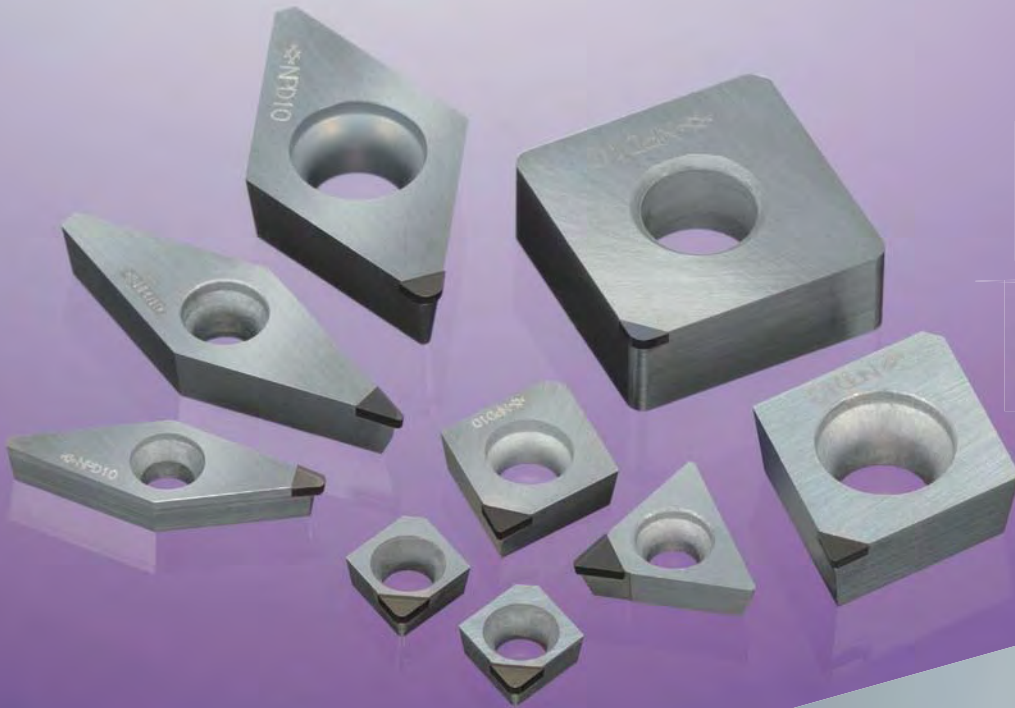


PCD tool for Cemented carbide & hard brittle material turning

# SUMIDIA BINDERLESS **NPD10** / SUMIDIA **DA90**



## SUMIDIA BINDERLESS **NPD10**

For Ultimate  
High-Precision Machining

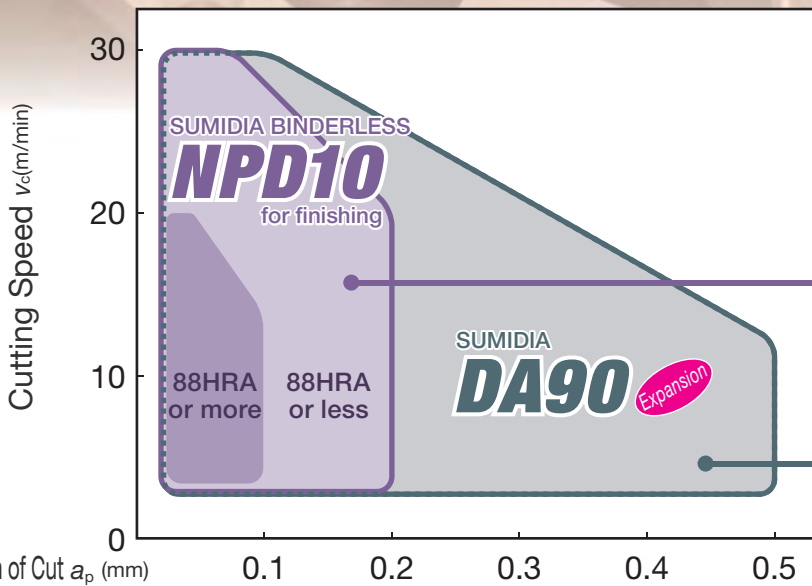


## SUMIDIA **DA90**

Your Secret Weapon for  
Roughing Cemented Carbides  
and Hard Brittle Materials

# SUMIDIA BINDERLESS NPD10/DA90

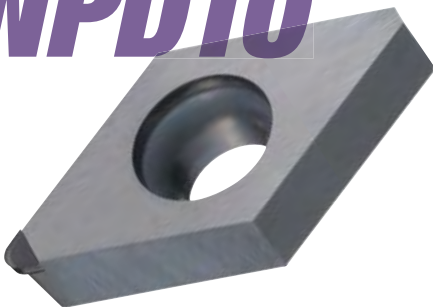
## Application Range (Cemented Carbide)



● **NPD10**  
Outstanding wear resistance and minimal dimensional shifting when finishing cemented carbide.

● **DA90** Expansion  
Stable tool life when processing sintered surfaces of cemented carbide.

## SUMIDIA BINDERLESS NPD10



Even with a pure diamond construction, unlike single-crystal diamonds, NPD10 has no anisotropy and adopts a nano-polycrystalline diamond with high hardness for the cutting edge. NPD10 offers improved tool life and machining precision that surpass conventional diamond tools in the machining of cemented carbide and hard brittle materials.

## Ideal for finishing of cemented carbide and hard brittle material

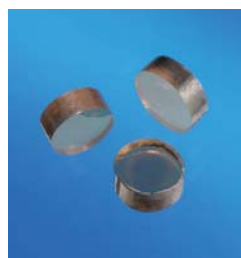
The excellent wear resistance of nano-polycrystalline diamond enables high-precision machining of cemented carbide.

## Maintains superior dimensional tolerances over many hours

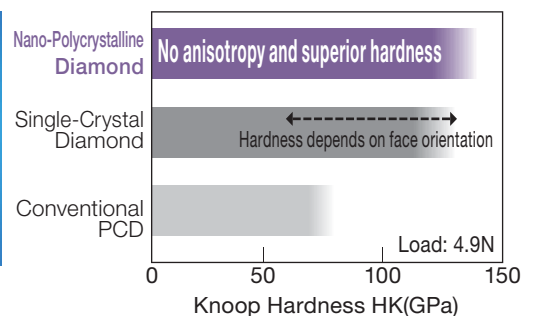
Greatly reduced tool replacements compared to conventional diamond tools will improve work efficiency and reduce total costs.

## ● Nano-Polycrystalline Diamond

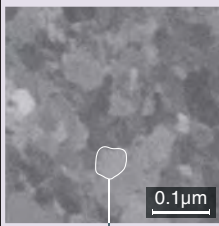
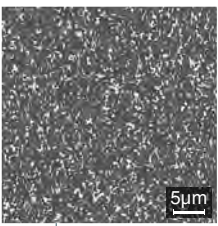
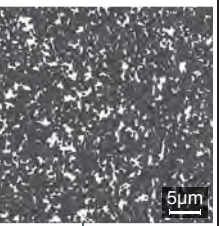
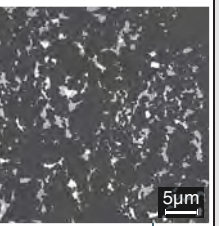
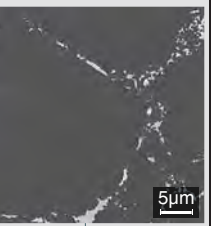
Nano-polycrystalline diamond is a diamond polycrystal that directly binds nanometer-level diamond particles with high strength and without using a binder. SUMIDIA BINDERLESS is harder than single-crystal diamond and has no cleavability. This enables machining of hard brittle materials such as cemented carbides and makes possible new machining methods.



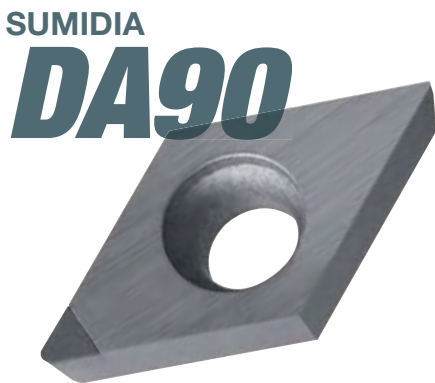
## ● Hardness



## ■ SUMIDIA Grade List

Grade	SUMIDIA BINDERLESS NPD10	SUMIDIA DA1000	SUMIDIA DA2200	SUMIDIA DA150	SUMIDIA DA90
Structure	 Diamond Particles				
Binder	–	Co	Co	Co	Co
Grain Size (µm)	~0.05	~0.5	0.5	5	50
Content (%)	100	90~95	85~90	85~90	90~95

\* Binders appear white on the image.



With densely sintered coarse diamond particles, this polycrystalline diamond grade features a high diamond content for excellent wear resistance even when roughing cemented carbide or other hard brittle materials. The optimal design and incorporation of mass production techniques allows for excellent cost effectiveness with the same performance as conventional models.

## Ideal for roughing of cemented carbide and hard brittle materials

Coarse polycrystalline diamonds offer excellent wear resistance performance, enabling stable tool life when working with sintered surfaces of cemented carbide or roughing hard brittle material.

## Adoption of SUMIDIA NF inserts

The optimal design and incorporation of mass production techniques allows for excellent cost effectiveness with the same performance as conventional models.

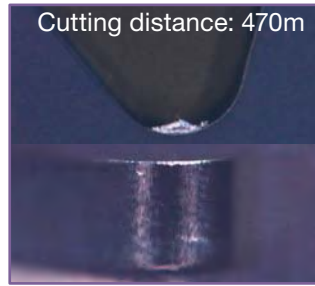
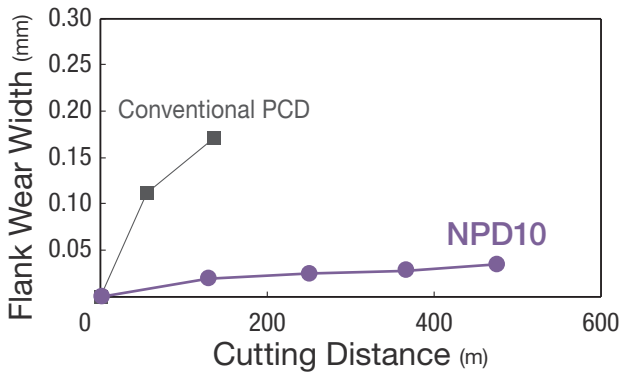
## Newly stocked inserts for cemented carbide and hard brittle material

### ■ NPD10/DA90 Applications (Cemented Carbide)

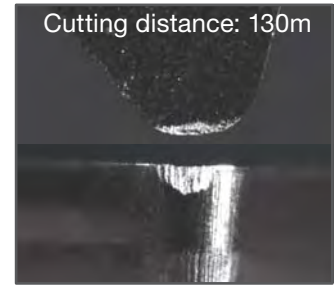
Grade	SUMIDIA BINDERLESS NPD10	SUMIDIA DA90
Tolerance	◎ Best	△ NPD10 recommended
Tool Life (Wear Resistance)	◎ Best $a_p=0.2\text{mm}$ or less, $f=0.1\text{mm/rev}$ or less recommended	○ $a_p$ =Suitable even for applications of 0.2mm or more
Sintered Surface Processing of Cemented Carbide	✕ Unusable	◎ Best
Machined Surface Quality	◎ Best	△ NPD10 recommended

## Wear Resistance of NPD10

Excellent wear resistance



NPD10  
 $(V_B=0.034\text{mm})$

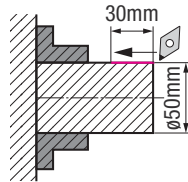
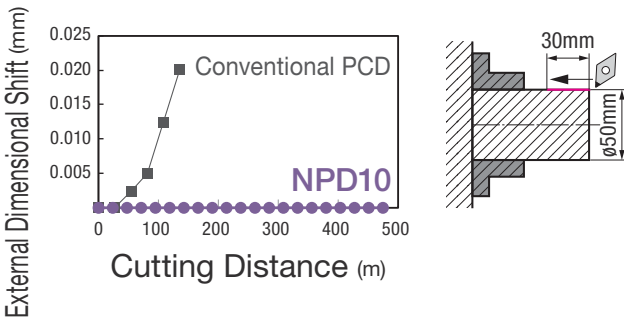


Conventional PCD  
 $(V_B=0.171\text{mm})$

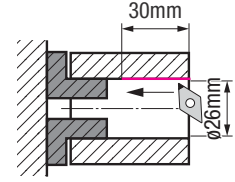
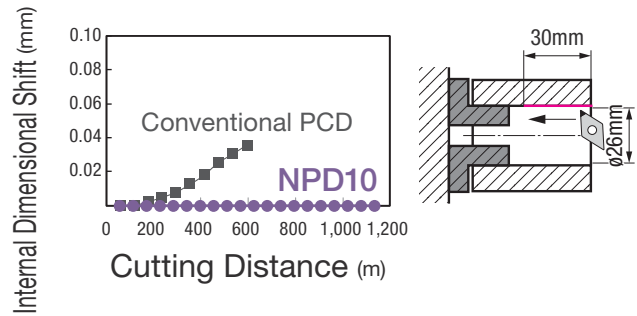
Work Material : Cemented Carbide (87HRA) Tool : DCMW11T304RH  
 Cutting Conditions :  $v_c=20\text{m/min}$   $f=0.1\text{mm/rev}$   $a_p=0.1\text{mm}$  Dry

## Machining Precision of NPD10

NPD10 undergoes no dimensional shift even with a cutting distance of 450m.



NPD10 undergoes no dimensional shift even with a cutting distance of 1,100m.

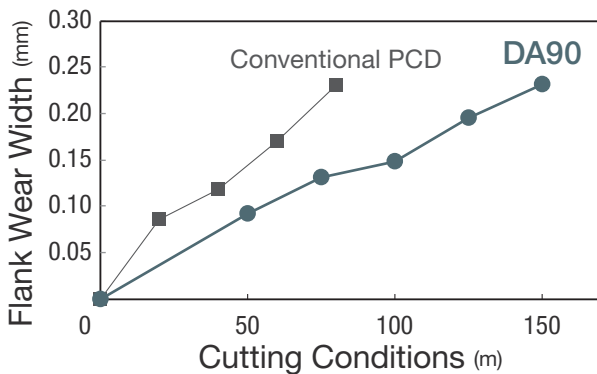


Work Material : Cemented Carbide VC50(87HRA)  
 Tool : DCMW11T304RH  
 Cutting Conditions :  $v_c=20\text{m/min}$   $f=0.1\text{mm/rev}$   $a_p=0.1\text{mm}$  Dry

Work Material : Cemented Carbide VM30(91HRA)  
 Tool : DCMW11T304RH  
 Cutting Conditions :  $v_c=20\text{m/min}$   $f=0.05\text{mm/rev}$   $a_p=0.05\text{mm}$  Dry

## Wear Resistance of DA90

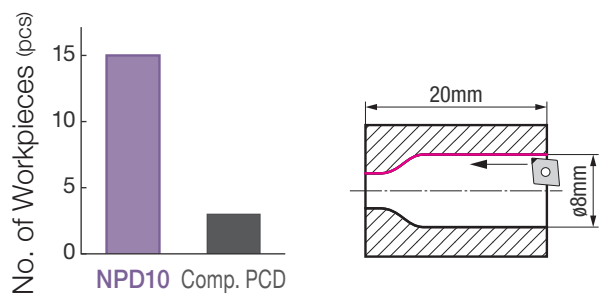
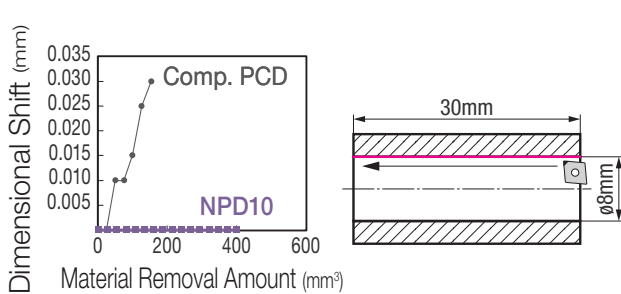
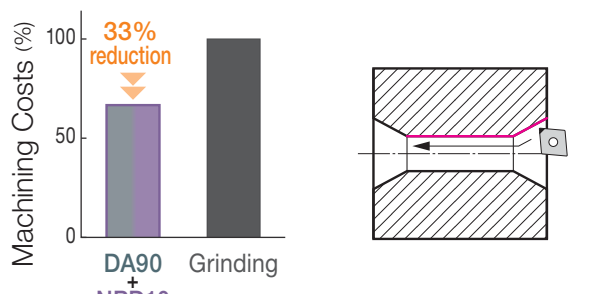
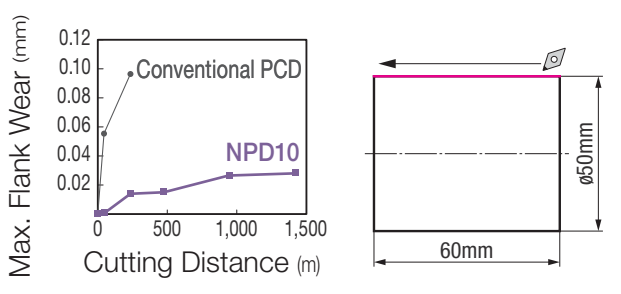
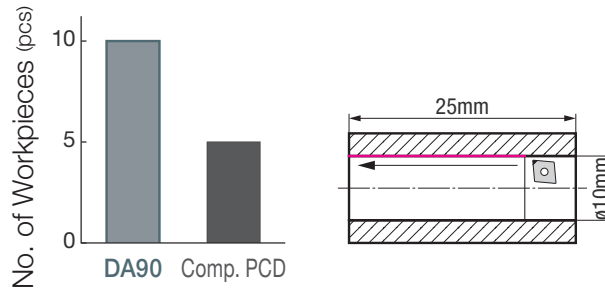
Excellent wear resistance even under roughing conditions.



Work Material : Cemented Carbide VC50(87HRA)  
 Tool : NF-DCMW070204  
 Cutting Conditions :  $v_c=20\text{m/min}$   $f=0.1\text{mm/rev}$   $a_p=0.2\text{mm}$  Wet



## Application Examples

<p><b>Cemented Carbide VC40(89HRA) Die Mold</b></p> <p><b>NPD10</b> offers 5 times the tool life compared with competitor PCDs.</p>  <p>No. of Workpieces (pcs)</p> <p>15 10 5 0</p> <p>NPD10 Comp. PCD</p> <p>20mm ø8mm</p>	<p><b>Cemented Carbide VM70(84HRA) Die Mold</b></p> <p><b>NPD10</b> offers 4 times the cutting efficiency compared with competitor PCDs for stable dimensional tolerance.</p>  <p>Dimensional Shift (mm)</p> <p>0.035 0.030 0.025 0.020 0.015 0.010 0.005 0</p> <p>Comp. PCD NPD10</p> <p>0 200 400 600</p> <p>Material Removal Amount (mm<sup>3</sup>)</p> <p>30mm ø8mm</p>
<p>Tool : CCMW04X104RH(NPD10) Boring          Cutting Conditions : <math>v_c=15\text{m/min}</math> <math>f=0.015\text{mm/rev}</math> <math>a_p=0.07\text{mm}</math>          Dry</p>	<p>Tool : CCMW03X102RH(NPD10) Boring          Cutting Conditions :          NPD10 <math>v_c=25\text{m/min}</math> <math>f=0.05\text{mm/rev}</math> <math>a_p=0.05\text{mm}</math> Dry          Comp. PCD <math>v_c=5\text{m/min}</math> <math>f=0.03\text{mm/rev}</math> <math>a_p=0.10\text{mm}</math> Dry</p>
<p><b>Cemented Carbide VM30(91HRA) Die Mold</b></p> <p>Using <b>DA90</b> for roughing and <b>NPD10</b> for finishing ensures a 33% reduction in machining costs compared with conventional grinding processes.</p>  <p>Machining Costs (%)</p> <p>100 50 0</p> <p>33% reduction</p> <p>DA90 + NPD10 Grinding</p>	<p><b>Alumina (99% purity)</b></p> <p><b>NPD10</b> delivers good wear resistance even when processing alumina materials.</p>  <p>Max. Flank Wear (mm)</p> <p>0.12 0.10 0.08 0.06 0.04 0.02 0</p> <p>Conventional PCD NPD10</p> <p>0 500 1,000 1,500</p> <p>Cutting Distance (m)</p> <p>60mm ø50mm</p>
<p>Tool : Roughing NF-CCMW060202(DA90) Boring          Finishing CCMW060202RH(NPD10) Boring          Cutting Conditions : Roughing <math>v_c=20\text{m/min}</math> <math>f=0.10\text{mm/rev}</math> <math>a_p=0.10\text{mm}</math> Dry          Finishing <math>v_c=20\text{m/min}</math> <math>f=0.02\text{mm/rev}</math> <math>a_p=0.02\text{mm}</math> Dry</p>	<p>Tool : DNMA150408RH(NPD10) External Turning          Cutting Conditions : <math>v_c=300\text{m/min}</math> <math>f=0.03\text{mm/rev}</math> <math>a_p=0.01\text{mm}</math>          Wet</p>
<p><b>Cemented Carbide VC70(85HRA) Die Mold</b></p> <p><b>DA90</b> offers 2 times the tool life compared with competitor PCDs.</p>  <p>No. of Workpieces (pcs)</p> <p>10 5 0</p> <p>DA90 Comp. PCD</p> <p>25mm ø10mm</p> <p>Tool : NF-CCMW04X102(DA90) Boring          Cutting Conditions : <math>v_c=20\text{m/min}</math> <math>f=0.075\text{mm/rev}</math> <math>a_p=0.1\text{mm}</math>          Wet</p>	

## ■ NPD10 Stocks

### Negative

Shape	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
		NPD10		Inscribed Circle	Thickness	Hole Size	Nose Radius
	DNMA 150408RH	●	1.8	12.7	4.76	5.16	0.8
	150412RH	●	1.8				
	SNMA 120408RH	●	1.7	12.7	4.76	5.16	0.8
	120412RH	●	1.7				
	VNMA 160408RH	●	1.8	9.525	4.76	3.81	0.8
	160412RH	●	1.5				

## ■ DA90 Stocks

### Negative NF

Shape	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
		DA90		Inscribed Circle	Thickness	Hole Size	Nose Radius
	NF-DNMA 150408	●	2.0	12.7	4.76	5.16	0.8
	150412	●	2.0				
	NF-SNMA 120408	●	2.4	12.7	4.76	5.16	0.8
	120412	●	2.4				
	NF-VNMA 160408	●	1.9	9.525	4.76	3.81	0.8
	160412	●	1.7				

### Positive

Shape	Relief Angle	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
			NPD10		Inscribed Circle	Thickness	Hole Size	Nose Radius
	7°	CCMW 03X102RH	●	1.3	3.5	1.4	1.9	0.2
		03X104RH	●	1.3				
	7°	CCMW 04X102RH	●	1.7	4.3	1.8	2.3	0.2
		04X104RH	●	1.7				
	7°	CCMW 060202RH	●	1.7	6.35	2.38	2.8	0.2
		060204RH	●	1.7				
	7°	CCMW 09T302RH	●	1.7	9.525	3.97	4.4	0.2
		09T304RH	●	1.7				
	7°	CCMW 09T308RH	●	1.6	9.525	3.97	4.4	0.8
		09T308RH	●	1.6				
	7°	DCMW 070202RH	●	2.1	6.35	2.38	2.8	0.2
		070204RH	●	2.0				
	7°	DCMW 11T302RH	●	2.1	9.525	3.97	4.4	0.2
		11T304RH	●	1.9				
	7°	DCMW 11T308RH	●	1.6	9.525	3.97	4.4	0.8
		11T308RH	●	1.6				
	11°	TPMW 080202RH	●	1.2	4.76	2.38	2.3	0.2
		080204RH	●	1.0				
	11°	TPMW 110302RH	●	1.5	6.35	3.18	3.4	0.2
		110304RH	●	1.3				
	11°	TPMW 110308RH	●	1.0	6.35	3.18	3.4	0.8
		110308RH	●	1.0				
	11°	TPMW 160402RH	●	2.2	9.525	4.76	4.4	0.2
		160404RH	●	2.0				
	11°	TPMW 160408RH	●	1.6	9.525	4.76	4.4	0.8
		160408RH	●	1.6				
	7°	VCMW 080201RH	●	2.2	4.76	2.38	2.3	0.1
		080202RH	●	1.9				
	7°	VCMW 080204RH	●	1.5	4.76	2.38	2.3	0.4
		080204RH	●	1.5				
	7°	VCMW 110302RH	●	2.1	6.35	3.18	2.8	0.2
		110304RH	●	1.7				
	7°	VCMW 160402RH	●	2.1	9.525	4.76	4.4	0.2
		160404RH	●	1.7				
	7°	VCMW 160408RH	●	1.8	9.525	4.76	4.4	0.8
		160408RH	●	1.8				
	7°	VCMW 160412RH	●	1.5	9.525	4.76	4.4	1.2
		160412RH	●	1.5				

\* Curve of cutting edge tip has a cylindrical shape.

### Positive NF

Shape	Relief Angle	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
			DA90		Inscribed Circle	Thickness	Hole Size	Nose Radius
	7°	NF-CCMW 03X102	●	1.1	3.5	1.4	1.9	0.2
		03X104	●	1.1				
	7°	NF-CCMW 04X102	●	1.5	4.3	1.8	2.3	0.2
		04X104	●	1.5				
	7°	NF-CCMW 060202	●	2.4	6.35	2.38	2.8	0.2
		060204	●	2.4				
	7°	NF-CCMW 09T302	●	2.4	9.525	3.97	4.4	0.2
		09T304	●	2.4				
	7°	NF-CCMW 09T308	●	2.3	9.525	3.97	4.4	0.8
		09T308	●	2.3				
	7°	NF-DCMW 070202	●	2.6	6.35	2.38	2.8	0.2
		070204	●	2.4				
	7°	NF-DCMW 11T302	●	2.6	9.525	3.97	4.4	0.2
		11T304	●	2.4				
	7°	NF-DCMW 11T308	●	2.0	9.525	3.97	4.4	0.8
		11T308	●	2.0				
	11°	NF-TPMW 080202	●	2.5	4.76	2.38	2.3	0.2
		080204	●	2.4				
	11°	NF-TPMW 110302	●	2.5	6.35	3.18	3.4	0.2
		110304	●	2.4				
	11°	NF-TPMW 110308	●	2.1	6.35	3.18	3.4	0.8
		110308	●	2.1				
	11°	NF-TPMW 160402	●	2.5	9.525	4.76	4.4	0.2
		160404	●	2.4				
	11°	NF-TPMW 160408	●	2.1	9.525	4.76	4.4	0.8
		160408	●	2.1				
	7°	NF-VCMW 080202	●	3.2	4.76	2.38	2.3	0.2
		080204	●	2.8				
	7°	NF-VCMW 110302	●	3.2	6.35	3.18	2.8	0.2
		110304	●	2.8				
	7°	NF-VCMW 160402	●	3.7	9.525	4.76	4.4	0.2
		160404	●	3.3				
	7°	NF-VCMW 160408	●	2.4	9.525	4.76	4.4	0.8
		160408	●	2.4				
	7°	NF-VCMW 160412	●	2.1	9.525	4.76	4.4	1.2
		160412	●	2.1				

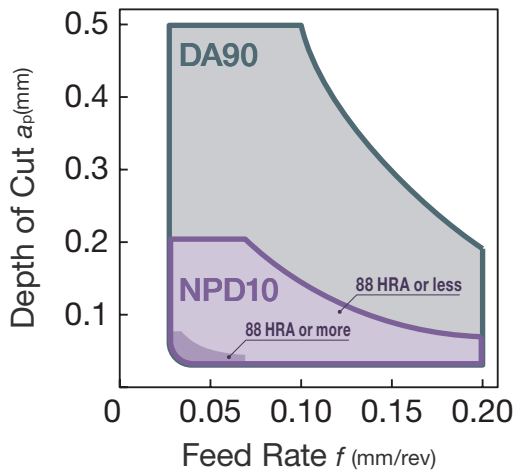
\* Curve of cutting edge tip has a cylindrical shape.

## Recommended Cutting Conditions

Work Material			Grade	Cutting Conditions			
Class	Hardness (HRA)	SEH Grade		Cutting Speed $v_c$ (m/min)	Feed Rate $f$ (mm/rev)	Depth of Cut $a_p$ (mm)	
VM,VC	40	88 or more	G5,D2	<b>NPD10</b>	5 - <b>15</b> - 20	0.03 - <b>0.05</b> - 0.07	0.03 - <b>0.05</b> - 0.07
VM,VC	70,60,50	83 to 87	G7,G6	<b>NPD10</b>	5 - <b>20</b> - 30	0.03 - <b>0.10</b> - 0.20	0.03 - <b>0.10</b> - 0.20
VM,VC	-	83 or more	G7,G6,G5,D2	<b>DA90</b>	5 - <b>20</b> - 30	0.03 - <b>0.10</b> - 0.20	0.03 - <b>0.20</b> - 0.50

Min. - **Optimum** - Max. Coolant : Dry(NPD10)/ Wet(DA90)

## Application Range for NPD10 and DA90



\* A cemented carbide shank toolholder is recommended for internal diameter machining.



- Very hot or lengthy chips may be discharged while the machine is in operation. Therefore, machine guards, safety goggles or other protective covers must be used. Fire safety precautions must also be considered.

**< SAFETY NOTES >**

- Please handle with care as this product has sharp edges.
- Improper cutting conditions or mis-handling of the tool may result in breakages or projectiles. Therefore, please use the tool within its recommended conditions.

- When using non-water soluble cutting oil, precautions against fire must be taken and please ensure that a fire extinguisher is placed near the machine.

 **Sumitomo Electric Industries, Ltd.**

**Hardmetal Division**

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<http://www.sumitool.com/global>