and welding resistance enables high speed machining for those materials, delivering excellent surface finish in continuous cutting of general non-ferrous metals.

**PD1010** is a grade for workpieces made of forged aluminum or AISi alloy, and for interrupted cutting. The combination of the chipping-resistant substrate and DLC coating greatly improves toughness, providing stable and long tool life in interrupted cutting or when machining non-ferrous metals of high hardness.

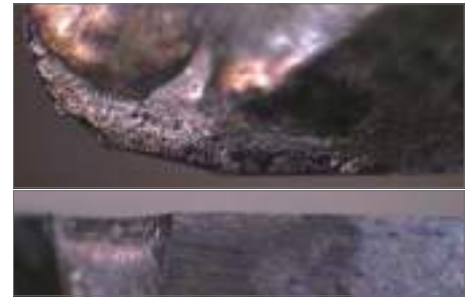


## ⇒ Problems When Machining Non-Ferrous Metals

### 1. Build-up edges



### 2. Unexpected chipping



## ⇒ Development of New PD Series

### DLC coating

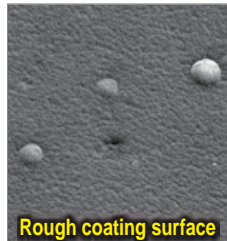
- Diamond-Like Carbon
- Amorphous carbon coating with physical properties similar to those of diamonds
- High hardness and lubrication ideal for non-ferrous metal machining with a high probability of build-up edge occurring

### Ultra-hard H-DLC coating

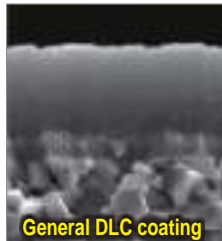


#### General DLC

- Hardness of coating: 3000 HV
- Friction coefficient: < 0.25



Rough coating surface

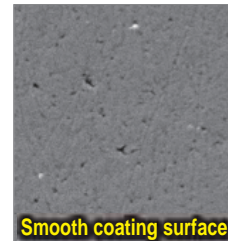


General DLC coating

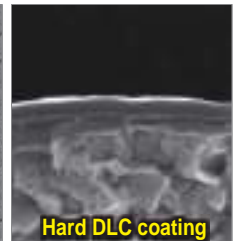


#### H-DLC

- Hardness of coating: 6500 HV
- Friction coefficient: < 0.15



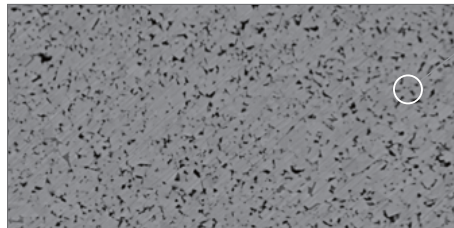
Smooth coating surface



Hard DLC coating

Excellent resistance to wear and welding

### Chipping resistant substrate



- Optimized proportion of WC particles and Co binders for each workpiece material provides improved resistance to chipping and wear.
- The ultrafine structure which has been made uniform attains stable machinability at all corners.

Improved chipping resistance

## ⇒ Development Effects

### Workpiece

AlZn5.5MgCu

### Cutting conditions

vc (m/min) = 1,000

fz (mm/t) = 0.2

ap (mm) = 1.0

ae (mm) = 70, dry

### Tools

XEKT19M508FR-MA

PAXCM5100HR-A

### 1. Improved resistance to welding and chipping



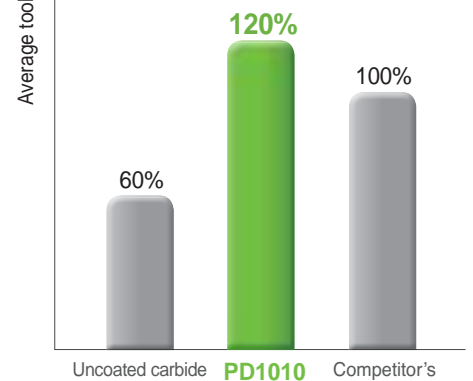
PD1010

Uncoated carbide

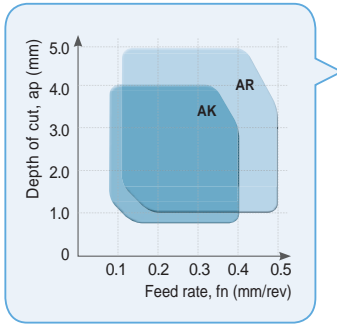







### 2. Extended tool life

\* Milling applications of forged aluminum (facing at medium to high speeds)



## ⇒ Applicable Products

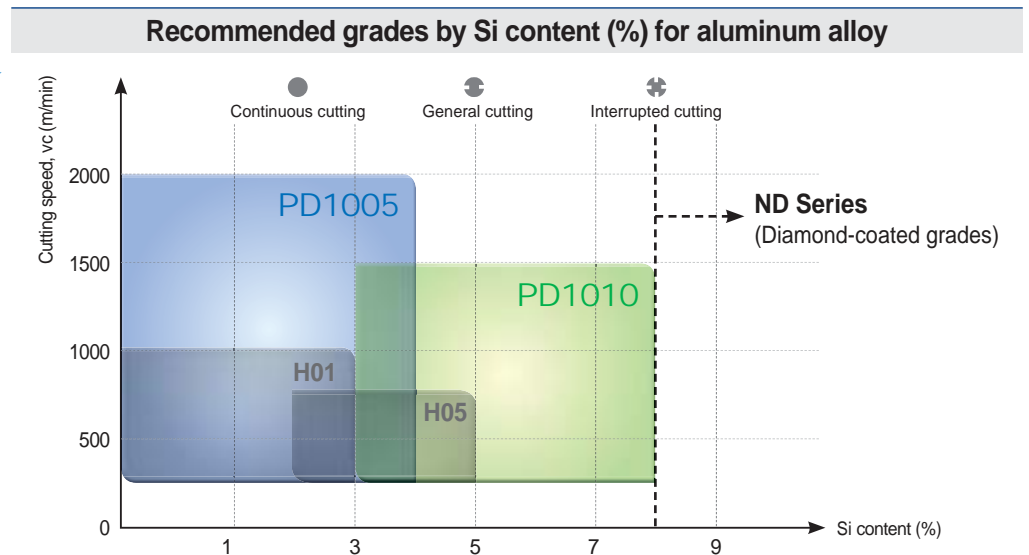


Cutting type	Name		
Turning	AK	AR	
			
Milling	Pro-X Mill	Alpha Mill	Future Mill (FMA, FMP)
			

## ⇒ Guideline for Grades Application

### PD1000 Series

- Higher speed and feed availability compared to uncoated grades
- Expanded application range for workpieces of higher Si content
- Stable and long tool life



## ⇒ Recommended Cutting Conditions

Cutting type	Workpiece	Application	C/B	Grade	Recommended cutting conditions		
					vc (m/min)	Turning: fn (mm/rev) Milling: fz (mm/t)	ap (mm)
Turning	Soft, non-ferrous (Si < 4%)	Medium to finish cutting	AK	PD1005	200 – 350 – 500	0.03 – 0.2 – 0.4	0.1 – 2.0 – 4.0
				PD1010	150 – 275 – 400	0.03 – 0.2 – 0.4	0.1 – 2.0 – 4.0
	Hard, non-ferrous (Si < 8%)	Medium to rough cutting	AR	PD1005	200 – 350 – 500	0.05 – 0.25 – 0.5	0.5 – 2.2 – 4.0
				PD1010	150 – 275 – 400	0.05 – 0.25 – 0.5	0.5 – 2.2 – 4.0
Milling	Soft, non-ferrous (Si < 4%)	General cutting	MA	PD1005	300 – 1150 – 2000	0.10 – 0.25 – 0.4	0.5 – 8.0 – 16.0
	Hard, non-ferrous (Si < 8%)			PD1010	200 – 850 – 1500	0.10 – 0.25 – 0.4	0.5 – 8.0 – 16.0



## ⇒ Cutting Performance

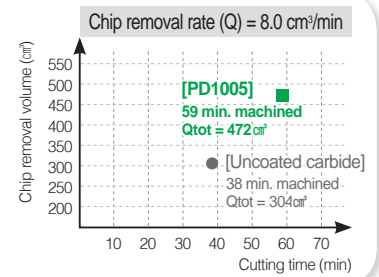


[ Uncoated carbide ]



### Performance evaluation of PD1005 with AK (Turning)

- Workpiece Aluminum alloy (AlZn5.5MgCu)
- Cutting conditions
  - vc (m/min) = 400
  - fn (mm/rev) = 0.2
  - ap (mm) = 1.0
  - outside diameter turning, dry
- Tools
  - Insert : VCGT160404-AK (PD1005)
  - Holder : SVJCL2525-M16



➔ 55% increased cutting volume compared to uncoated grades

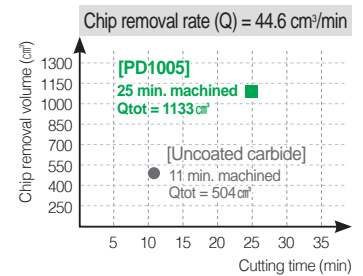


[ Uncoated carbide ]

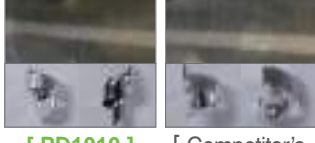
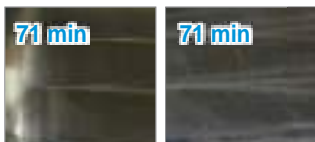


### Performance evaluation of PD1005 with Pro-X Mill (Milling)

- Workpiece Copper (C1020)
- Cutting conditions
  - vc (m/min) = 2000
  - fz (mm/t) = 0.1
  - ap (mm) = 1.0
  - ae (mm) = 70, wet
- Tools
  - Insert : XEKT19M508FR-MA (PD1005)
  - Holder : PAXCM5100HR-A



➔ 125% more cutting volume compared to uncoated grades

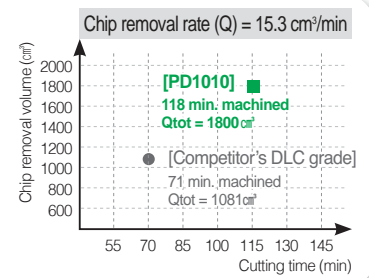


[ Competitor's DLC grade ]



### Performance evaluation of PD1010 with Alpha Mill (Milling)

- Workpiece Aluminum alloy (AlMg1SiCu)
- Cutting conditions
  - vc (m/min) = 800
  - fz (mm/t) = 0.1
  - ap (mm) = 3.0
  - ae (mm) = 20, dry
- Tools
  - Insert : APMT1604PDFR-MA (PD1010)
  - Holder : AMC3100HS



➔ 67% increased cutting volume and superior surface finish of the machined workpiece compared to the competitor's DLC grade

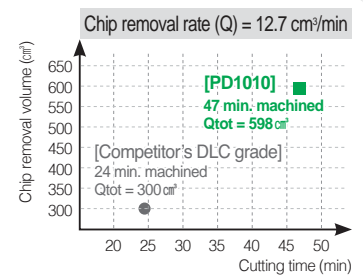


[ Competitor's DLC grade ]



### Performance evaluation of PD1010 with Pro-X Mill (Milling)

- Workpiece Aluminum casting alloy
- Cutting conditions
  - vc (m/min) = 200
  - fz (mm/t) = 0.2
  - ap (mm) = 2.0
  - ae (mm) = 50, wet
- Tools
  - Insert : XEKT19M508FR-MA (PD1010)
  - Holder : PAXCM5100HR-A



➔ 99% increased cutting volume compared to the competitor's DLC grade

## Application Examples



### Truck's clutch housing

- Workpiece Aluminum die casting alloy, Al-Si8Cu3 (Fe) (Si 8%)
- Cutting conditions  $vc$  (m/min) = 400,  $fn$  (mm/rev) = 0.25–0.3,  $ap$  (mm) = 1.0–1.5, wet
- Tool Insert : CNMG120408-HA (PD1005) Holder : PCLNR2525-M12

PD1005

80ea/corner

Competitor

30ea/corner

166%  
more

➔ 166% more machined workpieces compared to the competitor



### Automotive aluminum wheel

- Workpiece Aluminum forged alloy, Al-Si7Mg (Fe) (Si 7%)
- Cutting conditions  $vc$  (m/min) = 260–337,  $fn$  (mm/rev) = 0.6–0.7,  $ap$  (mm) = 2.0–3.0, wet
- Tool Insert : VCGT220530-AR (PD1010) Holder : S40T-XVXCR-22-DG

PD1010

450ea/corner

Competitor

330ea/corner

36%  
more

➔ 36% more machined workpieces compared to the competitor



### Automotive differential carrier

- Workpiece Aluminum forged alloy, Al-Si7Mg (Fe) (Si 7%)
- Cutting conditions  $vc$  (m/min) = 740,  $fz$  (mm/t) = 0.15,  $ap$  (mm) = 1.0–1.5, wet
- Tool Insert : XEKT19M504FR-MA (PD1010) Holder : PAXS5032HR-A

PD1010

900ea/corner

Competitor


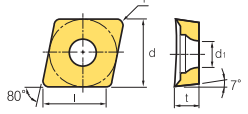

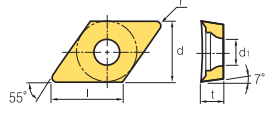

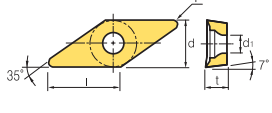
480ea/corner

188%  
more

➔ 188% more machined workpieces compared to the competitor


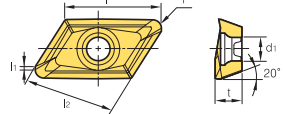

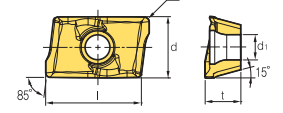

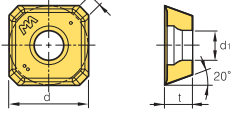

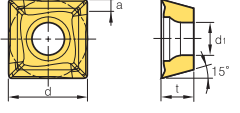


## ➔ Available Stock (Turning)

Chip breaker	Designation			Grade		Dimensions (mm)					Cutting conditions		Figure
				PD1005	PD1010	l	d	t	r	d <sub>1</sub>	Feed rate, f <sub>n</sub> (mm/rev)	Depth of cut, a <sub>p</sub> (mm)	
AK		CCGT	060204-AK	-	●	6.0	6.35	2.38	0.4	2.8	0.02-0.15	0.10-3.00	
			09T302-AK	-	●	9.4	9.525	3.97	0.2	4.4	0.02-0.20	0.05-3.00	
			09T304-AK	-	●	9.2	9.525	3.97	0.4	4.4	0.02-0.30	0.10-5.00	
			120404-AK	-	●	12.4	12.7	4.76	0.4	5.5	0.03-0.50	0.10-5.00	
		DCGT	070204-AK	-	●	7.3	6.35	2.38	0.4	2.8	0.02-0.30	0.10-4.00	
			11T302-AK	-	●	11.4	9.525	3.97	0.2	4.4	0.02-0.30	0.05-4.00	
			11T304-AK	-	●	11.2	9.525	3.97	0.4	4.4	0.03-0.50	0.10-5.00	
			11T308-AK	-	●	10.8	9.525	3.97	0.8	4.4	0.03-0.50	0.10-5.00	
		VCGT	110302-AK	-	●	10.5	6.35	3.18	0.2	2.8	0.02-0.20	0.05-3.00	
			110304-AK	-	●	10.0	6.35	3.18	0.4	2.8	0.02-0.25	0.10-4.00	
			160404-AK	-	●	15.6	9.525	4.76	0.4	4.4	0.03-0.40	0.10-5.00	
			160408-AK	-	●	14.0	9.525	4.76	0.8	4.4	0.03-0.50	0.10-5.00	

● : Stock item

## ➔ Available Stock (Milling)

Cutter	Designation			Grade		Dimensions (mm)						Figure		
				PD1005	PD1010	l	l <sub>2</sub>	l <sub>1</sub>	d	t	r		d <sub>1</sub>	a
Pro-X Mill		XEKT	19M504FR-MA	-	●	18	16.4	1.4	-	5	0.4	4.4	-	
			19M508FR-MA	-	●	18	16.4	1.0	-	5	0.8	4.4	-	
			19M512FR-MA	-	●	18	16.4	0.6	-	5	1.2	4.4	-	
			19M516FR-MA	-	●	17.5	16.4	0.5	-	5	1.6	4.4	-	
			19M520FR-MA	-	●	17.5	16.4	0.5	-	5	2.0	4.4	-	
			19M530FR-MA	-	●	17	16.4	0.7	-	5	3.0	4.4	-	
			19M532FR-MA	-	●	17	16.4	0.5	-	5	3.2	4.4	-	
			19M540FR-MA	-	●	16.5	16.4	0.5	-	5	4.0	4.4	-	
			19M550FR-MA	-	●	16	16.4	0.4	-	5	5.0	4.4	-	
Alpha Mill		APMT	1604PDFR-MA	-	●	16.4	-	-	9.41	5.76	0.8	4.5	-	
FMA		SEET	14M4AGFN-MA	-	●	-	-	-	14.0	4.0	-	4.4	2.64	
FMP		SDET	130504R-MA	-	●	-	-	-	13.5	5.56	0.4	5.56	2.2	

● : Stock item

***www.korloy.com***



Holystar B/D, 1350, Nambusunhwan-ro, Geumcheon-gu, Seoul, 08536, Korea  
Tel : +82-2-522-3181 Fax : +82-2-522-3184, +82-2-3474-4744 Web : [www.korloy.com](http://www.korloy.com) E-mail : [export@korloy.com](mailto:export@korloy.com)

### **KORLOY AMERICA**

620 Maple Avenue, Torrance, CA 90503, USA  
Tel : +1-310-782-3800 Toll Free : +1-888-711-0001 Fax : +1-310-782-3885  
[www.korloyamerica.com](http://www.korloyamerica.com) E-mail : [sales@korloy.us](mailto:sales@korloy.us)

### **KORLOY INDIA**

Plot NO.415, Sector 8, IMT Manesar, Gurgaon 122051, Haryana, India  
Tel : +91-124-4391790 Fax : +91-124-4050032  
[www.korloyindia.com](http://www.korloyindia.com) E-mail : [sales.kip@korloy.com](mailto:sales.kip@korloy.com)

### **KORLOY VIETNAM**

No. 133 Le Loi street, Hoa Phu ward, Thu Dau Mot city,  
Binh Duong proviende, Vietnam  
Tel : +86-532-86959880

### **KORLOY FACTORY QINGDAO**

Ground Dongjing Road 56(B) District Free Trade Zone. Qingdao, China  
Tel : +86-532-86959880 Fax : +86-532-86760651  
E-mail : [pro.kfq@korloy.com](mailto:pro.kfq@korloy.com)

### **KORLOY EUROPE**

Gablonzer Str. 25-27, 61440 Oberursel, Germany  
Tel : +49-6171-277-83-0 Fax : +49-6171-277-83-59  
[www.korloyeurope.com](http://www.korloyeurope.com) E-mail : [sales@korloyeurope.com](mailto:sales@korloyeurope.com)

### **KORLOY BRASIL**

Av. Aruana 280, conj.12, WLC, Alphaville, Barueri,  
CEP06460-010, SP, Brasil  
Tel : +55-11-4193-3810 E-mail : [vendas@korloy.com](mailto:vendas@korloy.com)

### **KORLOY FACTORY INDIA**

Plot No. 415, Sector 8, IMT Manesar, Gurgaon 122051, Haryana, India  
Tel : +91-124-4391790 Fax : +91-124-4050032  
[www.korloyindia.com](http://www.korloyindia.com) E-mail : [kimindia@korloy.com](mailto:kimindia@korloy.com)