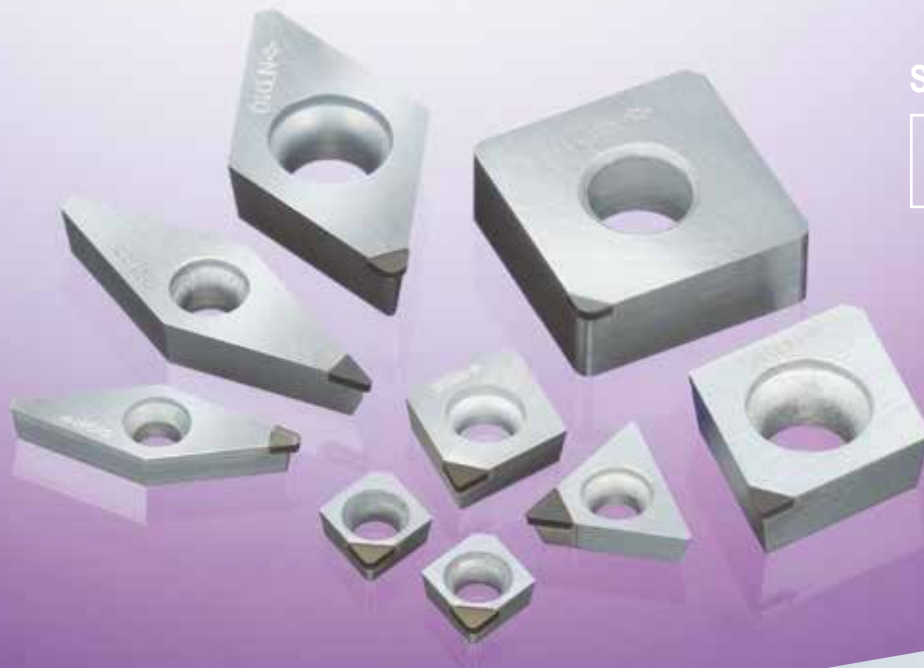


PCD Tools for  
Carbide and Hard Brittle Material Turning

# SUMIDIA Binderless **NPD10**/SUMIDIA **DA90**

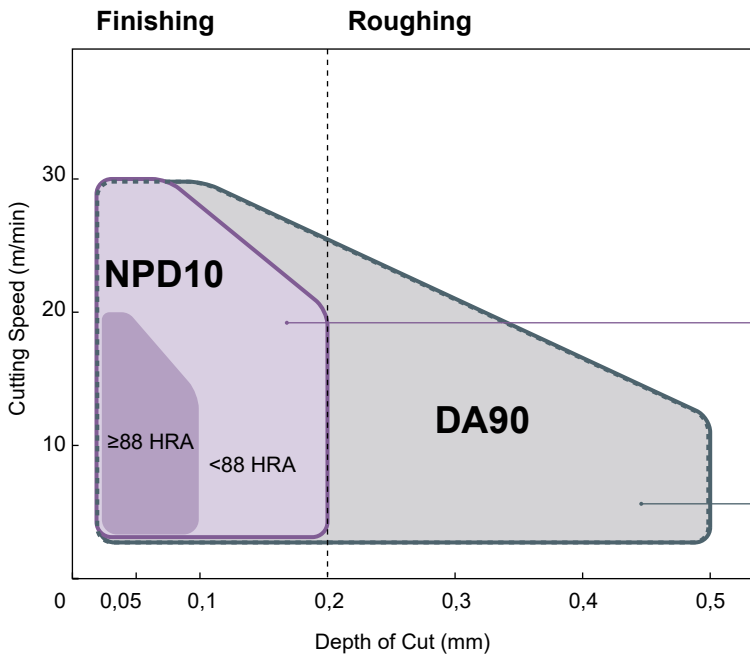


SUMIDIA Binderless  
**NPD10**



SUMIDIA  
**DA90**

■ Application Range (Carbide Machining)



● **NPD10**  
 Shows excellent wear resistance and prevents dimensional changes under finishing conditions of the carbide machining.

● **DA90**  
 Achieves stable tool life for rough machining of carbide.

SUMIDIA Binderless

**NPD10**



**NPD10 – Revolutionary Solution**

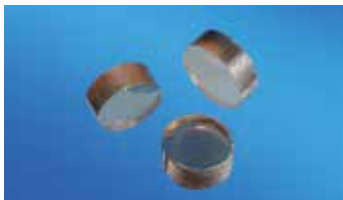
Best suited for high precision machining of carbide, hard brittle material and shows excellent results in ceramic machining with nano-polycrystalline diamond, which is binderless, isotropic and harder than single-crystal diamond.

Maintains excellent dimensional accuracy over long time periods and reduces tool replacing (tool set up) time compared to conventional tools.

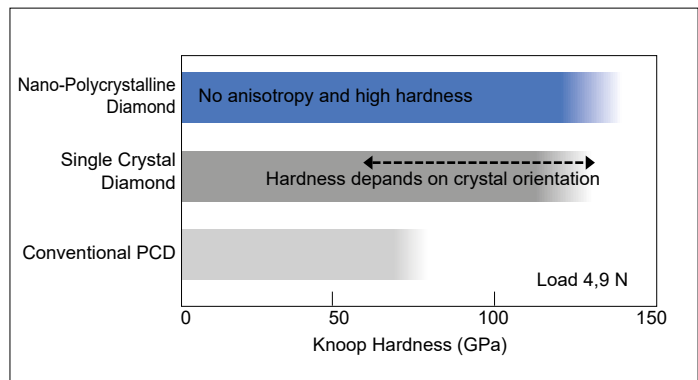
Great advantages in improving work quality and achieving total cost savings by higher productivity.

■ Nano-polycrystalline Diamond

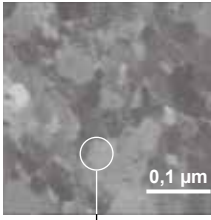
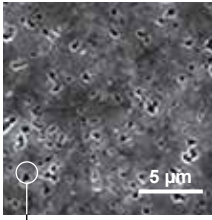
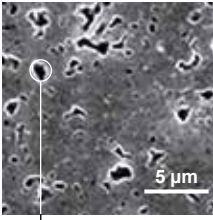
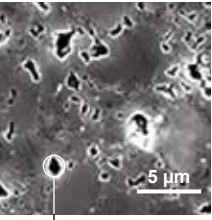
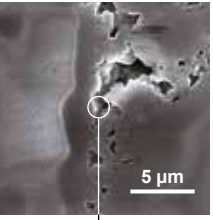
Nano-polycrystalline diamond is a polycrystalline diamond that directly binds nanometer-level diamond particles with high strength without using binders. It is harder than single-crystal diamond and has no cleavability. Therefore, it enables machining of hard brittle materials such as carbides and offers new machining methods.



■ Hardness



■ SUMIDIA Mirco-Structure Comparison

Grade	SUMIDIA Binderless NPD10	SUMIDIA DA1000	SUMIDIA DA2200	SUMIDIA DA150	SUMIDIA DA90
Microstructure	 Diamond Grain				
		Cavity which was made by some melted combination materials with acid treatment.			
Bonding Material	–	Co	Co	Co	Co
Grain Size (µm)	<0,05	<0,5	0,5	5	50
Diamond Content (%)	100	90–95	85–90	85–90	90–95
Work Material	cemented carbides and cermets, hard, brittle materials, ceramics, high strength Al-Si alloy	Al alloys, non-ferrous alloys	Al alloys, non-ferrous alloys	Al alloys, non-ferrous alloys, hard rubber, FRP	roughing cemented carbides, ceramics, high Si- Al alloys

SUMIDIA  
**DA90**



**DA90**

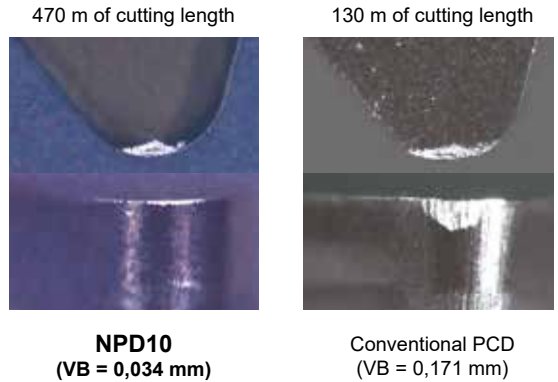
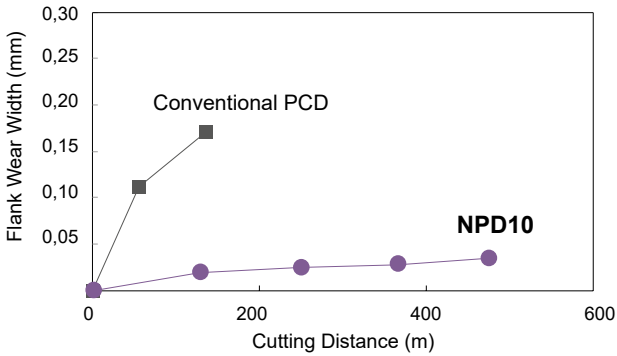
A grade made by sintering rough-grained polycrystalline diamond which contains the highest amount of diamond.

Best suited for rough machining of carbide and hard brittle material achieves stable tool life by excellent wear resistance.

Cost performance achieved by optimal design and development of mass production technology, utilizing the SUMIDIA NF.

■ **Wear Resistance of NPD10**

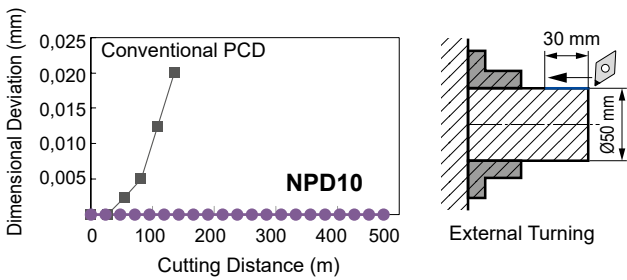
NPD10 shows excellent wear resistance.



Work Material: Carbide (87 HRA), ~3 μm grain size, 15%Co  
 Insert: DCMW 11T304 RH  
 Cutting Conditions:  $v_c = 20$  m/min,  $f = 0,1$  mm/rev,  $a_p = 0,1$  mm, dry

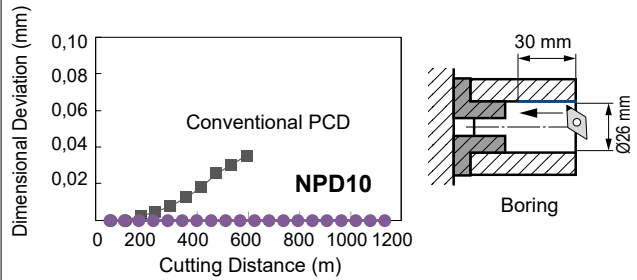
■ **Machining Accuracy of NPD10**

NPD10 has no dimension variation even with cutting distance of 450 m.



Work Material: Carbide VC50 (87 HRA), 15% Co  
 Insert: DCMW 11T304 RH  
 Cutting Conditions:  $v_c = 20$  m/min,  $f = 0,1$  mm/rev,  $a_p = 0,1$  mm, dry

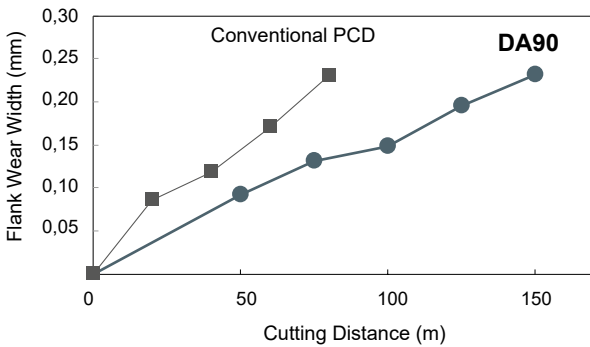
NPD10 has no dimension variation even with cutting distance of 1100 m.



Work Material: Carbide VM30 (91 HRA), 9% Co  
 Insert: DCMW 11T304 RH  
 Cutting Conditions:  $v_c = 20$  m/min,  $f = 0,05$  mm/rev,  $a_p = 0,05$  mm, dry

■ **Wear Resistance of DA90**

DA90 shows excellent wear resistance under rough machining conditions.



Work Material: Carbide (87 HRA)  
 Insert: DCMW 70204 NF  
 Cutting Conditions:  $v_c = 20$  m/min,  $f = 0,1$  mm/rev,  $a_p = 0,2$  mm, wet

■ Application Examples

**Carbide Machining VC40 (89 HRA), Die Metal Mold**

NPD10 achieves more than 5 times longer tool life than conventional PCD.

Work Material: Carbide VC40 (89 HRA), 9% Co  
 Insert: CCMW 04X104 RH (NPD10)  
 Cutting Conditions:  $v_c = 15$  m/min,  $f = 0,015$  mm/rev,  $a_p = 0,07$  mm, dry

**Carbide Machining VM70 (84 HRA), Die Metal Mold**

NPD10 achieves 4 times higher efficiency and stable processing accuracy.

Work Material: Carbide VM70 (84 HRA)  
 Insert: CCMW 03X102 RH (NPD10)  
 Cutting Conditions: NPD10:  $v_c = 25$  m/min,  $f = 0,05$  mm/rev,  $a_p = 0,05$  mm, dry  
 Comp. PCD:  $v_c = 5$  m/min,  $f = 0,03$  mm/rev,  $a_p = 0,10$  mm, dry

**Carbide Machining VM30 (91 HRA), Die Metal Mold**

Reduced processing costs 33% by applying DA90 for roughing and NPD10 for finishing.

Work Material: Carbide VM30 (91 HRA), 9% Co  
 Inserts: Roughing: CCMW 60202 (DA90)  
 Finishing: CCMW 060202 RH (NPD10)  
 Cutting Cond.: Roughing:  $v_c = 20$  m/min,  $f = 0,10$  mm/rev,  $a_p = 0,10$  mm, dry  
 Finishing:  $v_c = 20$  m/min,  $f = 0,02$  mm/rev,  $a_p = 0,02$  mm, dry

**Carbide Machining VC70 (85 HRA), Die Metal Mold**

DA90 achieves more than 2 times longer tool life than conventional PCD.

Work Material: Carbide VC70 (85 HRA), 25% Co  
 Insert: CCMW 04X102 NF (DA90)  
 Cutting Conditions:  $v_c = 20$  m/min,  $f = 0,075$  mm/rev,  $a_p = 0,01$  mm, wet

**Al<sub>2</sub>O<sub>3</sub>-Ceramic Machining**

NPD10 achieves more than 10 times higher wear resistance than conventional PCD.

Work Material: Al<sub>2</sub>O<sub>3</sub> Ceramic  
 Insert: DNMA 150404 RH (NPD10)  
 Cutting Conditions:  $v_c = 300$  m/min,  $f = 0,03$  mm/rev,  $a_p = 0,01$  mm, wet

**Carbide Machining VC70 (85 HRA), Die Metal Mold**

Dimensional Deviations (mm):




Diameter	Front	Exit
Ø 9,3	9,302	9,302
Ø 9,7	9,693	9,693
Ø 9,8	9,791	9,791
Ø 9,9	9,894	9,894
Ø 10,2	10,189	10,189
Ø 10,6	10,592	10,592
Ø 10,7	10,688	10,688

Work Material: Carbide (85 HRA)  
 Insert: CCEW03X104 RH (NPD10)  
 Cutting Conditions:  $v_c = 20$  m/min,  $f = 0,05$  mm/rev,  $a_p = 0,05$  mm, dry, overhang 25 mm

# NPD10 / DA90

## ■ Stock Items of NPD10

### Negative Type Inserts

Shape	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
		NPD10		Inscribed Circle	Thick- ness	Screw Hole Ø	Nose Radius
	DNMA 150408 RH	○	1,8	12,7	4,76	5,16	0,8
	150412 RH	○	1,8				1,2
	SNMA 120408 RH	○	1,7	12,7	4,76	5,16	0,8
	120412 RH	○	1,7				1,2
	VNMA 160408 RH	○	1,8	9,525	4,76	3,81	0,8
	160412 RH	○	1,5				1,2




### Positive Type Inserts

Shape	Relief Angle	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
			NPD10		Inscribed Circle	Thick- ness	Screw Hole Ø	Nose Radius
		CCMW03X102 RH	○	1,3	3,5	1,4	1,9	0,2
		03X104 RH	○	1,3				0,4
		CCMW04X102 RH	○	1,7	4,3	1,8	2,3	0,2
		04X104 RH	○	1,7				0,4
	7°	CCMW060202 RH	○	1,7	6,35	2,38	2,8	0,2
		060204 RH	○	1,7				0,4
	7°	CCMW09T302 RH	○	1,7				0,2
		09T304 RH	○	1,7	9,525	3,97	4,4	0,4
		09T308 RH	○	1,6				0,8
	7°	DCMW070202 RH	○	2,1	6,35	2,38	2,8	0,2
		070204 RH	○	2,0				0,4
		DCMW11T302 RH	○	2,1				0,2
		11T304 RH	○	1,9	9,525	3,97	4,4	0,4
		11T308 RH	○	1,6				0,8
		TPMW080202 RH	○	1,2	4,76	2,38	2,3	0,2
	11°	080204 RH	○	1,0				0,4
		TPMW110302 RH	○	1,5				0,2
		110304 RH	○	1,3	6,35	3,18	3,4	0,4
		110308 RH	○	1,0				0,8
		TPMW160402 RH	○	2,2				0,2
		160404 RH	○	2,0	9,525	4,76	4,4	0,4
160408 RH	○	1,6				0,8		
	7°	VCMW080201 RH	○	2,2				0,1
		080202 RH	○	1,9	4,76	2,38	2,3	0,2
		080204 RH	○	1,5				0,4
		VCMW110302 RH	○	2,1				0,2
		110304 RH	○	1,7	6,35	3,18	2,8	0,4
		VCMW160402 RH	○	2,1				0,2
160404 RH	○	1,7	9,525	4,76	4,4	0,4		
160408 RH	○	1,8				0,8		
160412 RH	○	1,5				1,2		




○ Japan stock

■ Stock Items of DA90

Negative Type Inserts

Shape	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
		DA90		Inscribed Circle	Thick- ness	Screw Hole Ø	Nose Radius
	DNMA 150408 NF	○	2,0	12,7	4,76	5,16	0,8
	150412 NF	○	2,0				1,2
	SNMA 120408 NF	○	2,4	12,7	4,76	5,16	0,8
	120412 NF	○	2,4				1,2
	VNMA 160408 NF	○	1,9	9,525	4,76	3,81	0,8
	160412 NF	○	1,7				1,2

Positive Type Inserts

Shape	Relief Angle	Cat. No.	Stock	Cutting Edge Length	Dimensions (mm)			
			DA90		Inscribed Circle	Thick- ness	Screw Hole Ø	Nose Radius
	7°	CCMW 03X102 NF	○	1,1	3,5	1,4	1,9	0,2
		03X104 NF	○	1,1				0,4
		CCMW 04X102 NF	○	1,5	4,3	1,8	2,3	0,2
		04X104 NF	○	1,5				0,4
		CCMW 060202 NF	○	2,4	6,35	2,38	2,8	0,2
		060204 NF	○	2,4				0,4
	7°	CCMW 09T302 NF	○	2,4	9,525	3,97	4,4	0,2
		09T304 NF	○	2,4				0,4
		09T308 NF	○	2,3				0,8
		DCMW 070202 NF	○	2,6	6,35	2,38	2,8	0,2
		070204 NF	○	2,4				0,4
		DCMW 11T302 NF	○	2,6	9,525	3,97	4,4	0,2
	11°	11T304 NF	○	2,4				0,4
		11T308 NF	○	2,0				0,8
		TPMW 080202 NF	○	2,5	4,76	2,38	2,3	0,2
		080204 NF	○	2,4				0,4
		TPMW 110302 NF	○	2,5	6,35	3,18	3,4	0,2
		110304 NF	○	2,4				0,4
	7°	110308 NF	○	2,1				0,8
		TPMW 160402 NF	○	2,5	9,525	4,76	4,4	0,2
		160404 NF	○	2,4				0,4
		160408 NF	○	2,1				0,8
		VCMW 080202 NF	○	3,2	4,76	2,38	2,3	0,2
		080204 NF	○	2,8				0,4
	7°	VCMW 110302 NF	○	3,2	6,35	3,18	2,8	0,2
		110304 NF	○	2,8				0,4
		VCMW 160402 NF	○	3,7	9,525	4,76	4,4	0,2
		160404 NF	○	3,3				0,4
		160408 NF	○	2,4				0,8
		160412 NF	○	2,1				1,2

○ Japan stock

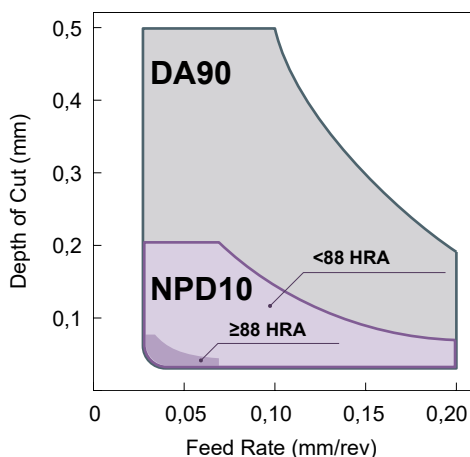
■ Recommended Cutting Conditions

Min.–Optimum–Max.

Work Material			Grade	Cutting Conditions			
Carbide Classification	Hardness (HRA)	SEI Grades		Cutting Speed (m/min)	Feed Rate (mm/rev)	Depth of Cut (mm)	
VM, VC	40	≥88	G5, D2	<b>NPD10</b>	5–15–20	0,03– <b>0,05</b> –0,07	0,03– <b>0,05</b> –0,07
VM, VC	70, 60, 50	≥83 – <88	G7, G6	<b>NPD10</b>	5–20–30	0,03– <b>0,10</b> –0,20	0,03– <b>0,10</b> –0,20
VM, VC	–	≥83	G7, G6, G5, D2	<b>DA90</b>	5–20–30	0,03– <b>0,10</b> –0,20	0,03– <b>0,20</b> –0,50

Coolant: Dry (NPD10) / Wet (DA90)

■ Application Range NPD10 / DA90



Carbide holder is recommended for inner diameter.



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