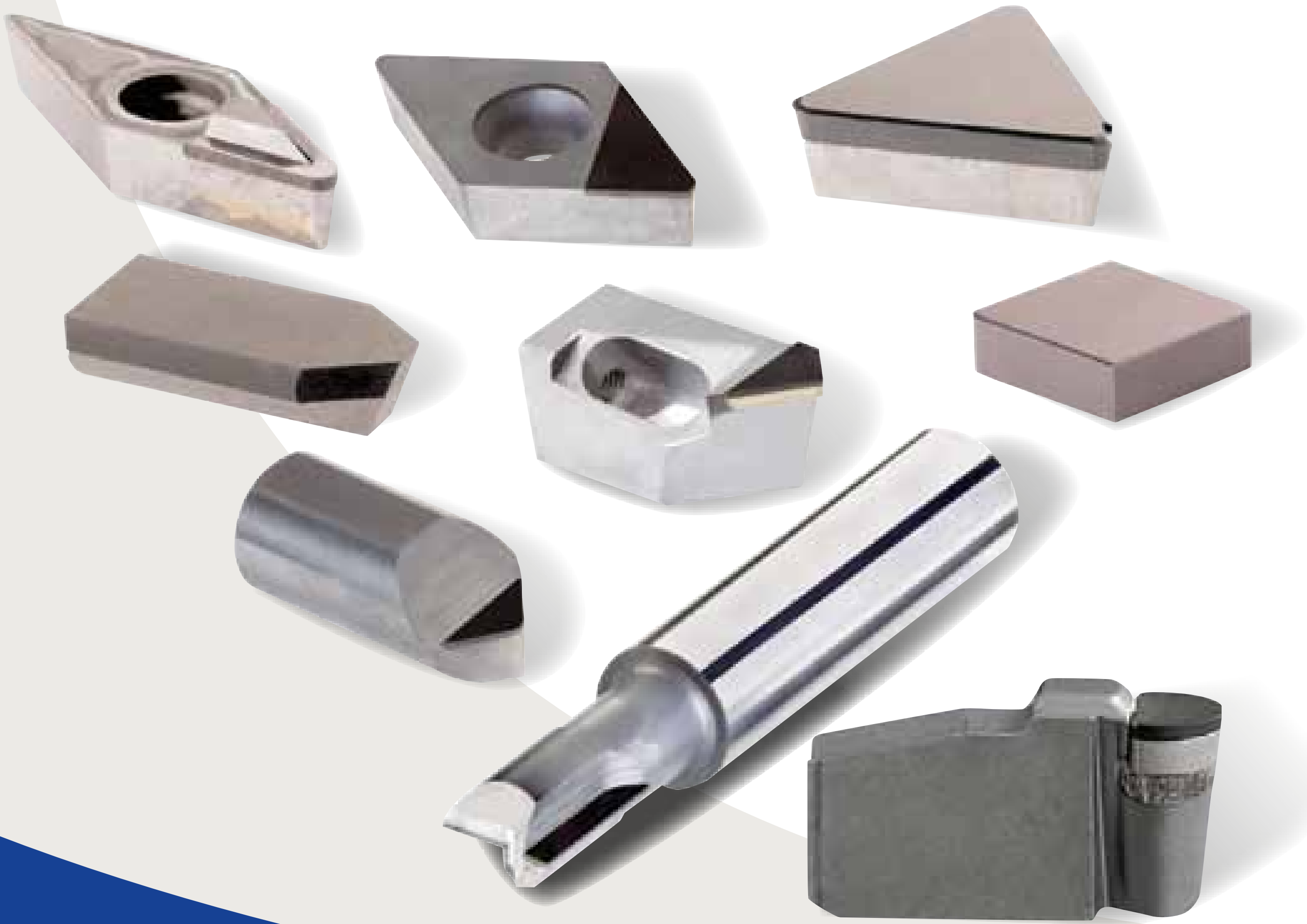
Catalogue

evatec tools®

Solutions sur mesure pour votre usinage

Machining solutions especially for you

PCBN / PCD



afaq ISO 9001 Qualité AFNOR CERTIFICATION

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Summary

■ PCD / PCDN

■ PCD

PCD

POLYCRYSTALLINE DIAMOND (PCD)

WHAT IS PCD ?

PCD Consist of a layer of polycrystalline diamond on cemented tungsten carbide substrate, formed into a integral blank, by high-pressure, and high-temperature process.

The Blanks thus combine the hardness and abrasion resistance of diamond with the toughness of cemented tungsten carbide.

Cutting tools made with PCD are designed to machine abrasives nonmetallics materials and nonferrous materials, faster and at alower cost than cemented tungsten carbide or single-crystal mined diamond tools.

DIAMANTE POLICRISTALINO (PCD)

QUE ES EL PCD ?

El PCD consiste en una capa de diamante policristalino sobre una base de carburo de tungsteno, que forma en si un conjunto integral conseguido por altas presiones e importantes temperaturas.

Las placas combinan la dureza y la resistencia a la abrasion de los elementos que las componen : el diamante y el carburo de tungsteno.

Las herramientas de corte de PCD estan diseñadas para el mecanizado de productos no metalicos pero muy abrasivos o de metales no ferrosos.

COMPARATIVE PROPERTIES / PROPIEDADES COMPARATIVAS

	NATURAL DIAMOND DIAMANTE NATURAL	POLYCRYSTALLINE DIAMOND DIAMANTE POLICRISTALINO	TUNGSTEN CARBIDE CARBURO DE TUNGSTENO
Structure Estructura	Single Crystal Monocristal	Polycrystalline Diamante Policristalino	Sintered Powdered Metal Sinterizado Metálico
Directional Grain	Layered Planes	Non-Directional	Non-Directional
Uniformity Uniformidad	Variable Variable	Consistent Constante	Consistent Constante
Wear Resistance Resistencia al Desgaste	Excellent Excelente	Excellent Excelente	Good Buena
Finish Acabado	2+rms 2+rms	10+rms 10+rms	10+rms 10+rms
Edge Sharpness Filo Corte	Keenest avallable El Mejor	Very sharp Muy Afilado	Sharp Afilado
Impact Resistance Resistencia al Impacto	Fair Fragil	Good Bueno	Excellent Excelente
Hardness (Knoop) Dureza (Knoop)	8.000 - 12.000 8.000 - 12.000	6.500 - 8.000 6.500 - 8.000	1.800 - 2.200 1.800 - 2.200

PCD Polycrystalline Diamond - Diamante Policristalino

RECOMMENDED MATERIALS	Recommended machining data / Par ámetros de mecanizado			MATERIALES RECOMENDADOS
	Speed / Velocidad m/min.	Feet / *Avance* mm/rev.	Depth of cut / Profundidad mm.	
Aluminium	200 - 2800	0,102	0,10 - 0,5	*Aluminio*
Aluminium alloys	400 - 2000	0,125	0,05 - 0,5	*Aleaciones de aluminio*
Brass alloys	200 - 1000	0,05 / 0,4	0,05 - 0,3	*Aleaciones de laton*
Bronze alloys	200 - 1000	0,07 / 0,15	0,05 - 0,3	*Aleaciones de bronce*
Copper	200 - 500	0,05 / 0,15	0,10 - 0,25	*Cobre*
Copper alloys	200 - 1000	0,06 - 0,15	0,05 - 0,10	*Cobre aleado*
Lead alloys	200 - 1000	0,06 - 0,08	0,05 - 3	*Aleaciones de plomo*
Manganesium alloys	20 - 800	0,05 - 0,4		*Aleaciones de manganeso*
Presintered tungsten carbide	100 - 500	0,05 - 0,2	0,2 - 0,05	*Carburo de tungsteno Presinterizado*
Cemented tungsten Carbide 13% Co	30 - 60	0,25 - 0,50	0,05 - 0,2	*Carburo de tungsteno Cementado 13% Co*
Graphite	250	0,02	0,2	*Grafito*
Fibers Glass	120	0,035	0,15	*Fibras de vidrio*
Alumina ceramic	100 - 600	0,125	0,25	*Alumina cerámica*
Composite resins	100 - 500	0,5	1 - 3	*Resinas*

RECOMMENDED

On most applications PCD tools can effectively work at 50% higher cutting speeds than carbide, provided that the machine will operate without vibration.

Start at the same speed as required for carbide cutting and raise the speed until you obtain the best mechanization.

RECOMANDACIONES

Ante la duda en la elección de parámetros, mantener los mismos que se usaban para mecanizar con herramientas de carburo de tungsteno y aumentar gradualmente las condiciones de trabajo hasta conseguir unos óptimos resultados.

Se considera correcto el incremento de hasta un 50% en los parámetros de mecanizado con diamante.

PCBN Polycrystalline Cubic Boron Nitride - Policristalino de Nutiro Boro Cúbico

RECOMMENDED MATERIALS	Recommended machining data Par ámetros de mecanizado			MATERIALES RECOMENDADOS
	Speed Velocidad m/min.	Feet *Avance* mm/rev.	Depth of cut Profundidad mm.	
Gray cast iron	600 - 1200	0,15 - 0,6	0,0 - 2,5	*Fundición gris perlitica*
Hard gray cast	75 - 150	0,15 - 0,6	0,1 - 2,5	*Fundición dura (>45 - HRC)*
Hard steel	75 - 150	0,1 - 0,3	0,1 - 2,5	*Aceros endurecidos*
Sintered metal power	75 - 150	0,1 - 0,3	0,1 - 2,5	*Metales en polvo sinterizados*
High temperature alloys	150 - 250	0,1 - 0,3	0,1 - 2,5	*Aleaciones de alta temperatura*
White cast irons (High Cr, Nihard,…)	50 - 60	0,3 - 0,4	2 - 4	*Bianca fundicion (Altor Cr, Nihard, …)*

GENERAL APPLICATION GUIDELINES

1. Use PCBN for machining ferrous materials with 55 Rockwell C. or more.

2. Select a rigid machine with sufficient horse-power to fully utilize the potential production's.

3. PCBN tools can be used with or without coolant (use coolant fluid on operations for long machining time).

4. Use negative-rake tools whenever possible.

NORMAS DE APLICACIÓN GENERAL

1. Use PCBN para el mecanizado de metales con más de 55 Rockwel C.

2. Seleccione una máquina rigida i robusta con suficiente fuerza para tener el máximo poder de producción.

3. Los útiles de PCBN pueden ser usados con o sin refrigerante (es aconsejable para los mecanizados de larga duración).

4. Usense ángulos de corte negativos siempre que sea posible.

Serie PCD/PCBN Standard Inserts - Placas de Fijación Mecánica

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
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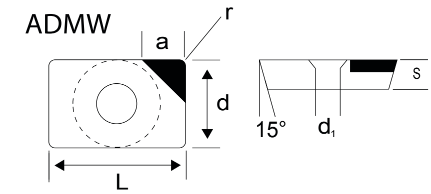
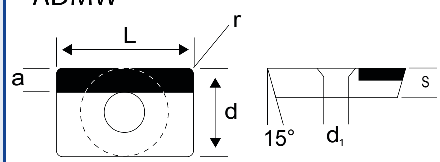
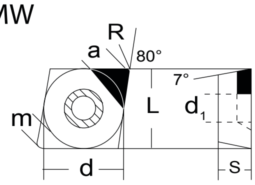
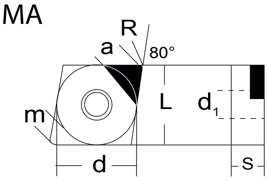
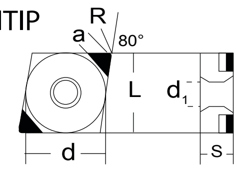
ADMW 15 03 08	9,520		3,20	15		0,8	4,5	■		ADMW 
ADMW 15 03 08 R/L	9,520		3,20	15		0,8	2,5	■		ADMW 
CCMW 06 02 02 06 02 04	6,350	2,8	2,38	6,4	1,651 1,544	0,2 0,4	3	■ ■	■ ■	CCMW 
08 03 04 08 03 08	7,937	3,4	3,18	8,1	1,986 1,765	0,4 0,8	4	■ ■	■ ■	
09 03 04 09 03 08	9,525	4,4	3,18	9,7	2,426 2,205	0,4 0,8	4	■ ■	■ ■	
09 T3 04 09 T3 08	9,525	4,4	3,97	9,7	2,426 2,205	0,4 0,8	4	■ ■	■ ■	
12 04 04 12 04 08	12,7	5,5	4,76	12,9	3,308 3,088	0,4 0,8	4/6	■ ■	■ ■	
CNMA 09 03 04 09 03 08	9,525	3,18	3,18	9,7	2,426	0,4	4		■ ■	CNMA 
12 04 04 12 04 08 12 04 12	12,7	5,13	4,76	12,9	3,308 3,088 2,868	0,4 0,8 1,2	4/6		■ ■ ■	
CNMA Multitip 12 04 04 /2 12 04 08 /2 12 04 12 /2	12,70	5,13	4,76	12,9		0,4 0,8 0,8	2	■ ■ ■	■ ■ ■	CNMA MULTITIP 

Serie PCD/PCBN Standard Inserts - Placas de Fijación Mecánica

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
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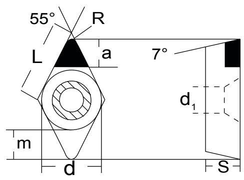
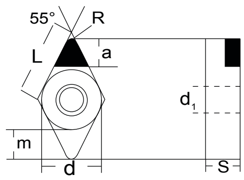
DCMW 07 02 02 07 02 04 07 02 08	6,350	2,8	2,38	7,75	3,464 3,238 2,786	0,2 0,4 0,8	4	■ ■ ■	■ ■ ■	DCMW
09 02 02 09 02 04 09 02 08	7,937	3,4	2,38	9,7	4,395 4,164 3,701	0,2 0,4 0,8	4	■ ■ ■	■ ■ ■	
11 03 02 11 03 04 11 03 08	9,525	4,4	3,18	11,6	5,320 5,089 4,626	0,2 0,4 0,8	4/6	■ ■ ■	■ ■ ■	
11 T3 02 11 T3 04 11 T3 08	9,525	4,4	3,97	11,6	5,320 5,089 4,626	0,2 0,4 0,8	4/6	■ ■ ■	■ ■ ■	
15 04 04 15 04 08	12,7	5,5	4,76	15,5	6,939 6,476	0,4 0,8	4/6	■ ■	■ ■	
DNMA 09 03 04 09 03 08	7,937	3,23	3,18	9,7	4,164 3,701	0,4 0,8	4		■ ■	DNMA
15 04 04 15 04 08	12,7	5,13	4,76	15,5	6,939 6,476	0,4 0,8	4/6		■ ■	
15 06 04 15 06 08 15 06 12	12,7	5,13	6,35	15,5	6,939 6,476 6,013	0,4 0,8 1,2	4/6		■ ■ ■	

DCMW

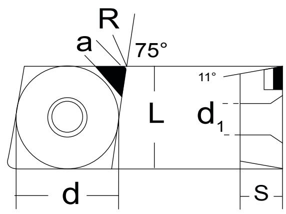


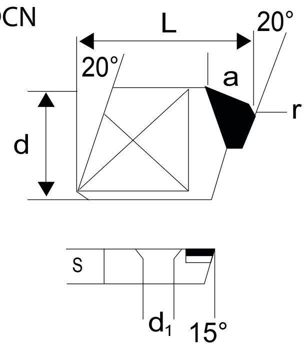
DNMA

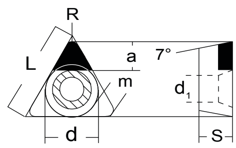


Serie PCD/PCBN Standard Inserts - Placas de Fijación Mecánica

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES d	d1	S	L	m	R	a	PRODUCT PRODUCTO PCD	PCBN	TYPE TIPO
EPMW 04 02 02	4,76	2,15	2,38	4,80		0,2	2,5	■		EPMW
04 02 04						0,4		■		
04 02 08						0,8		■		
05 02 02	5,56	2,4	2,38	5,7		0,2	2,5	■		
05 02 04						0,4		■		
06 02 02	6,35	2,8	3,38	6,5		0,2	3,0	■		
06 02 04						0,4		■		
06 02 08						0,8		■		
08 03 04	7,94	3,4	3,18	8,3		0,4	3,5	■		
08 03 08						0,8		■		
GDCN 2004PDR	12,7		4,76	20		1,2	6	■		GDCN
TCMW 08 02 02	4,760	2,2	2,38	8,5	6,945	0,2	2	■	■	TCMW
08 02 04					6,747	0,4		■	■	
08 02 08					6,350	0,8		■	■	
09 02 02	5,566	2,5	2,38	9,6	8,132	0,2	4	■	■	
09 02 04					7,938	0,4		■	■	
09 02 08					7,541	0,8		■	■	
11 02 02	6,350	2,8	2,38	11	9,326	0,2	4/6	■	■	
11 02 04					9,128	0,4		■	■	
11 02 08					8,731	0,8		■	■	
13 03 04	7,937	3,4	3,18	13,7	11,509	0,4	4/6	■	■	
13 03 08					11,113	0,8		■	■	
16 T3 04	9,525	4,4	3,97	16,5	13,891	0,4	4/6	■	■	
16 T3 08					13,494	0,8		■	■	







Serie PCD/PCBN Standard Inserts - Placas de Fijación Mecánica

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
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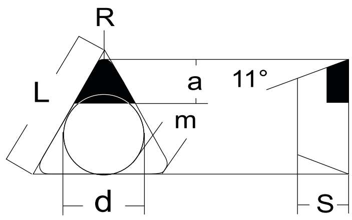
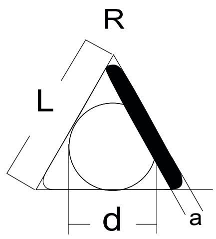
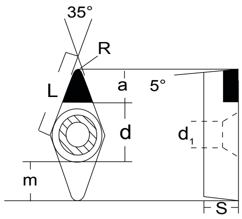
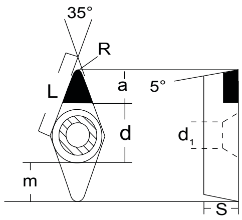
TPUN 09 02 02	5,556		2,38	9,6	8,136	0,2	4	■	■	TPUN 
09 02 04					7,938	0,4		■	■	
09 02 08					7,541	0,8		■	■	
11 02 02	6,350		2,38	11	9,326	0,2	4/6	■	■	
11 02 04					9,128	0,4		■	■	
11 02 08					8,731	0,8		■	■	
11 03 02	6,350		3,18	11	9,326	0,2	4/6	■	■	
11 03 04					9,128	0,4		■	■	
11 03 08					8,731	0,8		■	■	
13 03 04	7,937		3,18	13,7	11,509	0,4	4/6	■	■	
13 03 08					11,113	0,8		■	■	
16 03 04	9,525		3,18	16,5	13,891	0,4	4/6	■	■	
16 03 08					13,494	0,8		■	■	
TPUN 11 03 04	6,35		3,18	11		0,4	2,5	■		TPUN Full length 
16 03 04	9,52		3,18	16,5		0,4	3	■		
16 03 08						0,8		■		
22 04 08						0,8	4,76	■		

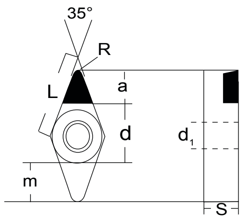
Serie PCD/PCBN

Standard Inserts - Placas de Fijación Mecánica

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
	d	d_1	S	L	m	R	a	PCD	PCBN	
VBMW 16 04 04	9,525	4,4	4,76	16,6	10,152	0,4	4/6	■	■	VBMW
16 04 08					9,229	0,8		■	■	
16 04 12					8,308	1,2		■	■	
VCMW 11 03 02	6,35	2,9	3,18	11,1	6,918	0,2	4/6	■	■	VCMW
11 03 04					6,453	0,4		■	■	
11 03 08					5,523	0,8		■	■	
11 03 02	7,937	3,4	3,18	13,6	8,746	0,2	4/6	■	■	
11 03 04					8,285	0,4		■	■	
11 03 08					7,362	0,8		■	■	
16 04 02	9,525	4,4	4,76	16,6	10,614	0,2	4/6	■	■	
16 04 04					10,152	0,4		■	■	
16 04 08					9,229	0,8		■	■	
16 04 12					8,308	1,2		■	■	
VNMA 16 04 04	9,525	3,81	4,76	16,6	10,152	0,4	4/6		■	VNMA
16 04 08					9,229	0,8			■	
16 04 12					8,308	1,2			■	

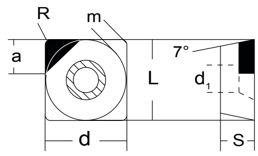




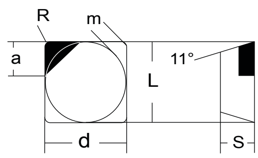


Serie PCD/PCBN Standard Inserts - Placas de Fijación Mecánica

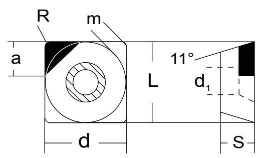
ISO CODE / CÓDIGO ISO	d	d_1	S	L	m	R	a	PCD	PCBN	TYPE / TIPO
SCMW 09 03 02	9,525	4,4	3,18	9,525	1,890	0,2	4	■	■	SCMW
09 03 04					1,808	0,4		■	■	
09 03 08					1,644	0,8		■	■	
09 T3 02	9,525	4,4	3,97	9,525	1,890	0,2	4	■	■	
09 T3 04					1,808	0,4		■	■	
09 T3 08					1,644	0,8		■	■	
12 04 04	12,7	5,5	4,76	12,7	2,466	0,4	4/6	■	■	
12 04 08					2,301	0,8		■	■	



ISO CODE / CÓDIGO ISO	d	d_1	S	L	m	R	a	PCD	PCBN	TYPE / TIPO
SPGN 09 03 02	9,525		3,18	9,525	1,890	0,2	4	■	■	SPGN
09 03 04					1,808	0,4		■	■	
09 03 08					1,644	0,8		■	■	
12 03 04	12,7		3,18	12,7	2,466	0,4	4/6	■	■	
12 03 08					2,301	0,8		■	■	
12 04 04	12,7		4,76	12,7	2,466	0,4	4/6	■	■	
12 04 08					2,301	0,8		■	■	

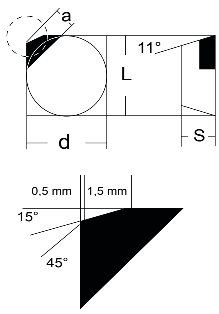
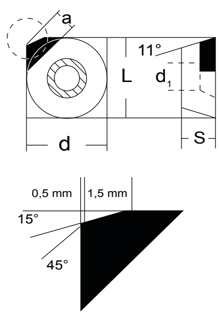
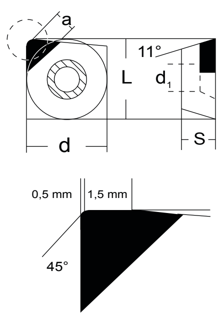


ISO CODE / CÓDIGO ISO	d	d_1	S	L	m	R	a	PCD	PCBN	TYPE / TIPO
SPMW 09 03 02	9,525	4,4	3,18	9,525	1,890	0,2	4	■	■	SPMW
09 03 04					1,808	0,4		■	■	
09 03 08					1,644	0,8		■	■	
09 T3 02	9,525	4,4	3,97	9,525	1,890	0,2	4	■	■	
09 T3 04					1,808	0,4		■	■	
09 T3 08					1,644	0,8		■	■	
12 04 04	12,7	5,5	4,76	12,7	2,466	0,4	4/6	■	■	
12 04 08					2,30	0,8		■	■	



Serie PCD/PCBN

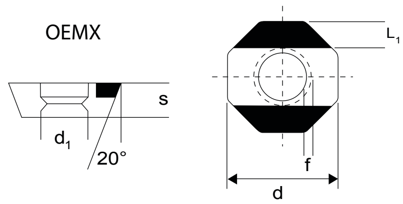
Standard Milling Inserts
Placas de Fijación Mecánica para Fresados

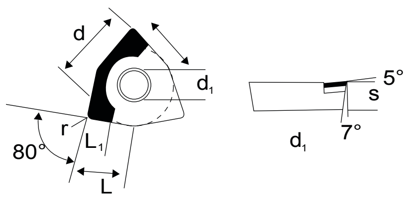
ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
	d	d_1	S	L	m	R	a	PCD	PCBN	
SFKN EDR/L 12 03	12,7		3,18	12,7			4/6	■	■	SFKN EDR/L 
12 04	12,7		4,76	12,7			4/6	■	■	
SPMW EDR/L 12 03	12,7	5,5	3,18	12,7			4/6	■	■	SPMW EDR/L 
12 04	12,7	5,5	4,76	12,7			4/6	■	■	
SPMW PDR/L 12 04	12,7	5,5	4,76	12,7			4/6	■	■	SPMW PDR/L 

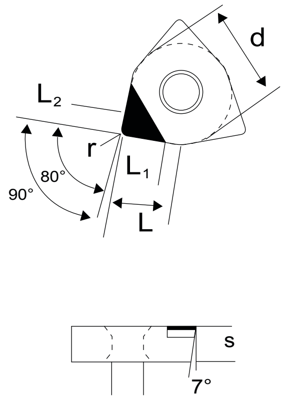
Serie PCD/PCBN

Standard Milling Inserts
Placas de Fijación Mecánica para Fresados

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
	d	d_1	S	L	m	R	L_1	PCD	PCBN	
OEMX 12 T3	12,70	5,5	3,97			1	3	■	■	OEMX
WCMT 03 03 04	5,56		2,38	3,46		0,4				WCMT
03 02 08						0,8				
04 02 08	6,35		2,38	3,99		0,8				
05 03 04	7,94		3,18	5,07		0,4				
05 03 08						0,8				
06 T3 04	9,52	4,4	3,97	6,14		0,4				
06 T3 08						0,8				
08 04 08	12,70	5,5		8,14		0,8				
	d	d_1	S	L	m	L_1	L_2			
WCGX 06 T3 W	9,52		3,97	6,14		4	3	■	■	WCGX

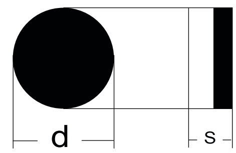
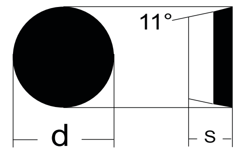
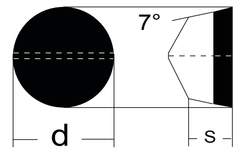
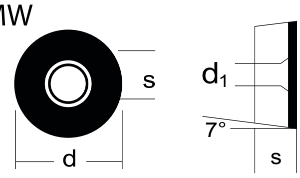
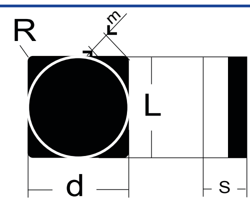
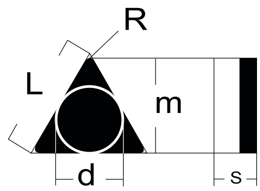
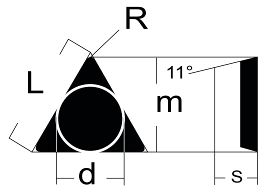






Serie PCD/PCBN

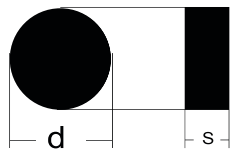
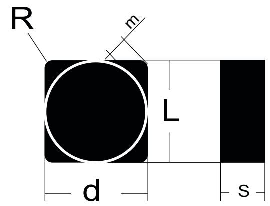
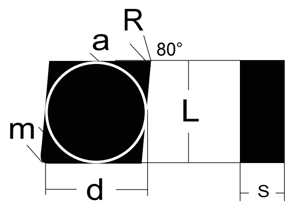
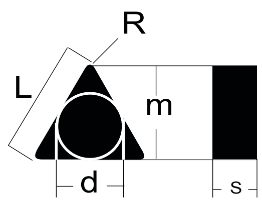
Standard Inserts - **A-FULL TOP**
Placas de Fijación Mecánica - **A-FULL TOP**

ISO CODE / CÓDIGO ISO	DIMENSIONS / DIMENSIONES							PRODUCT / PRODUCTO		TYPE / TIPO
	d	d_1	S	L	m	R	a	PCD	PCBN	
RNGN 09 03 00	9,525		3,18					■	■	RNGN 
12 04 00	12,70		4,76						■	
13 04 00	13,6		4,30					■	■	
15 04 00	15,88		4,76						■	
19 04 00	19,05		4,76						■	
25 04 00	25,4		4,76						■	
RPGN 06 02 00	6,350		2,38					■	■	RPGN 
09 03 00	9,526		3,18					■	■	
12 04 00	12,70		3,18					■	■	
RCGX 09 08 00	9,52									RCGX 
12 08 00	12,70					7,97			■	
RCMW 08 03 M0	8	3,4	3,18					■	■	RCMW 
10 03 M0	10	4,4	3,18					■	■	
12 04 M0	12	4,4	4,76					■	■	
SNGN 12 04 08	12,70		4,76		2,301	0,8			■	SNGN 
12 04 12	12,70		4,76		2,137	1,2			■	
TNGN 11 03 04	6,350		3,18	11	9,128	0,4			■	TNGN 
11 03 08					8,731	0,8			■	
16 04 08	9,526		4,76	16,5	13,494	0,8			■	
TPGN 06 01 02	3,97		1,58	6,5	5,754	0,2		■	■	TPGN 
09 02 04	5,556		2,38	9,6	7,938	0,4		■	■	
11 03 04	6,350		3,18	11	9,128	0,4		■	■	
11 03 08					8,731	0,8		■	■	

Serie PCD/PCBN

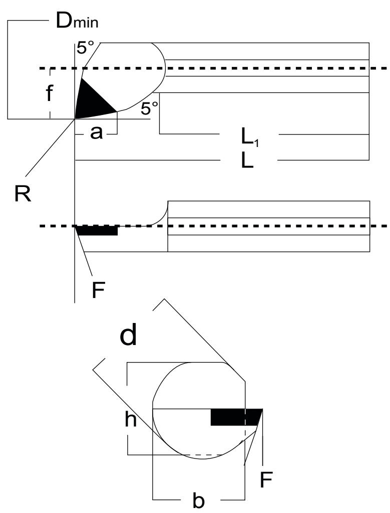
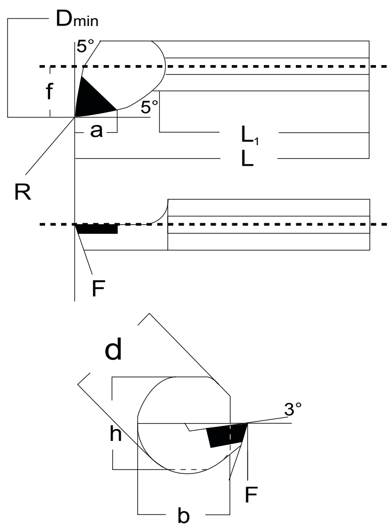
Standard Inserts - **B-MONOBLOC**

Placas de Fijación Mecánica - **B-MONOBLOC**

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
	d	d_1	S	L	m	R	a	PCD	PCBN	
RNMN 09 03 00	9,52		3,18						■	
12 03 00	12,70		3,18						■	
12 04 00	12,70		4,76						■	
15 04 00	15,88		4,76						■	
19 04 00	19,05		4,76						■	
25 04 00	25,40		4,76						■	
25 06 00	25,40		6,35						■	
SNMN 09 03 08	9,52		3,18	9,52	1,644	0,8			■	
09 03 12	9,52		3,18		1,479	1,2			■	
12 03 12	12,70		3,18	12,70	2,137	1,2			■	
12 04 16	12,70		4,76		1,972	1,6			■	
CNMN 09 03 08	9,52		3,18	9,52	2,205	0,8			■	
12 04 08	12,70		4,76	12,70	3,088	0,8			■	
12 04 12	12,70		4,76	12,70	2,888	1,2			■	
12 04 16	12,70		4,76	12,70	2,646	1,6			■	
TNMN 11 03 08	6,35		3,18	11	8,731	0,8			■	

Serie PCD/PCBN

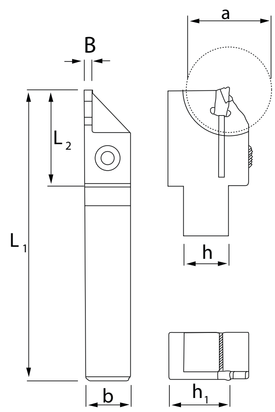
Brazed Tools
Herramientas Soldadas

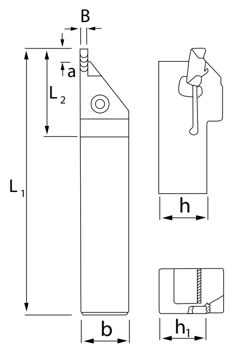
ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES										PRODUCT PRODUCTO		TYPE TIPO
	d	L	L_1	h	b	f	D_{min}	F	R	a	PCD	PCBN	
RBIC 06 R/L	6	80	70	5,0	5,5	5	9	15°	0,4	4		■	
08 R/L	8	100	85	7,0	7,5	6	11	15°	0,4	4		■	
10 R/L	10	100	85	9,0	9,5	7	13	11°	0,4	4		■	
12 R/L	12	125	105	11,0	11,5	9	16	11°	0,8	6		■	
14 R/L	14	125	105	12,6	13,3	10	18	7°	0,8	6		■	
16 R/L	16	150	130	14,6	15,3	11	20	7°	0,8	6		■	
RDIC 06 R/L	6	80	70	5,0	5,5	5	9	15°	0,2	4	■		
08 R/L	8	100	85	7,0	7,5	6	11	15°	0,2	4	■		
10 R/L	10	100	85	9,0	9,5	7	13	11°	0,4	4	■		
12 R/L	12	125	105	11,0	11,5	9	16	11°	0,4	6	■		
14 R/L	14	125	105	12,6	13,3	10	18	7°	0,4	6	■		
16 R/L	16	150	130	14,6	15,3	11	20	7°	0,4	6	■		

Serie PCD/PCBN

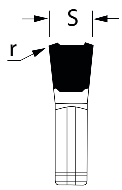
Grooving Tools Inserts
Insertos de Ranurar

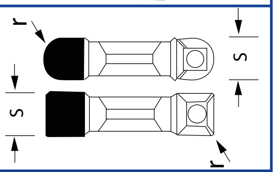
ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
	h	b	L_1	L_2	h_1	B	a	PCD	PCBN	
CZCB R/L 1010 X01	10	10	91	25	21	1,6	22			Toolholders
CZCB R/L 1010 X02	10	10	91	25	21	2,2	22			
CZCB R/L 1212 X01	12	12	91	25	21	1,6	22			
CZCB R/L 1212 X02	12	12	91	25	21	2,2	22			
CZCB R/L 1612 X02	16	12	95	29	21	2,2	32			
CZCB R/L 1612 X03	16	12	95	29	21	3,0	32			
CZCB R/L 2016 M03	20	16	150	35	30	3,0	42			
CZCB R/L 2016 M04	20	16	150	35	30	4,0	42			
CZCB R/L 2016 M05	20	16	150	35	30	5,0	42			
CZCB R/L 2016 M06	20	16	150	35	30	6,0	42			
CZCB R/L 2520 X03	25	20	165	50	30	3,0	80			
CZCB R/L 2520 X04	25	20	165	50	30	4,0	80			
CZCB R/L 2520 X05	25	20	165	50	30	5,0	80			
CZCB R/L 2520 X06	25	20	165	50	30	6,0	80			
CZCF R/L 1616 F34	16	16	80	24		3-4	4,5			Toolholders
CZCF R/L 2020 H34	20	20	100	24		3-4	4,5			
CZCF R/L 2525 H34	25	25	100	24		3-4	4,5			

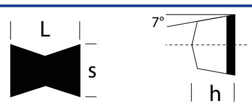




	S	r	L	h	PCD	PCBN	
MRCN 1,6	1,6	0,15			■	■	With Toolholders CZBC
MRCN 2,2	2,2	0,20			■	■	
MRCN 3,0	3,0	0,20			■	■	
MRCN 4,0	4,0	0,20			■	■	
MRCN 5,0	5,0	0,30			■	■	
MRCN 6,0	6,0	0,40			■	■	
MTC 3,0	3,0	0,15			■	■	With Toolholders CZCF
MTC 4,0	4,0	0,20			■	■	
MTR 3,0	3,0	1,50			■	■	
MTR 3,8	3,8	1,90			■	■	
LCGX 1406	6,0		14	8,0		■	
LCGX 1408	8,0		14	8,0		■	



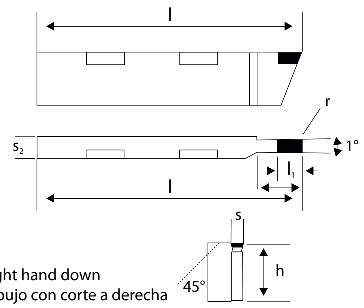
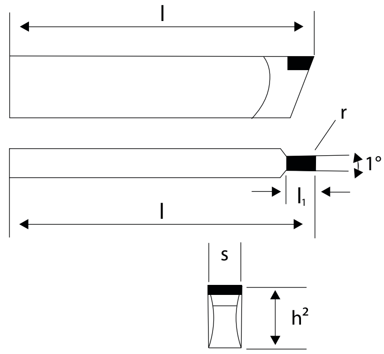




Serie PCD/PCBN

Blade Grooving Tools

Lamas de Ranurar

ISO CODE / CÓDIGO ISO	DIMENSIONS / DIMENSIONES						PRODUCT / PRODUCTO		TYPE / TIPO
	l	l_1	h	r	s	s_2	PCD	PCBN	
RF - 190409 R/L	90	5	19	2,0	0,9	4	■	■	 Right hand down Dibujo con corte a derecha Tolerance S - 0,004 mm. S other sice on request Tolerancia en cota S - 0,004 mm. Cota S no referenciadas bajo demanda
RF - 190410 R/L					1,00		■	■	
RF - 190412 R/L					1,225		■	■	
RF - 190415 R/L					1,50		■	■	
RF - 190420 R/L	90	6	19	0,25	2,00		■	■	
RF - 190425 R/L					2,50		■	■	
RT - 501210	50	6	12,70	2,0	1		■	■	 Tolerance S - 0,01 mm. S other sice on request Tolerancia en cota S - 0,01 mm. Cota S no referenciadas bajo demanda
RT - 501212					1,25		■	■	
RT - 501215					1,50		■	■	
RT - 501220		6	12,70	0,25	2,00		■	■	
RT - 501215					2,50		■	■	
RT - 501230		7	12,70	0,3	3,00		■	■	
RT - 501235					3,50		■	■	

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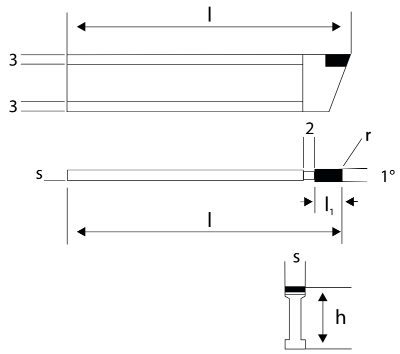
Serie PCD/PCBN

Blade Grooving Tools
Lamas de Ranurar

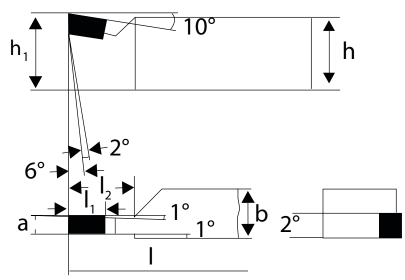
ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES						PRODUCT PRODUCTO		TYPE TIPO
	l	l_1	h	r	s	s_2	PCD	PCBN	
RM - 701509	70	5	14,80	2,0	0,900		■	■	
RM - 701510					1,000		■	■	
RM - 701512					1,225		■	■	
RM - 701515					1,500		■	■	
RM - 701520	70	6	14,80	0,25	2,000		■	■	
RM - 701525					2,500		■	■	
RM - 701530	70	7	14,80	0,3	3,00		■	■	
RM - 701535					3,50		■	■	
RM - 701540					4		■	■	



Tolerance S - 0,004 mm.
S other sice on request

Tolerancia en cota S - 0,004 mm.
Cota S no referenciadas bajo demanda

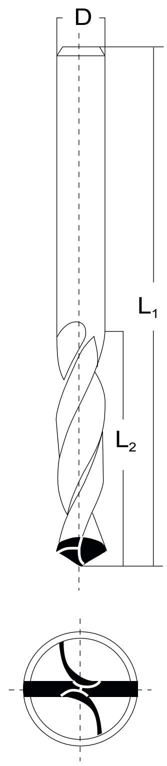
	b	h	l	h_1	l_2	r	a	PCD	PCBN
GDRN 1202 R/L	8	12	1100	12	12	0,15	2	■	■
GDRN 1602 R/L	10	16	100	16	12	0,15	2	■	■
GDRN 1603 R/L	10	16	105	16	14	0,15	3	■	■
GDRN 1604 R/L	10	16	100	16	14	0,15	4	■	■



Serie PCD

Solid Carbide Twist Drill With Polycrystalline Diamond Tip

Brocas De Diamante Policristalino Con Soporte De Metal Duro

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES							PRODUCT PRODUCTO		TYPE TIPO
	D	d_1	d_2	L_1	L_2	R	a	PCD	PCBN	
CXC 32050	5,0			62	26			■		
33055	5,5			66	28			■		
33060	6,0			66	28			■		
34065	6,5			70	31			■		
34070	7,0			74	34			■		
34075	7,5			74	34			■		
35080	8,0			79	37			■		
36085	8,5			79	37			■		
36090	9,0			84	40			■		
37095	9,5			84	40			■		
37100	10,0			89	43			■		
38105	10,5			89	43			■		
39110	11,0			95	47			■		
39115	11,5			95	47			■		
40120	12,0			100	51			■		

Drills with diamond tip are recommended when drilling the following materials :

Aluminum, Aluminum alloys,
Graphite, Green ceramic,
Composites,
Fiber-Glass,
Carbon-fiber.

WORKING CONDITIONS :

Speed : Between 50% to 75% higher than the speed of the Tungsten Carbide as long as the machine is vibration free.

Coolant : We recommend abundant and continious flow.

Se recomienda el uso de brocas de diamante para el taladro de los siguientes materiales :

Aluminios, y sus aleaciones,
Grafitos, Ceràmicas,
Composites,
Fibras de Vidrio,
Fibras de Carbono.

CONDICIONES DE TRABAJO :

Velocidades : entre un 50% y un 75% mas àltas que las brocas de Carburo de Tungsteno, siempre que la maquìna esté exenta de vibraciones.

Refrigerante : Aconsejable que sea abundante y continuo.

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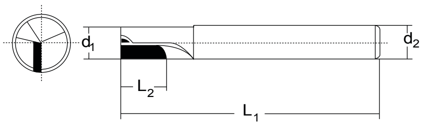
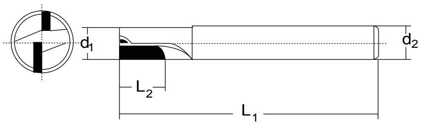
Serie PCD

Solid Carbide End Mills With Polycrystalline Diamond Tip
Fresas De Diamante Policristalino Con Soporte De Metal Duro

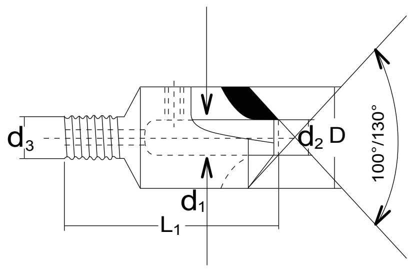
ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES						PRODUCT PRODUCTO		TYPE TIPO
	d	d_1	d_2	L_1	L_2	CUTTING EDGES FILOS DE CORTE	PCD	PCBN	
FR 0405		4	6	60	5	1	■		
0607		6	6	80	7	1	■		
0807		8	8	80	7	1	■		
FR 1007		10	10	100	7	2	■		
1013		10	10	100	13	2	■		
1207		12	12	100	7	2	■		
1213		12	12	100	13	2	■		
1407		14	14	100	7	2	■		
1410		14	14	100	13	2	■		
1610		16	16	100	10	2	■		
1614		16	16	100	14	2	■		
1810		18	18	100	10	2	■		
1814		18	18	100	14	2	■		

Serie PCD

Polycrystalline Diamond Coutersink

Avellanadores De Diamante Policristalino

ISO CODE CÓDIGO ISO	DIMENSIONS DIMENSIONES						PRODUCT PRODUCTO		TYPE TIPO
	d_2	d_1	D	L_1	d_3	CUTTING EDGES FILOS DE CORTE	PCD	PCBN	
AV 0251002	2,5	2,0	10	28,5	M6	2	■		
0301202	3,0	2,0	12	28,5	M6	2	■		
0351202	3,5	2,0	12	28,5	M6	2	■		
0401402	4,0	3,0	14	28,5	M6	2	■		
0451402	4,5	3,0	14	28,5	M6	2	■		
0501702	5,0	4,0	17	28,5	M6	2	■		
0551702	5,5	4,0	17	28,5	M6	2	■		
0601702	6,0	5,0	17	28,5	M8	2	■		
0601703	6,0	5,0	17	28,5	M8	3	■		
0701702	7,0	5,0	17	28,5	M8	2	■		
0701703	7,0	5,0	17	28,5	M8	3	■		
0801702	8,0	5,0	17	28,5	M8	2	■		
0802203	8,0	5,0	22	28,5	M8	3	■		
0901703	9,0	6,0	17	28,5	M8	2	■		
0902203	9,0	6,0	22	28,5	M8	3	■		
1002202	10,0	8,0	22	28,5	M8	2	■		
1002203	10,0	8,0	22	28,5	M8	3	■		

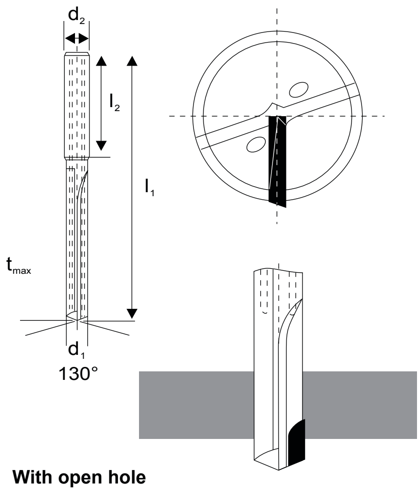


Serie PCD

Solid carbide drills with PCD tip internal coolant
Broca de Metal Duro Integral, con punta de diamante, para el taladro de aleaciones de aluminio

ISO CODE / CÓDIGO ISO	DIMENSIONS / DIMENSIONES						PRODUCT / PRODUCTO	
	d_1	d_2	l_1	l_2	tm		PCD	PCBN
BRS 9050	5	6	90	50	30		■	
9055	5,50	6	90	50	30		■	
9060	6	6	90	50	30		■	
9065	6,50	8	90	50	35		■	
9070	7	8	90	50	35		■	
9075	7,5	8	90	50	35		■	
9080	8	8	90	50	35		■	
10090	9	10	100	50	40		■	
10010	10	10	100	50	40		■	
10011	11	12	100	50	40		■	

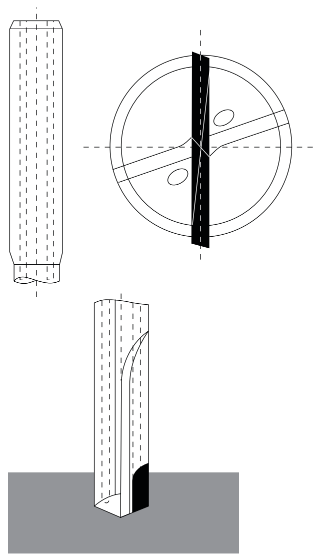
TYPE / TIPO



With open hole
Cooling on the clip channel

Agujero passante
Salida de refrigirante en los canales de la viruta

ISO CODE / CÓDIGO ISO	DIMENSIONS / DIMENSIONES						PRODUCT / PRODUCTO	
	d_1	d_2	l_1	l_2	tm		PCD	PCBN
BRS 9050	5	6	90	50	30		■	
9055	5,50	6	90	50	30		■	
9060	6	6	90	50	30		■	
9065	6,50	8	90	50	35		■	
9070	7	8	90	50	35		■	
9075	7,5	8	90	50	35		■	
9080	8	8	90	50	35		■	
10090	9	10	100	50	40		■	
10010	10	10	100	50	40		■	
10011	11	12	100	50	40		■	

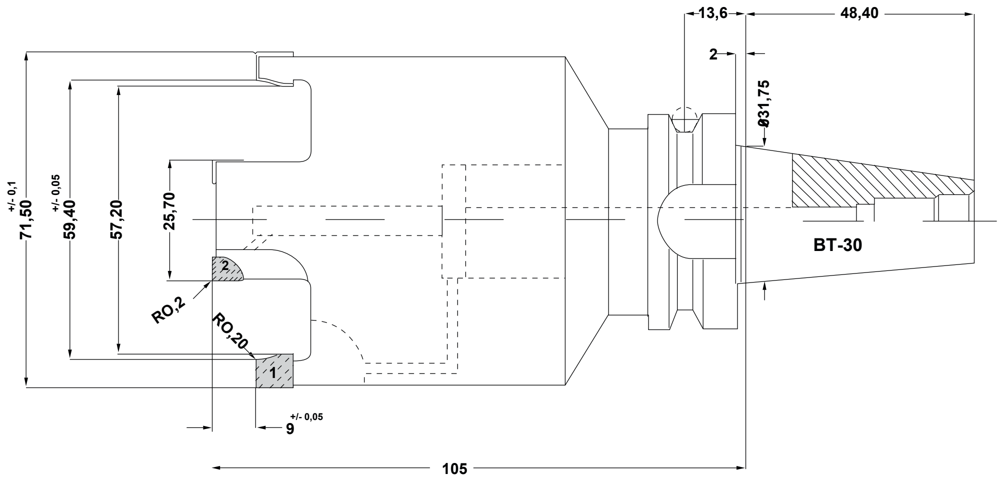


With closed hole
Cooling in front

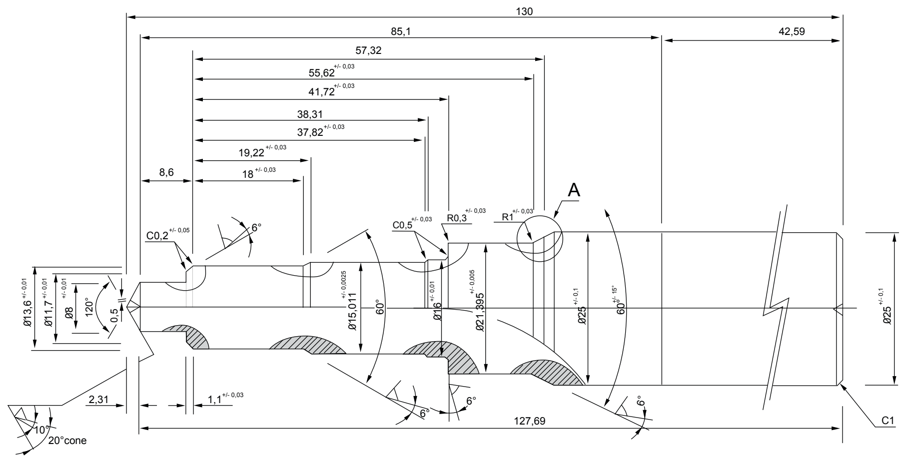
Agujero ciego
Salida de refrigirante en el frente

Serie PCD

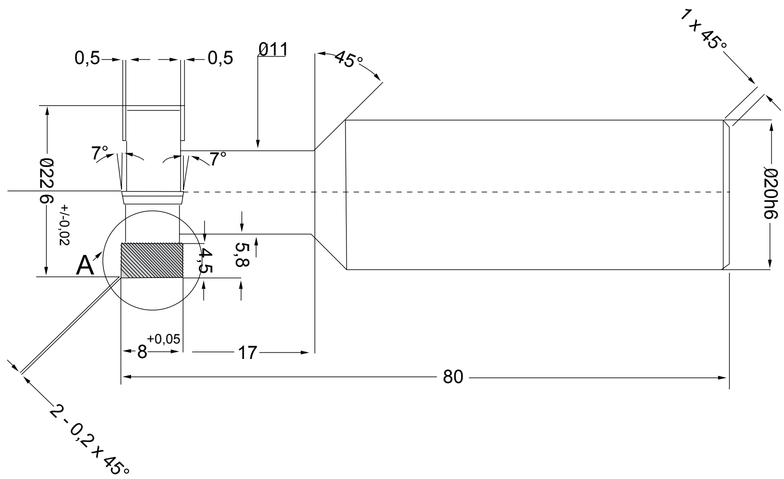
Special Tools
Herramientas Especiales



Boring Tool
Cuchilla Cortador



Grooving mill
Fresa de Ranurar



General Information

Summary

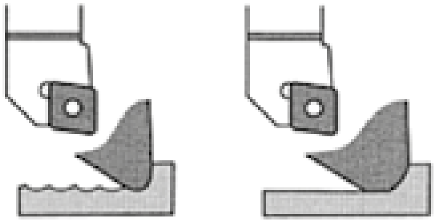
■ 1. Troubles of cutting edge

CAUSE	CONTROL ACTION / REMEDY
• Excessive Cutting Speed • Work Material Microstructure Contains Carbides	• Reduce Cutting Speed • Use Harder Grade • Select More Positive Rake Chipbreaker • Flood Cutting Zone w/Coolant
• Excessive Cutting Speed • Ineffective Use of Coolant	• Reduce Cutting Speed & Feed • Select Harder Grade w/Oxide Coating • Select More Positive Rake Chipbreaker • Flood Cutting Zone w/Coolant
• Low Cutting Speed • Low Feed Rate • Poor Shearing Action	• Increase Cutting Speed • Select More Positive Rake Chipbreaker • Select Tougher Grade (Use PVD Coated Insert) • Flood Cutting Zone w/Coolant
• Excessive Feed Rate • Interrupted Cut	• Reduce Feed Rate • Select Tougher Grade • Select Stronger Chipbreaker • Increase Lead Angle
• Scale Part • High Work Hardening Materials	• Increase Lead Angle • Increase Cutting Speed • Select Tougher Grade • Select Stronger Chipbreaker • Vary Depth of Cut if Possible

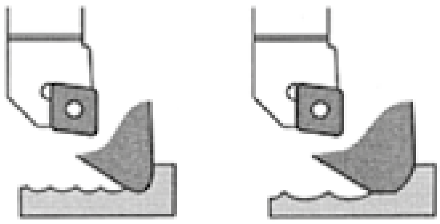
CAUSE	CONTROL ACTION / REMEDY
• Improper Selection of Grade/Chipbreaker and/or Cutting	• Reduce Feed Rate • Select Tougher Grade • Select Stronger Chipbreaker • Make Sure Set-Up is as Rigid as Possible
• Extreme Variation in Cutting Temperatures • Interrupted Cut	• Reduce Feed Rate • Increase Cutting Speed • Select Stronger Chipbreaker
• High Feed Rate • Low Cutting Speed • Nose Radius Too Small	• Reduce Feed Rate •Increase Cutting Speed • Select More Positive Rake Chipbreaker • Flood Cutting Zone w/Coolant • Use Larger Nose Radius
• Poor Set-up • Improper Insert Selection	• Use Sharp Inserts • Select More Positive Rake Chipbreakers • Increase Feed Rate • Increase Lead Angle • Use Smaller Nose Radius
• Low Feed Rate • Large Nose Radius	• Increase Feed Rate • Select Smaller Nose Radius • Decrease Lead Angle

How Wiper Inserts Work

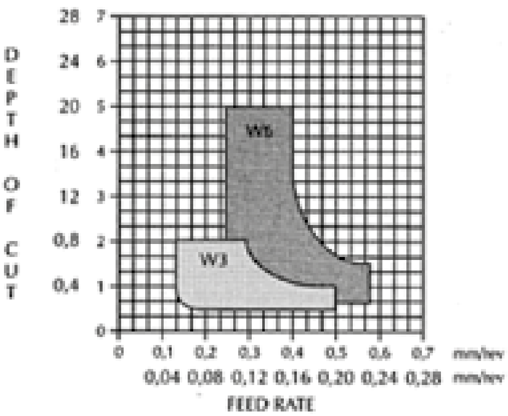
Conventional inserts produce a certain finish (Ra) at a given feed rate (mm/rev). Using wiper inserts can improve finish or increase feed rate.



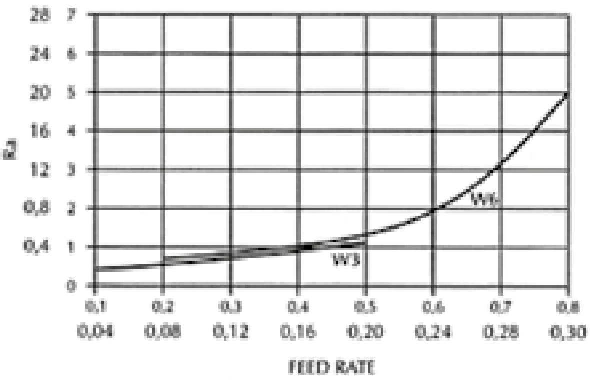
Wiper inserts operating at the same feed rate (mm/rev) as conventional inserts can improve surface finish by up to 100%.



Wiper inserts can also produce surfaces equal to those of conventional inserts while doubling the feed rate (mm/rev).



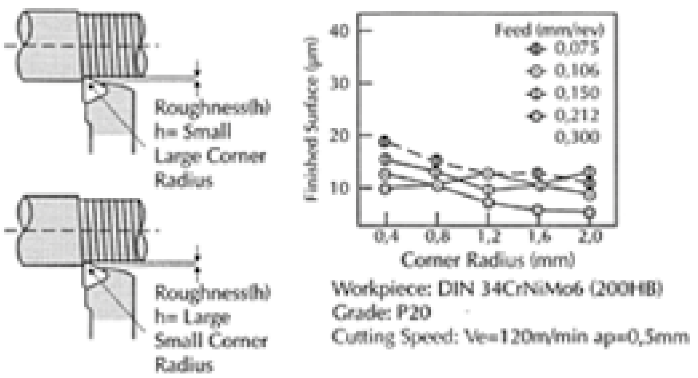
Get improved chip control and improved tool life at existing feed rates while improving surface finishes by 100%.



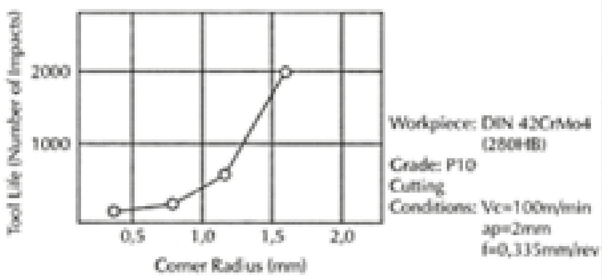
Innovative wiper corner radius design improves surface finish compared to conventional inserts at the same corner radius.

■ *RADIUS*

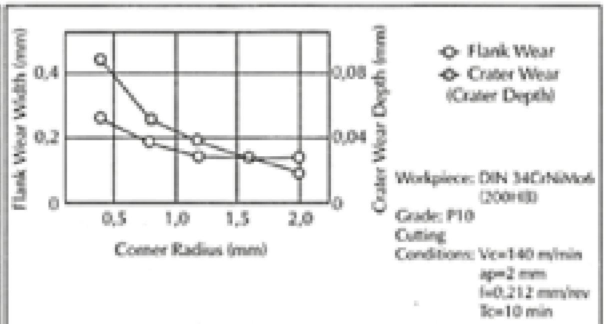
Radius effects the cutting edge strength and finished surface. In general, a corner radius 2~3times the feed is recommended.



Corner Radius and Finished Surface



Corner Radius Size and Tool Life Due to Fracturing



Corner Radius Size and Tool Wear

● *Effects of Corner Radius*

1. Increasing the corner radius improves the surface finish.
2. Increasing the corner radius improves cutting edge strength.
3. Increasing the corner radius too much increases the cutting resistance and causes chattering.
4. Increasing the corner radius decreases flank and rake wear.
5. Increasing the corner radius too much results in poor chip control.

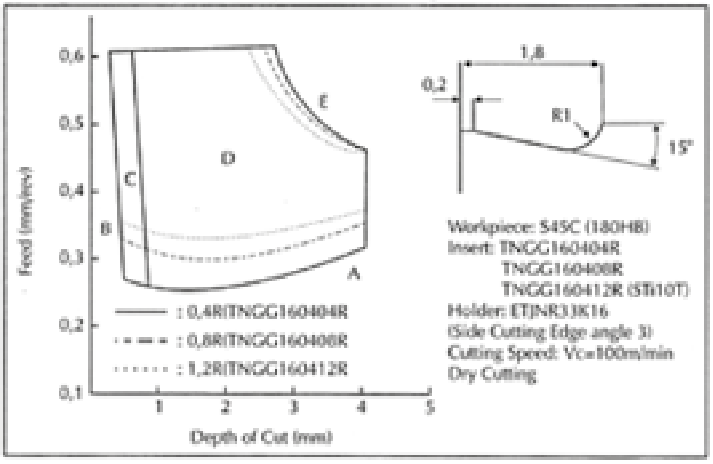
When to Decrease Corner Radius

- Finishing with small depth of cut.
- Thin, long workpieces.
- When then machine has poor rigidity.

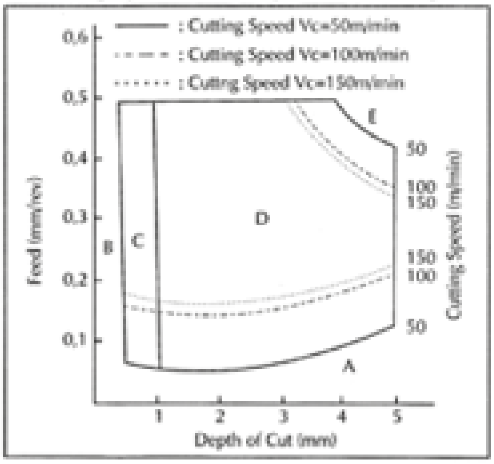
When to Increase Corner Radius

- When the cutting edge strength is required such as in interrupted cutting and uncut surface cutting.
- When roughing a workpiece with large diameter.
- When the machine has high rigidity.

● *Corner Radius and Chip Control Range*

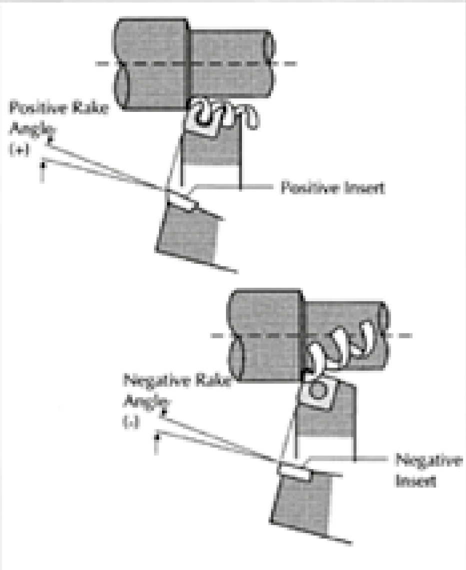


● *Cutting Speed and Chip Control Range*

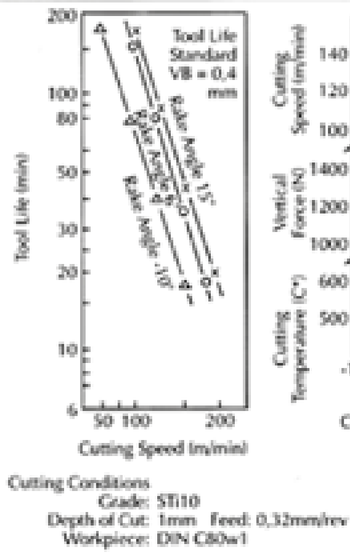


■ *RAKE ANGLE*

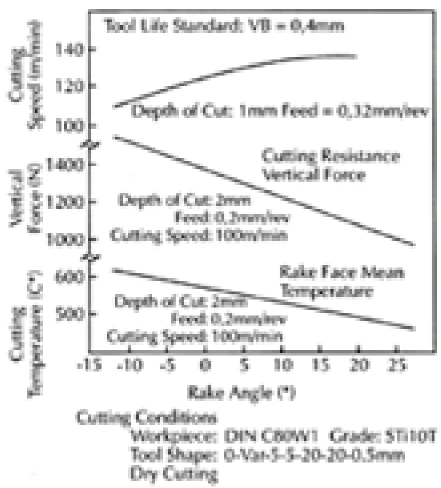
Rake angle is a cutting edge that has large effects on cutting resistance, chip disposal, cutting temperature and tool life.



Chip Disposal and Rake Angle



Rake Angle and Tool Life



Effets of Rake Angle on Cutting Speed, Vertical Force, and Cutting Temperature

● ***Effects of Rake Angle***

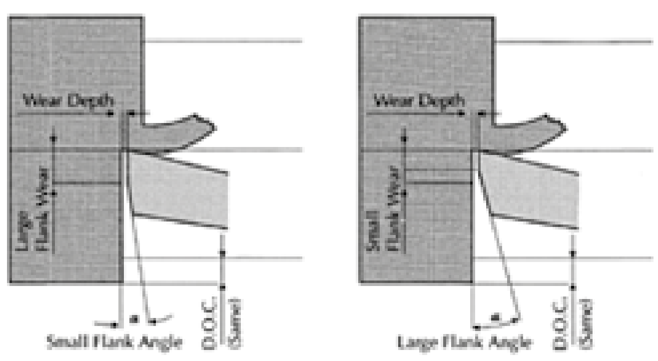
1. Increasing rake angle in the positive (+) direction improves sharpness.
2. Increasing rake angle by 1° in the positive (+) direction decreases cutting power by about 1%.
3. Increasing rake angle in the positive (+) direction lower cutting edge strength and in the negative (-) direction increases cutting resistance.

When to Increase Rake Angle in the Negative (-) Direction
◻ Hard workpiece.
◻ When cutting edge strength is required such as in interrupted cutting and uncut surface cutting.

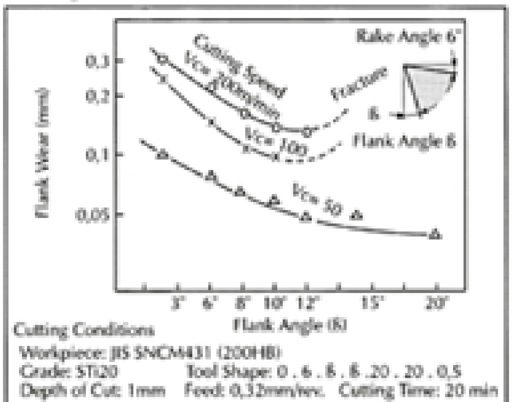
When to Increase Rake Angle in the Positive (+) Direction
◻ Soft workpiece.
◻ Workpiece is easily machined.
◻ When workpiece or the machine have poor rigidity.

■ *FLANK ANGLE*

Flank angle prevents friction between flank face and workpiece resulting in smooth feed.



Flank Angle creates a space between tool and workpiece



Flank Angle and Flank Wear Relationship

● ***Effects of Flank Angle***

1. Increasing flank angle decreases flank wear occurrence.
2. Increasing flank angle lowers cutting edge strength.

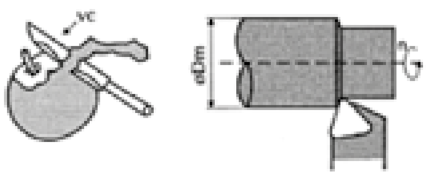
When to Decrease Flank Angle
◻ Hard workpieces.
◻ When cutting edge strength is required.

When to Increase Flank Angle
◻ Soft workpieces.
◻ Workpieces suffer from work hardening easily.

■ CUTTING SPEED (vc)

$Vc = \frac{\pi \cdot Dm \cdot n}{1000}$ (m/min)	vc (m/min) : Cutting Speed Dm (mm) : Workpiece Diameter π (3.14) :Pi n (min^{-1}) : Main Axis Spindle Speed

* Divide by 1,000 to change to m from mm.



(Problem) What is the cutting speed when main axis spindle is 700 min^{-1} and external diameter is ø50 ?

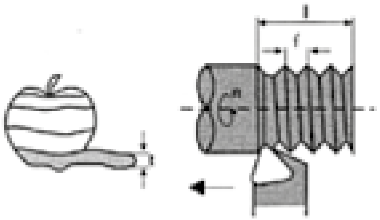
(Answer) Substitute π= 3.14, Dm= 50, n= 700 into the formula.

$$Vc = \frac{\pi \cdot Dm \cdot n}{1000} = \frac{3.14 \times 50 \times 700}{1000} = 110 \text{ m/min}$$

Cutting speed is 110m/min.

■ FEED (f)

$f = \frac{l}{n}$ (mm/rev)	f (mm/rev) : Feed per Revolution l (mm/min) : Cutting Length per Min. n (min^{-1}) : Main Axis Spindle Speed



(Problem) What is the feed per revolution when main axis spindle speed is 500 min^{-1} and cutting length per minute is 120 mm/min ?

(Answer) Substitute n= 500, l= 120 into the formula.

$$f = \frac{l}{n} = \frac{120}{500} = 0{,}24 \text{ (mm/rev)}$$

The answer is 0,24 mm/rev.

■ CUTTING TIME (Tc)

$Tc = \frac{lm}{l}$ (min)	Tc (min) : Cutting Time lm (mm) : Workpiece Length l (mm/min) : Cutting Length per Min.

(Problem) What is the cutting time when 100mm workpiece is machined at 1000 min^{-1} with feed= 0,2 mm/rev ?

(Answer) First, calculate the cutting length per min. from the feed and spindle speed.

$l = f \times n = 0{,}2 \times 1000 = 200$ mm/min

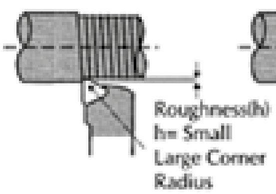
Substitute the answer above into the formula.

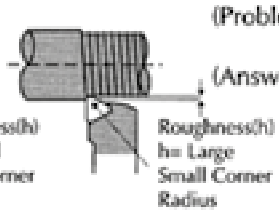
$$Tc = \frac{lm}{l} = \frac{100}{200} = 0{,}5 \text{ (min)}$$

0,5 x 60 = 30 (sec.) The answer is 30 sec.

■ THEORETICAL FINISHED SURFACE ROUGHNESS (h)

$h = \frac{f^2}{8R} \times 1000$ (µm)	h (µm) : Finished Surface Roughness f (mm/rev) : Feed per Revolution R (mm) : Insert Corner Radius





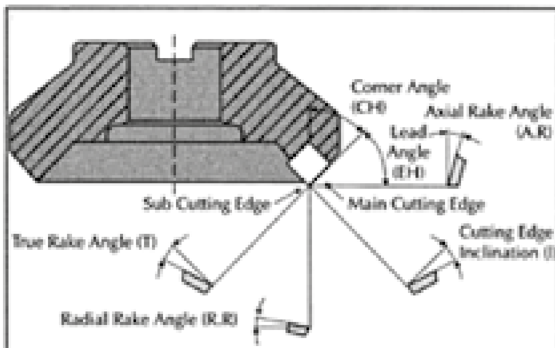
(Problem) What is the theoretical finished surface roughness when the insert corner radius is 0,8 mm and feed is 0,2 mm/rev ?

(Answer) Substitute f = 0,2 mm/rev, R = 0,8 into the formula.

$$h = \frac{0{,}2^2}{8 \times 0{,}8} \times 1000 = 6{,}25 \mu m$$

The theoretical finished surface roughness is 6µm.

■ FUNCTION OF EACH CUTTING EDGE ANGLE IN FACE MILLING



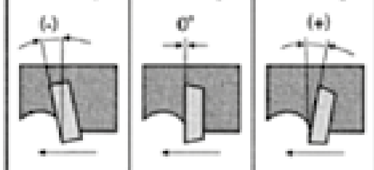
Each Cutting Edge Angle in Face Milling

Type of Angle	Symbol	Function	Effect
Axial Rake Angle	A.R	Determines chip disposal direction.	**Positive:** Excellent machinability.
Radial Rake Angle	R.R	Determines sharpness.	**Negative:** Excellent chip disposal
Corner Angle	CH	Determines chip thickness.	**Large:** Thin chips and small cutting impact. Large back force.
True Rake Angle	T	Determines actual sharpness.	**Positive (large):** Excellent machinability. Minimal welding. **Negative (large):** Poor machinability. Strong cutting edge.
Cutting Edge Inclination	I	Determines chip disposal direction.	**Positive (large):** Excellent chip disposal. Low cutting edge strength.

■ STANDARD INSERTS

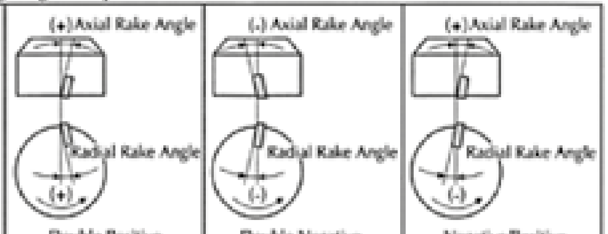
▫ Positive and Negative Rake Angle

Negative Rake Angle (-)	Neutral Rake Angle 0°	Positive Rake Angle (+)



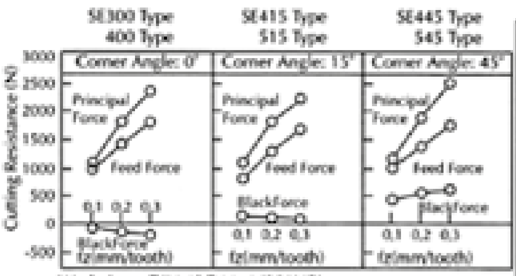
- Insert shape whose cutting edge precedes is a positive rake angle.
- Insert shape whose cutting edge follows is a negative rake angle.

▫ Standard Cutting Edge Shape



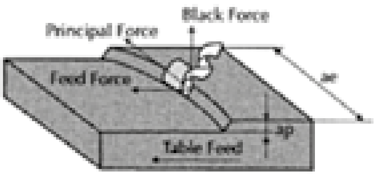
Standard Cutting Edge Combinations		Double Positive (DP Edge Type)	Double Negative (DN Edge Type)	Negative/Positive (NP Edge Type)
Axial Rake Angle (A.R)		Positive (+)	Negative (-)	Positive (+)
Radial Rake Angle (R.R)		Positive (+)	Negative (-)	Negative (-)
Insert Used		Positive Insert (One Sided Use)	Negative Insert (Double Sided Use)	Positive Insert (One Sided Use)
Workpiece	Steel	●	—	●
	Cast Iron	—	●	●
	Aluminium Alloy	●	—	—
	Difficult-to-Cut Material	●	—	●

■ CORNER ANGLE (CH) AND CUTTING CHARACTERISTICS



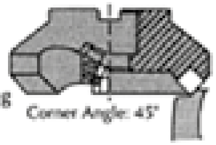
Workpiece: DIN 42CrMo4 (281HB)
Tool: Ø 125mm Single Insert
Cutting Conditions: Vc=125.6m/min ap=4mm ae=110mm

Cutting Resistance Comparison Between Different Insert Shapes

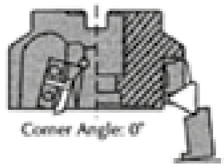


Three Cutting Resistance Forces in Milling

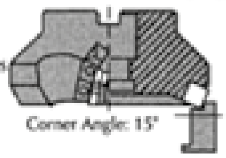
Corner Angle 45° — The largest black force. Bends thin workpieces and lowers cutting accuracy.
* Prevents workpiece edge chipping in cast iron cutting.



Corner Angle 0° — Back force is in the minus direction. Lifts the workpiece when workpiece clamp rigidity is low.



Corner Angle 15° — Corne angle 15o is recommended for face milling of workpieces with low rigidity such as thin workpieces.

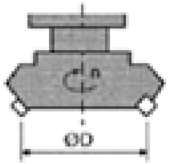


* Principal force: Force is in the opposite direction of face milling rotation.
* Back Force: Force that pushes in the axial direction.
* Feed Force: Force is in the feed direction and is caused by table feed.

■ **CUTTING SPEED (vc)**

$Vc = \dfrac{\pi . D . n}{1000}$ (m/min)	vc (m/min) : Cutting Speed D (mm) : Cutter Diameter π (3.14) :Pi n (min^{-1}) : Main Axis Spindle Speed

* Divide by 1,000 to change to m from mm.



(Problem) What is the cutting speed when main axis spindle is 350 min^{-1} and cutter diameter is Ø125 ?

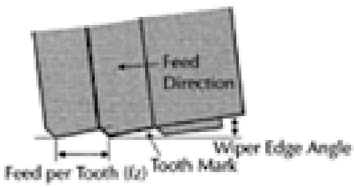
(Answer) Substitute π 3.14, D= 125, n= 350 into the formula.

$$Vc= \frac{\pi . D . n}{1000} = \frac{3.14 \times 125 \times 350}{1000} = 137,4 \text{ m/min}$$

Cutting speed is 137,4m/min.

■ **FEED PER TOOTH (fz)**

$fz= \dfrac{vf}{z.n}$ (mm/tooth)	fz (mm/tooth): Feed per Tooth z: Insert Number vf (mm/min) : Table Feed per Min. n (min^{-1}) : Main Axis Spindle Speed (Feed per Revolution fr=z x fz)



(Problem) What is the feed per tooth when main axis spindle speed is 500 min^{-1},insert number is 10, and table feed is 500 mm/min ?

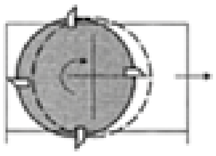
(Answer) Substitute the above figures into the formula.

$$fz= \frac{Vf}{z \times n} = \frac{500}{10 \times 500} = 0,1 \text{ mm/tooth}$$

The answer is 0,1 mm/tooth.

■ **TABLE FEED (Vf)**

vf= fz . z . n(mm/min)	vf (mm/min) : Table Feed per Min. z: Insert Number fz (mm/tooth): Feed per Tooth n (min^{-1}) : Main Axis Spindle Speed



(Problem) What is the table feed when feed per tooth is 0,1 mm/tooth, insert number is 10, and main axis spindle speed is 500 min^{-1} ?

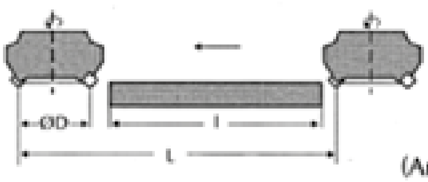
(Answer) Substitute the above figures into the formula.

$$vf = fz \times z \times n = 0,1 \times 10 \times 500 = 500 \text{ mm/min.}$$

The table feed is 500 mm/min.

■ **CUTTING TIME (Tc)**

$Tc= \dfrac{L}{vf}$ (min)	Tc (min) : Cutting Time vf (mm/min) : Table Feed per Min. L (mm) : Total Table Feed Length (Workpiece Length: l+Cutter Diameter:D)



(Problem) What is the cutting time required for finishing 100 mm width and 300 length surface of a cast iron (DIN GG-20) block when cutter diameter is Ø200, the numbrer of inserts is 16, the cutting speed is 125 m/min, and feed per tooth is 0,25 mm (spindle speed is 200 min^{-1} ?

Calculate table feed per min vf=0,25x16x200=800 mm/min

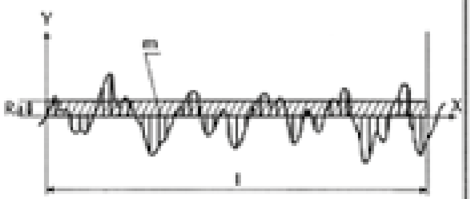
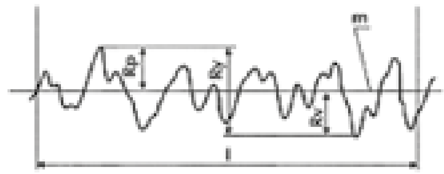
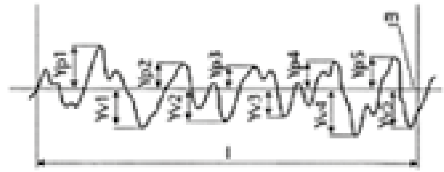
(Answer) Calculate total table feed length. L=300+200=500 mm

Substitute the above answers into the formula.

$$Tc= \frac{500}{800} = 0,625(\text{min})$$

0,625x60=37,5 (sec). The answer is 37,5 sec.

SURFACE ROUGHNESS

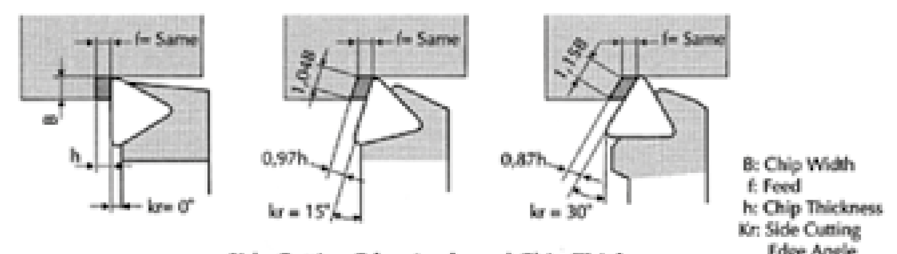
Type	Code	Determination	Determination Example (Figure)
Arithmetical Mean Roughness	Ra	Ra means the value obtained by the following formula and expressed in micrometer (μm) when sampling only the reference length from the roughness curve in the direction of the mean line, taking X-axis in the direction of mean line and Y-axis in the direction of longitudinal magnification of this sampled part and the roughness curve is expressed by y=f(x): $Ra=\frac{1}{l}\int_0^l \lvert f(x)\rvert\,dx$	
Maximum Height	Ry	Ry shall be that only when the reference length is sampled from the roughness curve in the direction of the mean line, the distance between the top prefile peak line and the bottom profile valley line on this sampled portion is measured in the longitudinal magnification direction of roughness curve and the obtained value is expressed in. $Ry=Rp+Rv$	
Ten-Point Mean Roughness	Rz	Rz shall be that only when the reference length is sampled from the roughness curve in the direction of its mean line, the sum of the average value of absolute values of the heights of five highest profile peaks (Yp) and the depths of five deepest profile valleys (Yv) measured in the vertical magnification direction from the mean line of this sampled portion and this sum is expressed in micrometer (μm). $Rz=\frac{(Yp1+Yp2+Yp3+Yp4+Yp5)+(Yv1+Yv2+Yv3+Yv4+Yv5)}{5}$	 Yp1, Yp2, Yp3, Yp4, Yp5: altitudes of the five highest profile peaks of the sampled portion corresponding to the reference length l. Yv1, Yv2, Yv3, Yv4, Yv5: altitudes of the five deepest profile valleys of the sampled portion corresponding to the reference length l.

■ *Relationship Between Arithmetical Mean (Ra) and Conventional Designation (Reference Data)*

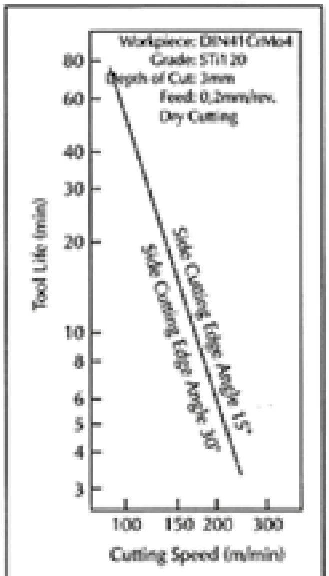
Arithmetical Mean Roughness Ra		Maximum Height Ry	Ten-Point Mean Roughness Rz	Sampling Length for Ry - Rz l (mm)	Conventional Finish Mark
Standard Series	Cutoff Value λc (mm)	Standard Series			
0,012 a	0,08	0,005 s	0,005 z	0,08	▽▽▽▽
0,025 a	0,25	0,1 s	0,1 z		
0,05 a		0,2 s	0,2 z	0,25	
0,1 a	0,8	0,4 s	0,4 z		
0,2 a		0,8 s	0,8 z	0,8	
0,4 a		1,6 s	1,6 z		▽▽▽
0,8 a		3,2 s	3,2 z		
1,6 a		6,3 s	6,3 z		
3,2 a	2,5	12,5 s	12,5 z	2,5	▽▽
6,3 a		25 s	25 z		
12,5 a	8	50 s	50 z		▽
25 a		100 s	100 z		
50 a		200 s	200 z	8	~
100 a	—	400 s	400 z	—	

* The correlation among the three is shown for convenience and is not exact.
* Ra: The evaluation length of Ry and Rz is the cutoff value and sampling length multiplied by 5, respectively.

Side Cutting edge angle and corner angle lower impact load and effect feed force, back force, and chip thickness.



Side Cutting Edge Angle and Chip Thickness

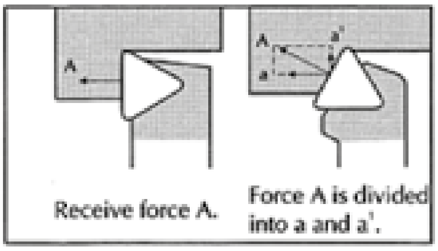


Side Cutting Edge and Tool Life

- **Effects of Side Cutting Edge Angle (Lead Angle)**

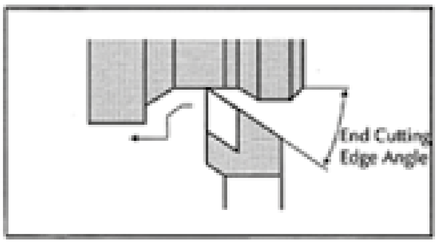
1- At the same feed rate, increasing the side cutting edge angle increases the chip contact length and decreases chip thickness. As a result, the cutting force is dispersed on a longer cutting edge and tool life is prolonged.
2- Increasing the side cutting edge angle increases force a' Thus, thin, long workpieces suffer from bending in some cases.
3- Increasing the side cutting edge angle decreases chip control.
4- Increasing the side cutting edge angle decreases the chip thickness and increases chip width. Thus, breaking chips is difficult.

When to Decrease Lead Angle	When to Increase Lead Angle
▫ Finishing with small depth of cut. ▫ Thin, long workpieces. ▫ When the machine has poor rigidity.	▫ Hard workpieces which produce high cutting temperature. ▫ When roughing a large diameter workpiece. ▫ When the machine has high rigidity.



■ END CUTTING EDGE ANGLE

End cutting edge angle prevents wear on tool and workpiece surface and is usually 5° ~ 15°.

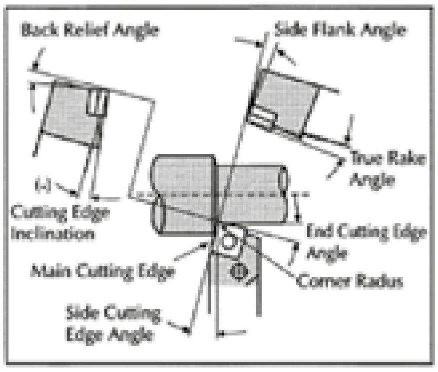


- **Effects of End Cutting Edge Angle**

1- Decreasing the end cutting edge angle increases cutting edge strength, but it also increases cutting edge temperature.
2- Decreasing the end cutting edge angle increases the back force and can result in chattering and vibration while machining.
3- Samall end cutting edge angle in roughing and large angle in finishing are recommended.

■ CUTTING EDGE INCLINATION

Cutting edge inclination indicates inclination of the rake face. In heavy cutting, the cutting edge receives extremely large shock at the beginning of cutting. Cutting edge inclination. Keeps the cutting edge from receiving this shock and prevents fracturing. 3° ~ 5° in turning and 10° ~ 15° in milling are recommended.



- **Effects of Cutting Edge Inclination**

1- Negative (-) cutting edge inclination disposes chips in the workpiece direction, and positive (+) disposes chips in the opposite direction.
2- Negative (-) cutting edge inclination increases cutting edge strength, but it also increases back force of cutting resistance.
Thus, chattering easily occurs.

ESTRUCTURAL AND CONSTRUCTIONAL STEEL

Country												
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard											
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
1.0401	C15	080M15	-	1350	1015	CC12	-	C15C16	F-111	-
1.0402	C22	050A20	2C	1450	1020	CC20	C25-1	C20C21	F-112	-
1.0501	C35	060A35	-	1550	1035	CC35	C35-1	C35	F-113	-
1.0503	C45	080M46	-	1650	1045	CC45	C45-1	C45	F-114	-
1.0535	C55	070M55	-	1655	1055	-	C55-1	C55	-	-
1.0601	C60	080A62	43D	-	1060	CC55	C60-1	C60	-	-
1.0715	9SMn28	230M07	-	1912	1213	S250	-	CF9SMn28	11SMn28	SUM22
1.0718	9SMnPb28	-	-	1914	12L13	S250Pb	-	CF9SMnPb28	11SMPb28	SUM22L
1.0722	10SPb20	-	-	-	-	10PbF2	-	CF10Pb20	10SPb20	-
1.0726	35S20	212M36	8M	1957	1140	35MF4	-	-	F210G	-
1.0736	9SMn36	240M07-	1B	-	1215	S300	-	CF9SMn36	12SMn35	-
1.0737	9SMnPB36		-	1926	12L14	S300Pb	-	CF9SMnPb36	12SMnP35	-
1.0904	55Si7	250A53	45	2085	9255	55S7	55Si7	55Si8	56Si7	-
1.0961	60SiCr7	-	-	-	9262	60SC7	60SiCr8	60SiCr8	60SiCr8	
1.1141	Ck15	080M15	32C	1370	1015	XC12	C16-2	C16	C15K	S15C
1.1157	40Mn4	150M36	15	-	1039	35M5	-	-	-	-
1.1158	Ck25	-	-	-	1025	-	C25-2	-	-	S25C
1.1167	36Mn5	-	-	2120	1335	40M5	-	-	36Mn5	SMn438(H)
1.1170	28Mn6	150M28	14A	-	1330	20M5	28Mn6	C28Mn	-	SCMn1
1.1183	Cf35	060A35	-	1572	1035	XC38TS	C36	C36	-	S35C
1.1191	Ck45	080M46	-	1672	1045	XC42	C45-2	C45	C45K	S45C
1.1203	Ck55	070M55	-	-	1055	XC55	C55-2	C50	C55K	S55C
1.1213	Cf53	060A52	-	1674	1050	XC48TS	C53	C53	-	S50C
1.1221	Ck60	080A62	43D	1678	1060	XC60	C60-2	C60	-	S58C
1.1274	Ck101	060A96	-	1870	1095	-	-	-	-	SUP4
1.3401	G-X120Mn12	Z120M12	-	-	-	Z120M12	-	XG120Mn12	X120Mn12	SCMnH/1
1.3505	100Cr6	534A99	31	2258	52100	100C6	-	100Cr6	F-131	SUJ2
1.5415	15Mo3	1501-240	-	2912	ASTM A20Gr.A	15D3	16Mo3	16Mo3KW	16Mo3	-
1.5423	16Mo5	1503-245-420	-	-	4520	-	16Mo5	16Mo5	16Mo5	-
1.5622	14Ni6	-	-	-	ASTM A350LF5	16N6	18Ni6	14Ni6	15Ni6	-
1.5662	X8Ni9	1501-509-510	-	-	ASTM A353	-	10Ni36	X10Ni9	X8Ni09	-
1.5680	12Ni19	-	-	-	2515	Z18N5	12Ni20	-	-	-
1.5710	36NiCr6	640A35	111A	-	3135	35NC6	-	-	-	SNC236
1.5732	14NiCr10	-	-	-	3415	14NC11	-	16NiCr11	15NiCr11	SNC415(H)
1.5752	14NiCr14	655M13 655A12	36A	-	3415;3310	12NC15	13NiCr12	-	-	SNC815(H)
1.6511	36CRNiMo4	816M40	110	-	980	40NCD3	-	38NiCrMo4(KB)	35NiCrMo4	-
1.6523	21NiCrMo2	805M20	362	2506	8620	20NCD2	-	20NiCrMo2	20NiCrMo2	SNCM220(H)
1.6546	40NiCrMo22	311-Type7	-	-	8740	-	40NiCrMo2	40NiCrMo2(KB)	40NiCrMo2	SNCM240
1.6582	34CrNiMo6	817M40	24	2541	4340	35NCD6	35CrNiMo6	35NiCrMo6(KB)	-	-
1.6587	17CrNiMo6	820A16	-	-	-	18NCD6	17CrNiMo7	-	14NiCrMo13	-
1.6657	14NiMo134	832M13	36C	-	-	-	14NiCrMo13	15NiCrMo13	14NiCrMo131	-
1.7015	15Cr3	523M15	-	-	5015	12C3	15Cr2	-	-	SCr415(H)
1.7033	34Cr4	530A32	18B	-	5132	32C4	34Cr4	34Cr4(KB)	35Cr4	SCr430(H)
1.7035	41Cr4	530M40	18	-	5140	42C4	42Cr4	41Cr4	42Cr4	SCr440(H)
1.7045	42Cr4	-	-	2245	5140	-	-	-	42Cr4	SCr440
1.7131	16MnCr5	(527M20)	-	2511	5115	16MC5	16MnCr5	16MnCr5	16MnCr45	-
1.7176	55Cr3	527A60	48	-	5155	55C3	55Cr3	-	-	SUP9(A)
1.7218	25CrMo4	1717CDS110	-	2225	4130	25CD4	25CrMo4	25CrMo4(KB)	55Cr3 AM26CrMo4	SCM420 SCM430

ESTRUCTURAL AND CONSTRUCTIONAL STEEL

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
1.7220	34CrMo4	708A37	19B	2234	4137;4135	35CD4	34CrMo4	35CrMo4	34CrMo4	SCM432,SCCRM3
1.7223	41CrMo4	708M40	19A	2244	4140;4142	42CD4TS	41CrMo4	41CrMo4	42CrMo4	SCM440
1.7225	42CrMo4	708M40	19A	2244	4140	42CD4	42CrMo4	42CrMo4	42CrMo4	SCM440H
1.7262	15CrMo5	-	-	2216	-	12CD4	-	-	12CrMo4	SCM415H
1.7335	13CrMo4 4	1501-620Gr27	-	-	ASTM A182 F11;F12	15CD3.5 15CD4.5	14CrMo45	14CRMo45	14CrMo45	-
1.7361	32CrMo12	722M24	40B	2240	-	30CD12	32CrMo12	32CrMo12	F-124.A	-
1.7380	10CrMo9 10	1501-622 Gr31;45	- -	2218	ASTM A182 F.22	12CD9;10 -	-	12CrMo9,10	TU.H -	- -
1.7715	14MoV6 3	1503-660-440	-	-	-	-	13MoCrV6	-	13MoCrV6	-
1.8159	50CrV4	735A50	47	2230	6150	50CV4	50CrV4	50CrV4	51CrV4	SUP10
1.8509	41CrAlMo7	905M39	41B	2940	-	40CAD6,12	41CrAlMo7	41CrAlMo7	41CrAlMo7	-
1.8523	39CrMoV13 9	897M39	40C	-	-	-	39CrMoV13	36CrMoV12	-	-

TOOL STEELS

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
1.1545	C105W1	-	-	1880	W.110	Y,105	-	C98KU C100KU	F-515 F-516	-
1.1663	C125W	-	-	-	W.112	Y,120	-	C120KU	(C120)	SK2
1.2067	100Cr6	BL3	-	-	L3	Y100C6	-	-	100Cr6	-
1.2080	X210Cr12	BD3	-	-	D3	Z200C12	-	X210Cr13KU X250Cr12KU	X210Cr12	SKD1
1.2344	X40CrMoV51	BH13	-	2242	H13	Z40CDV5	-	X35CrMoV05KU X40CrMoV511KU	X40CrMoV5	SKD61
1.2363	X100CrMoV51	BA2	-	2260	A2	Z100CDV5	-	X100CrMoV51KU	X100CrMoV5	SKD12
1.2419	105WCr6	-	-	2140	-	105WC13	-	10WCr6 107WCr5KU	105WCr5	SKS31 SKS,SKS3
1.2436	X210CrW12	-	-	2312	-	-	-	X215CrW121KU	X210CrW12	SKD2
1.2542	45WCrV7	BS1	-	2710	S1	-	-	45WCrV8KU	45WCrSi8	-
1.2581	X30WCrV9 3 X30WCrV9 3KU	BH21	-	-	H21	Z30WCV9	- -	X28W09KU X30WCrV9 3KU	X30WCrV9	SKD5
1.2601	X165CrMoV12	-	-	2310	-	-	-	X165CrMoW12KU	X160CrMoV12	-
1.2713	55NiCrMoV6	-	-	-	L6	55NCDV7	-	-	F-520.S	SKT4
1.2833	100V1	BW2	-	-	W210	Y,105V	C98KU 102V2KU	-	-	SKS43
1.3243	S 6-5-2-5	-	-	2723	-	Z85WDKCV 06-05-05-04-02	-	HS 6-5-2-5	HS 6-5-2-5	SKH55
1.3255	S 18-1-2-5	BT4	-	-	T4	Z80WKCV 18-05-04-01	-	X78WCo1805KU	HS 18-1-1-5	SKH3
1.3343	S 6-5-2	BM2	-	2722	M2	Z85WDCV 06-05-04-02	-	X82WMo0605KU	HS 6-5-2	SKH9
1.3348	S 2-9-2	-	-	2782	M7	Z100WCWV 09-04-02-02	-	HS 2-9-2	HS 2-9-2	-
1.3355	S 18-0-1	BT1	-	-	T1	Z80WCV 18-04-01	-	X75W18KU	HS 18-0-1	SKH2

GREY CAST IRON (unalloyed)

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
-	-	-	-	-	ASTM	-	-	-	-	-
-	-	-	-	-	A48-76	-	-	-	-	-
-	-	-	-	01 00	-	-	-	-	-	-
-	GG 10	-	-	01 10	No 20 B	Ft 10 D	-	-	-	FC100
0.6015	GG 15	Grade 150	-	01 15	No 25 B	Ft 15D	-	G15	FG15	FC150
0.6020	GG 20	Grade 220	-	01 20	No 30 B	Ft 20 D	-	G20	-	FC200
0.6025	GG 25	Grade 260	-	01 25	No 35 B	Ft 25 D	-	G25	FG25	FC250
-	-	-	-	-	No 40 B	-	-	-	-	-
0.6030	GG 30	Grade 300	-	01 30	No 45 B	Ft 30 D	-	G30	FG30	FC300
0.6035	GG 35	Grade 350	-	01 35	No 50 B	Ft 35 D	-	G35	FG35	FC350
0.6040	GG 40	Grade 400	-	01 40	No 55 B	Ft 40 D	-	-	-	-

GREY CAST IRON (alloyed)

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
-	DIN4694	3468: 1974	-	MB	ASTM	-	-	-	-	-
-	GGL-	-	-	ISO-215	A436-72	A32-301	-	-	-	-
-	NiCr 20 2	L-NiCr 20 2	-	05 23	Type 2	L-NC 20 2	-	-	-	-

NODULAR CAST IRON (unalloyed)

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
-	-	2789:1973	-	-	A536-72	NF A32-201	-	-	-	-
0.7040	GGG 40	SNG 420/12	-	07 17-02	60-40-18	FCS 400-12	-	GS 370-17	FGE 38-17	FCD400
-	GGG 40,3	SNG 370/17	-	07 17-12	-	FGS 370-17	-	-	-	-
0.7033	GGG 35,3	-	-	07 17-15	-	-	-	-	-	-
0.7050	GGG 50	SNG 500/7	-	07 27-02	80-55-06	FGS 500-7	-	GS 500	FGE 50-7	FCD500
-	GGG 60	SNG 600/3	-	07 32-03	-	FGS 600-3	-	-	-	FCD600
0.7070	GGG 70	SNG 700/2	-	07 37-01	100-70-03	FGS 700-2	-	GS 700-2	FGS 70-2	FCD700

ALLOYED CAST IRON

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
-	DIN 1694	-	-	-	-	-	-	-	-	-
-	GGGNiMn13 7	L-NiMn 13 7	-	07 72	-	L-MN 13 7	-	-	-	-
-	GGG NiCr20 2	L-NiMn 20 2	-	07 76	Type 2	L-NC 20 2	-	-	-	-

MALLEABLE CAST IRON

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNF	JIS
-	-	-	-	-	ASTM	-	-	-	-	-
-	-	-	-	-	A47-74	-	-	-	-	-
-	-	-	-	-	A 220-76 2	-	-	-	-	-
-	-	8290/6	-	08 14	-	MN 32-8	-	-	-	-
-	GTS-35	B 340/12	-	08 15	32510	MN 35-10	-	-	-	FCMW330
0.81145	GTS-45	B 440/7	-	08 52	40010	MN 450	-	GMN45	-	FCMW370
0.8155	GTS-55	P 510/4	-	08 54	50005	MP 50-5	-	GMN55	-	FCMP490
-	GTS-65	P 570/3	-	08 58	70003	MP 60-3	-	-	-	FCMP540
-	GTS-70	P 690/2	-	08 62	A 220-80002	MN700-2	-	-	-	FCMP690

STAINLESS

Country										
Germany		U.K.		Sweden	USA	France	Belgium	Italy	Spain	Japan
Standard										
W-nr.	DIN	BS	EN	SS	AIS/SAE	AFNOR	NBN	UNI	UNI	JIS
1.4000	X7Cr13	403S17	-	2301	403	Z6C13	-	X6Cr13	F-3110	SUS403
1.4001	X7Cr14								F-8401	
1.4006	X10Cr13	410S21	56A	2302	410	Z10C14	-	X12Cr13	F-3401	SUS410
1.4016	X8Cr17	430S15	60	2320	430	Z8C17	-	X8Cr17	F-3113	SUS430
1.4027	G-X20Cr14	420C29	56B	-	-	Z20C13M	-	-	-	SCS2
1.4034	X46Cr13	420S45	56D	2304	-	Z40CM Z38C13M	-	X40Cr14	F-3405	SUS420J2
1.4057	X22CrNi17	431S29	57	2321	431	Z15CNi6.02	-	X16CrNi16	F-3427	SUS431
1.4104	X12CrMoS17	-	-	2383	430F	Z10CF17	-	X10CrS17	F-3117	SUS430F
1.4113	X6CrMo17	434S17	-	2325	434	Z8CD17.01	-	X8CrMo17	-	SUS434
1.4301	X5CrNi189	304S15	58E	2332	304	Z6CN18.09	-	XACrNi18 10	F-3551 F-3541 F-3504	SUS304
1.4305	X12CrNiS18 8	303S21	58M	2346	303	Z10CNF 18.09	-	X10CrNiS18 09	F-3508	SUS303
1.4306	X2CrNi18 9	304S12 304C12	-	2352 2333	304L	Z2CN18.10 Z3CN19.10	- -	X2CrNi18 11	F-3503	SCS19 SUS304L
1.4308	G-X6CrNi18 9	304C15	-	-	-	Z6CN18.10M	-	-	-	SCS13
1.4310	X12CrNi17 7	-	-	2331	301	Z12CN17.07	-	X12CrNi17 07	F-3517	SUS301
1.4311	X2CrNiN 18 10	304S62	-	2371	304LN	Z2CN18.10	-	-	-	SUS304LN
1.4313	X5CrNi13 4	425C11	-	-	-	Z4CND13.4M	-	-	-	SCS5
1.4401	X5CrNiMo 18 10	316S16	58J	2347	316	Z6CND17.11	-	X5CrNiMo17 12	F-3543	SUS316
1.4408	G-X6CrNiMO 18 10	316C16	-	-	-	-	-	-	-	SCS14
1.4429	X2CrNiMoN 18 13	-	-	2375	316LN	Z2CND17.13	-	-	-	SUS316LN
1.4435	X2CrNiMo 18 12	316S12	-	2353	316L	Z2CND17.13 -	-	X2CrNiMo1713 -	- -	SCS16 SUS316L
1.4438	X2CrNiMo 18 16	317S12	-	2367	317L	Z2CND19.15	-	X2CrNiMo 18 16	-	SUS317L
1.4460	X8CrNiMo 27 5	-	-	2324	329	- -	- -	- -	- -	SUS329JL SCHI1;SCS11
1.4541	X10CrNiTi 18 9	2337	321S12	58B	321	Z6CNT18.10	-	X6CrNiTi18 11	F-3553 F-3523	SUS321
1.4550	X10CrNiNb 18 9	347S17	58F	2338	347	Z6CNNb18.10	-	X6CrNiNb18 11	F-3552 F-3524	SUS347
1.4571	X10CrNiMoTi 18 10	320S17	58J	2350	316Ti	Z6CNDT17.12	-	X16CrNiMoTi 17 12	F-3535	-
1.4581	G-X5CrNi MoNb 18 10	318C17	-	-	-	Z4CNDNb 18 12M	-	XG8CrNiMo 18 11	-	SC22
1.4583	X10CrNi MoNb 18 12	-	-	-	318	Z6CNDNb 17 13B	-	X6CrNiMoNb 17 13	-	-
1.4718	X45CrSi 93	401S45	52	-	HW3	Z45CS 9	-	X45CrSi8	F-322	SUH1
1.4724	X10CrAl13	403S17	-	-	405	Z10C13	-	X10CrAl12	F-311	SUS405
1.4742	X10CrAl18	430S15	60	-	430	Z10CAS18	-	X8Cr17	F-3113	SUS430
1.4747	X80CrNiSi20	443S65	59	-	HNV6	Z80CSN20.02	-	X80CrSiNi20	F-320B	SUH4
1.4762	X10CrAl24	-	-	2322	446	Z10CAS24	-	X16Cr26	-	SUH446
1.4828	X15CrNiSi 20 12	309S24	-	-	309	Z15CNS20.12	-	-	-	SUH309
1.4845	X12CrNi25 21	310S24	-	2361	310S	Z12CN25 20	-	X6CrNi25 20	F-331	SUH310
1.4864	X12NiCrSi 36 16	-	-	-	330	Z12NCS35.16	-	-	-	SUH330
1.4865	G-X40NiCrSi 38 18	330C11	-	-	-	-	-	XG50NiCr 39 19	-	SCH15
1.4871	X53CrMnNiN 21 9	349S54	-	-	EV8	Z52CMN21.09	-	X53CrMnNiN219	-	SUH35;SUH36
1.4878	X12CrNiTi 18 9	321S12 321S20	58B,58C	-	321	Z6CNT18.12B	-	X6CrNiTi1811	F-3523	SU321

EDGE PREPARATION GUIDELINES OF CBN

ACCORDING TO **CBN CONTENTS**

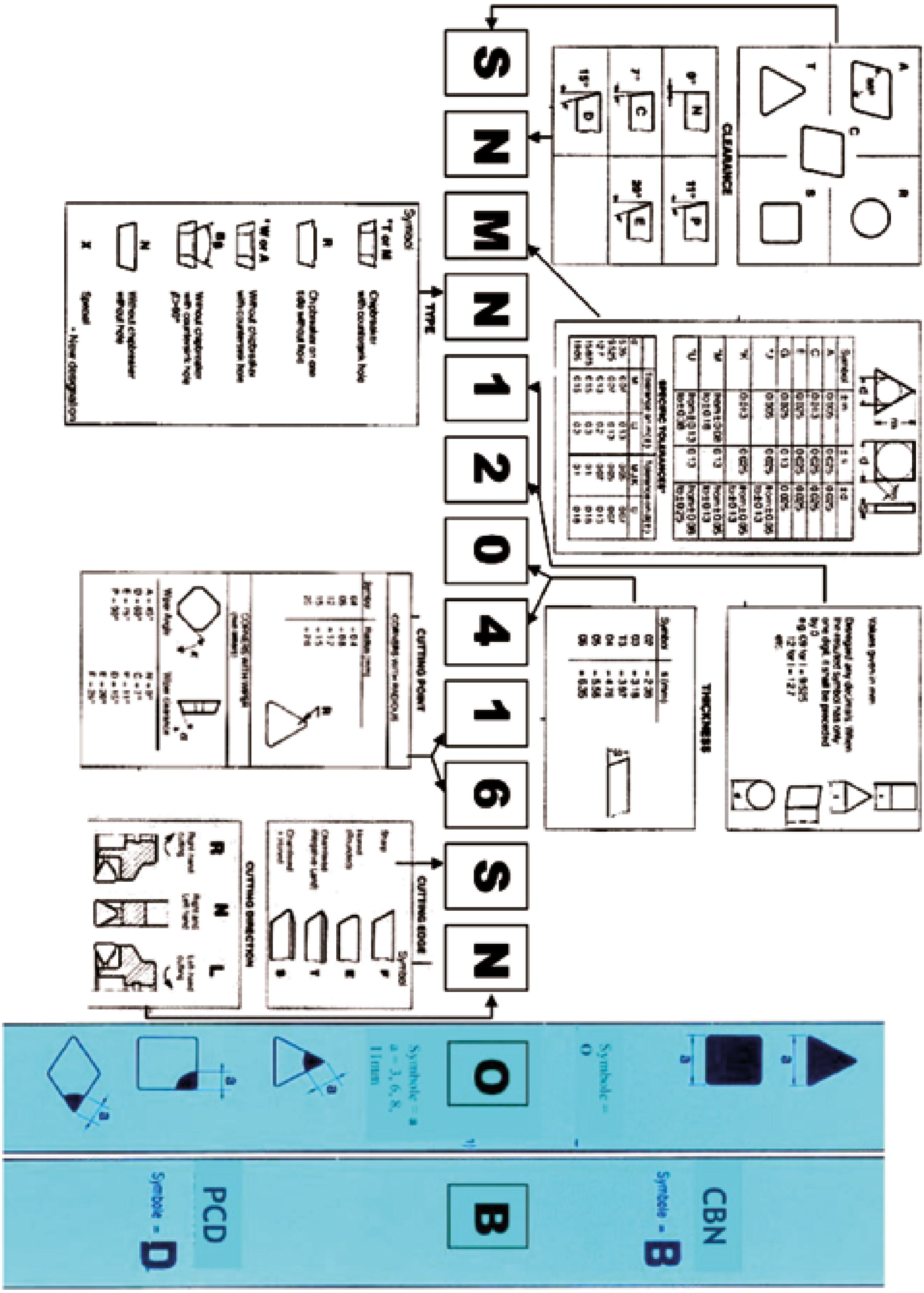
Material	high content CBN		Low content CBN	
	Roughing	Finishing		
Hardened steel	20° x 0.2 - 0.5mm			25° x 0.1mm (2)
Hard facing alloys	20° x 0.2mm (1)	20° x 0.2mm (1)		25° x 0.1mm (2)
Soft grey cast iron	20° x 0.2mm (1)	20° x 0.2mm/ 0.25mm hone		
Superalloy	20° x 0.2mm (1)	0.25mm hone		

ACCORDING TO **CUTTING AMOUNTS**

Material	Roughing (> 0.5mm DOC)	Finishing (< 0.5mm DOC)
Hardened steel	20° x 0.2 - 0.5mm	25° x 0.1mm (2)
Powder syntherized metal	20° x 0.2mm (1)	20° x 0.2mm
Soft grey cast iron	20° x 0.2mm (1)	20° x 0.2mm/ 0.25mm hone
Superalloy	20° x 0.2 - 0.5mm	20° x 0.2mm (1)

(1) iso codification : 02020

(2) iso codification : 01025


S
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6
S
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O
B
SHAPE
CLEARANCE
TOLERANCE
TYPE
SIZE
THICKNESS
CUTTING POINT
CUTTING EDGE
CUTTING DIRECTION
CBN
Symbole - B
PCD
Symbole - D

NOUVEAUTÉ !

Comment dompter vos gros durs ?

Le CORIATEC d'evatec-tools®, LA solution !

Notre priorité : Votre productivité !

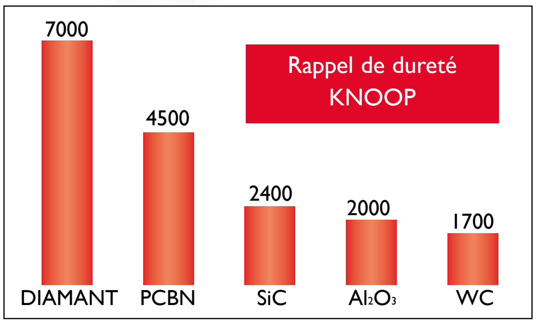
evatec-tools® propose le CORIATEC, plaquette de coupe PCBN monobloc.

Pour maximiser vos performances d'usinage, evatec-tools® présente le CORIATEC, PCBN monobloc décliné en plusieurs nuances en dimensions spéciales et ISO, qui diffère sensiblement des PCBN sur substrat carbure.

Avantages :
- **Dureté élevée**
- **Réduction des temps morts**
- **Résistance élevée aux chocs**
- **Permet le travail à grande vitesse**
- **Résistance élevée à l'usure**
- **Meilleur fini de surface**

En plus du CORIATEC monobloc, notre gamme comprend des plaquettes à insert brasé dans un large éventail de géométries et de traitements d'arêtes.

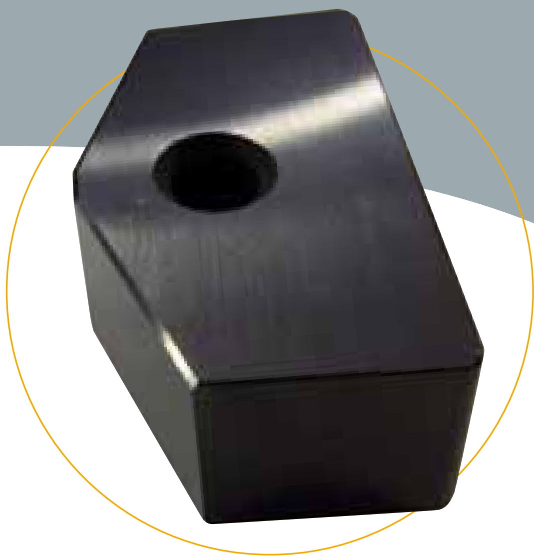
Industries ciblées :
- **Automobile**
- **Aéronautique**
- **Aciéries**
- **Roulement à billes**
- **Mécanique lourde**
- **Outils et matrices**
- **Machines outils**



GUIDE D'APPLICATIONS PCBN

MATÉRIAUX RECOMMANDÉS	DONNÉES MACHINE CONSEILLÉES		
	Vitesse m/min	**Pied mm/rev**	**Prof de coupe mm**
Fonte grise	600-1200	0,15-0,6	0,0-2,5
Fonte dure	75-150	0,15-0,6	0,1-2,5
Acier dur	75-150	0,1-0,3	0,1-2,5
Métal	75-150	0,1-0,3	0,1-2,5
Alliage haute température	150-250	0,1-0,3	0,1-2,5
Fontes blanches (high Cr, Nihard...	50-60	0,3-0,4	2-4

evatec-tools® s'attaque aussi à vos PETITS durs !



Notre priorité : Concevoir des solutions d'usinage !

evatec-tools® *propose les plaquettes de coupe en CERAMIQUE.*

Afin d'usiner fontes, alliages spéciaux et aciers traités, evatec-tools® eva réalise, à partir d'ébauches, des plaquettes céramiques prêtes à l'emploi dans différentes nuances.

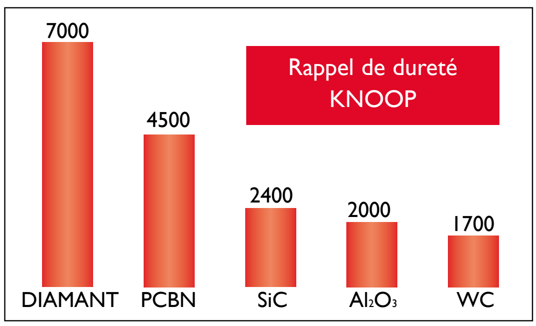
Céramique blanche grade CYW15 (Al_2O_3 + ZrO^2) destinée à l'usinage des fontes grises et malléables ;

Céramique noire grades CYB30 (Al_2O_3 + TiC) et CYB330 (Al2O3 + TiCN) dédiée à l'usinage des aciers traités ;

Nitrure de silicium grade CYD300, CYD770 CYD880 (Si_3N_4 + TiN) pour l'usinage des fontes Ni-hard, inox réfractaire et super alliages ;

Céramique renforcée (Whiskers) : La céramique est renforcée par une structure spécifique d'adjonction de filaments de carbure de silicium. Le champ d'application principal de cette céramique est l'usinage d'alliage à base de nickel et de cylindres de laminoirs en fonte traitée.

Qualité, traitements, préparation d'arêtes, evatec-tools® met son savoir-faire au service de la production de plaquettes céramiques hautement performantes.



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Solutions sur mesure pour votre usinage

Machining solutions especially for you

Carbure **PCBN / PCD** **Aéronautique**

Tournage **Usinage de Trous** **Attachements**

Fraisage

Métiers / Spécifiques

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afaq ISO 9001 Qualité AFNOR CERTIFICATION

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