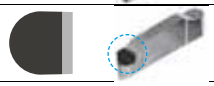
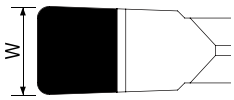
Grooving Parting

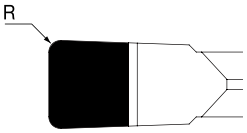
EHWA grooving tools are suitable for precise grooving and cutting of the workpieces. the tools are designed with optimal PCD, PCBN or carbide grades by the applications, providing longer tool life and effective cutting.

ES type | PCD/PCBN

ESG	30	04	R/L
Insert shape	Width	Corner radius	Hand of insert

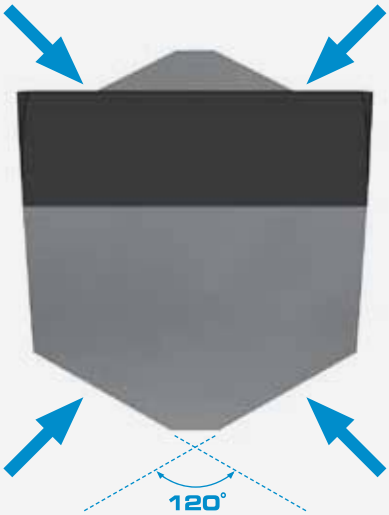
Symbol	Shape
ESG	
ESR	
ESX	Special





Symbol	Shape
R	
L	

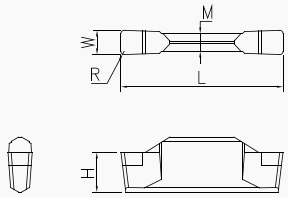
ES type

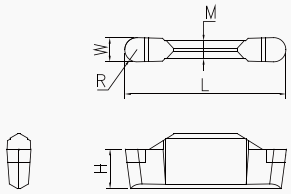


Characteristic

- Ehwa standard type
- You can choose various processing type, groove, width and groove depth for holder
- Higher clamping strength achieved by 120° taper

ES type | PCD/PCBN

Shape	Item No.	Dimensions (mm)					PCD			PCBN			
		W	R	M	L	H	EP20	EP55	EP750	EB29X	EB190	EB570	EB51
	ESG2002-R/L	2	0.2	1.7	20	7							
	ESG3002-R/L	3	0.2	2.2	20	7							
	ESG4002-R/L	4	0.2	3.0	20	7							
	ESG4004-R/L	4	0.4	3.0	20	7							
	ESG6002-R/L	6	0.2	5.0	25	7.5							
	ESG6004-R/L	6	0.4	5.0	25	7.5							
	ESG8002-R/L	8	0.2	6.0	30	8.7							
	ESG8004-R/L	8	0.4	6.0	30	8.7							

Shape	Item No.	Dimensions (mm)					PCD			PCBN			
		W	R	M	L	H	EP20	EP55	EP750	EB29X	EB190	EB570	EB51
	ESR2010	2	1	1.7	20	7							
	ESR3015	3	1.5	2.2	20	7							
	ESR4020	4	2	3.0	20	7							
	ESR6030	6	3	5.0	25	7.5							
	ESR8040	8	4	6.0	30	8.7							

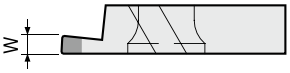
Special order (possible to choose W1, R, PCD, PCBN material)

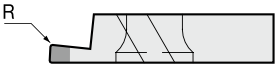
Holder : 136~145p

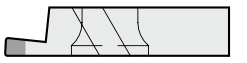
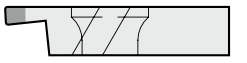
ED type | PCD/PCBN

EDG	30	04	R/L
Insert shape	Width	Corner radius	Hand of insert

Symbol	Shape
EDG	
EDR	
EDX	Special





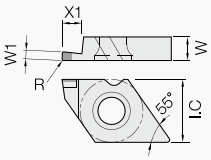
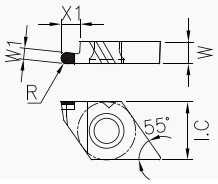
Symbol	Shape
R	
L	

ED type

Characteristic

- Suitable for grooving requiring a narrow groove and high rigidity
- Excellent clamping rigidity by double clamping of screw and clamp

ED type | PCD/PCBN

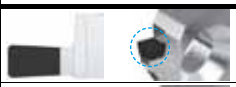
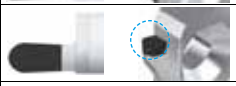
Shape	Item No.		Dimensions (mm) W1	X1	R	W	I.C	PCD EP20	EP55	EP750	PCBN EB28X	EB190	EB570	EB51
	EDG	1502-R/L	1.5	2.6	0.2	4.76	12.7							
		2002-R/L	2	3	0.2	4.76	12.7							
		3002-R/L	3	4.5	0.2	4.76	12.7							
		4002-R/L	4	4.5	0.2	4.76	12.7							
	EDR	1502-R/L	1.5	2.6	0.75	4.76	12.7							
		2002-R/L	2	3	1.0	4.76	12.7							
		3002-R/L	3	4.5	1.5	4.76	12.7							
		4002-R/L	4	4.5	2.0	4.76	12.7							

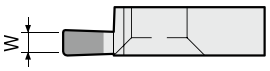
Special order (possible to choose W1, X1, R, PCD, PCBN material)

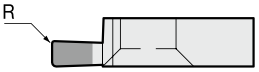
Holder : 143p

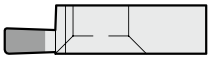
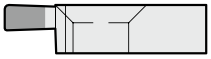
ET type | PCD/PCBN

ETG	30	04	R/L
Insert shape	Width	Corner radius	Hand of insert

Symbol	Shape
ETG	
ETR	
ETX	Special





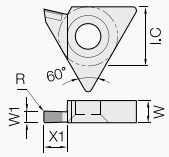
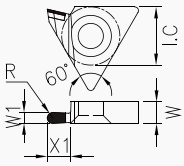
Symbol	Shape
R	
L	

ET type

Characteristic

- Suitable for narrow grooving
- Easy tool setting

ET type | PCD/PCBN

Shape	Item No.		Dimensions (mm) W1	X1	R	W	I.C	PCD EP20	EP55	EP750	PCBN EB28X	EB190	EB570	EB51
	ETG	1502-R/L	1.5	3	0.2	4.76	12.7							
		2002-R/L	2	3.5	0.2	4.76	12.7							
		3002-R/L	3	4.5	0.2	4.76	12.7							
		4002-R/L	4	4.5	0.2	4.76	12.7							
	ETR	1502-R/L	1.5	3	0.75	4.76	12.7							
		2002-R/L	2	3.5	1.0	4.76	12.7							
		3002-R/L	3	4.5	1.5	4.76	12.7							
		4002-R/L	4	4.5	2.0	4.76	12.7							

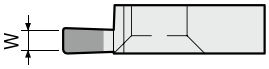
Special order (possible to choose W1, X1, R, PCD, PCBN material)

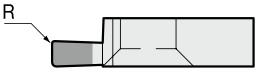
Holder : 144p

EM type | PCD/PCBN

EMG	30	04	R/L
Insert shape	Width	Corner radius	Hand of insert

Symbol	Shape
EMG	
EMX	Special





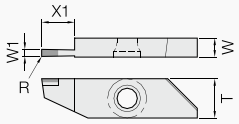
Symbol	Shape
R	
L	

EM type

Characteristic

- Micro-grooving tool for automatic lathes
- Suitable for small and precise grooving

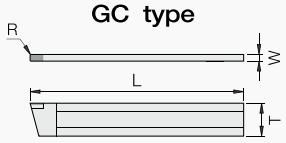
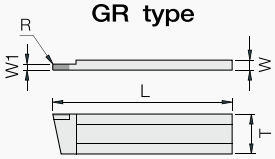
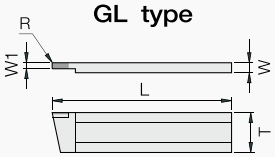
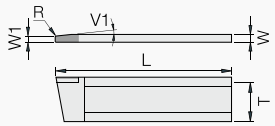
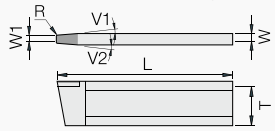
EMG type | PCD/PCBN

Shape	Item No.	Dimensions (mm)						PCD			PCBN		
		W1	X1	R	W	L	T	EP20	EP55	EP750	EB570	EB22	EB51
	EMG 05000-L/R	0.5	3.0	0.00	2.7	22.2	5.6						
	10005-L/R	1.0	3.5	0.00	2.7	22.2	5.6						
	15005-L/R	1.5	3.5	0.05	2.7	22.2	5.6						
	2001-L/R	2.0	4.0	0.10	2.7	22.2	5.6						
	2501-L/R	2.5	4.0	0.10	2.7	22.2	5.6						

Special order (possible to choose W1, X1, R, PCD, PCBN material)

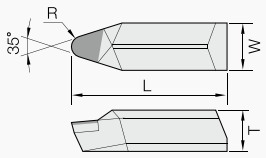
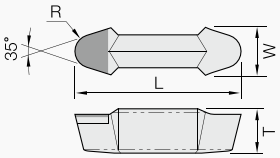
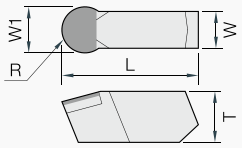
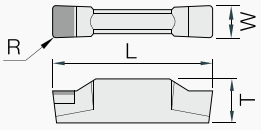
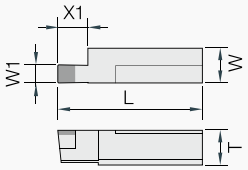
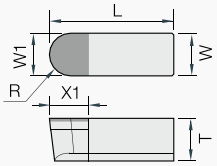
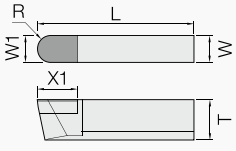
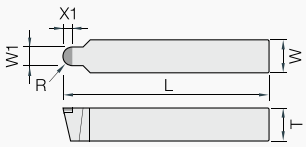
Holder : 145p

Customized design | Piston ring - PCD/ PCBN

Shape	Item No.	Dimensions (mm)						PCD			PCBN	
		W	T	L	R	V1	V2	EP13	EP750	EP59	EB51	EB710
GC type 												
GR type 												
GL type 												
1Side Taper type 												
2Side Taper type 												

Please specify the workpiece, W, W1, R, L, T and V.

Customized design | Others - PCD/ PCBN

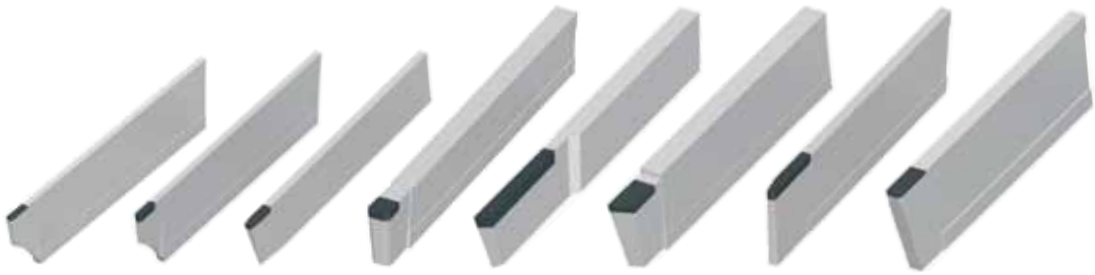
Shape	Dimensions (mm)						PCD			PCBN			
	W	W1	R	X1	L	T	EP20	EP55	EP750	EB28X	EB570	EB190	EB51
													
													
													
													
													
													
													
													

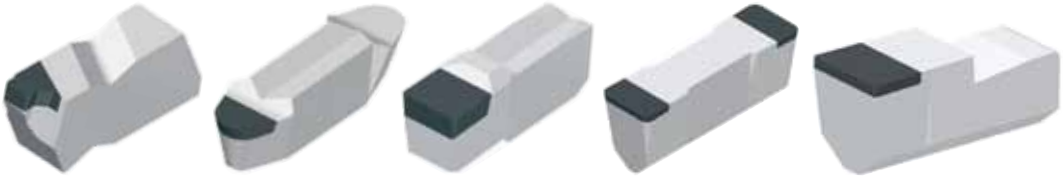
Please specify the workpiece, W, W1, R, X1, L and T.

Grooving/ Parting

Customized design | PCD/ PCBN

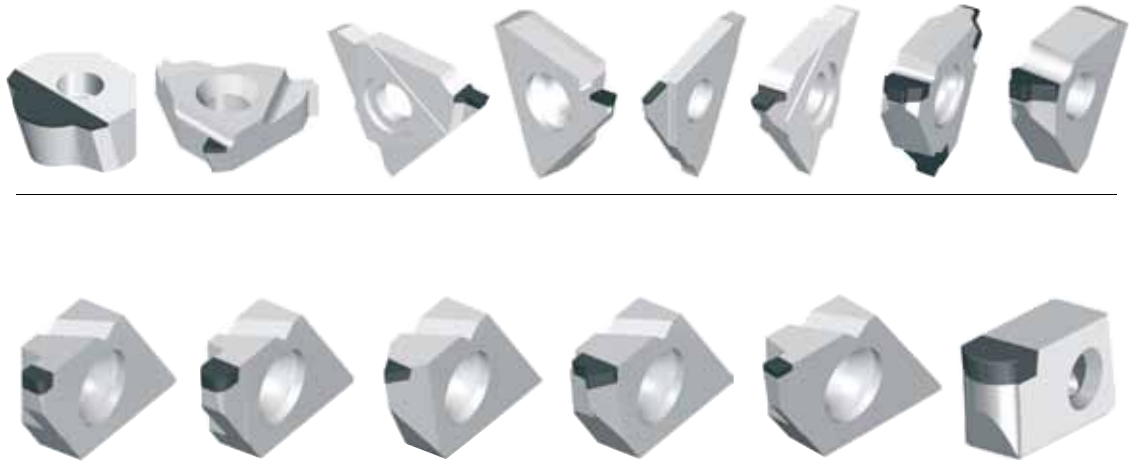
- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.

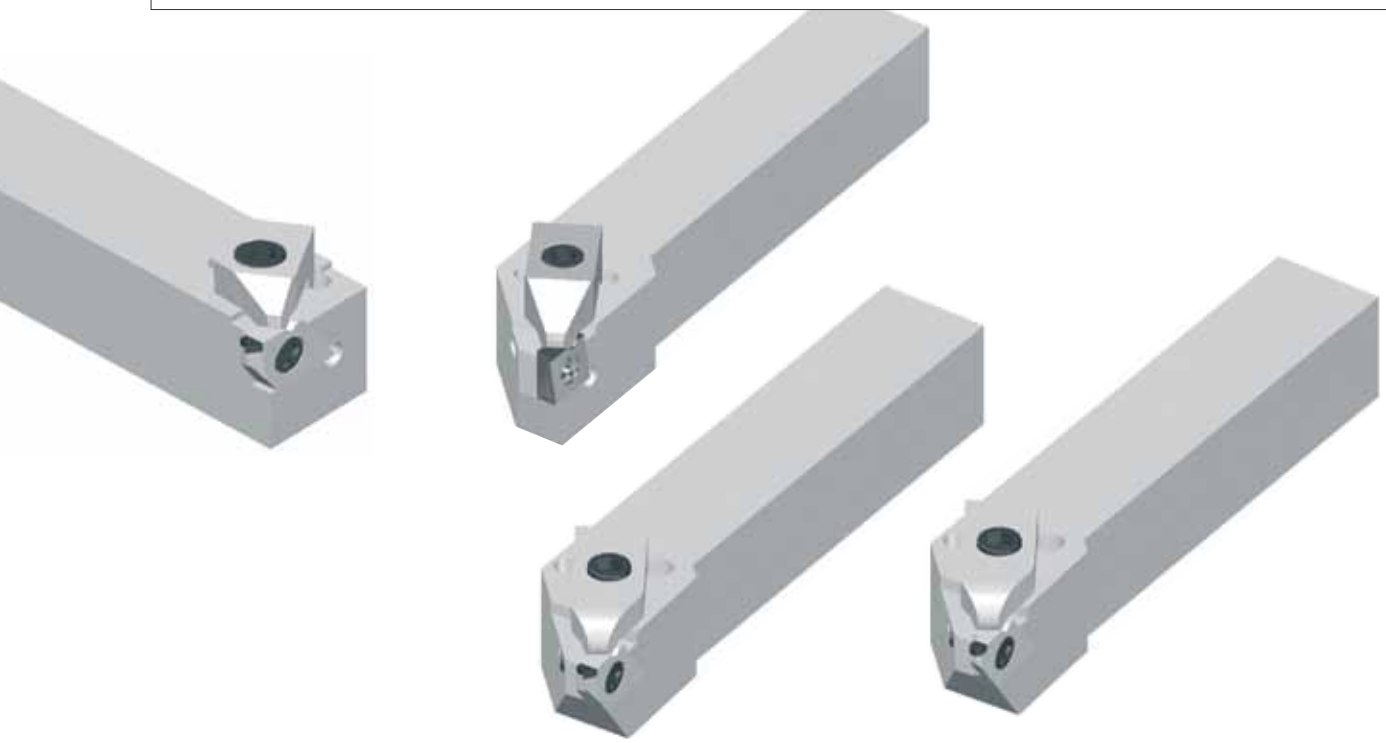




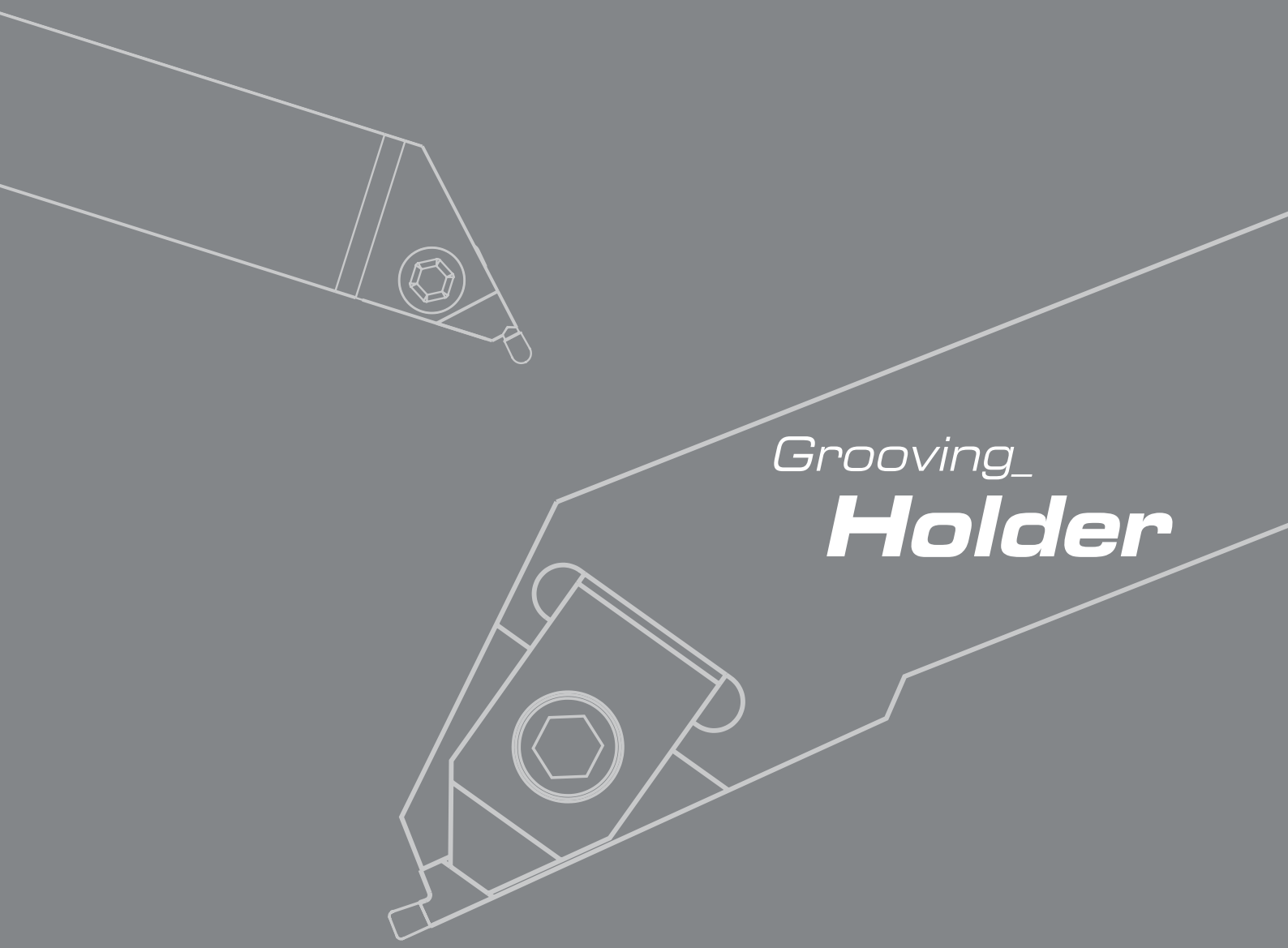
Customized design | PCD/ PCBN

- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.



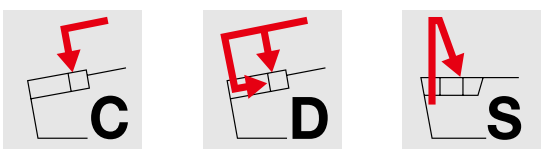


MEMO



Grooving_ Holder

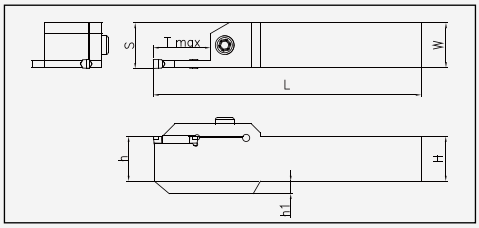
How to combine the holder



C Clamp on clamping (ESG Type)
D Double clamping (EDG Type)
S Screw clamping (ETG, EMG Type)

ESEH R/L

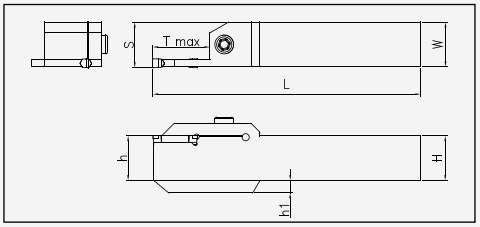
+ ESG(R,X)□□



Insert	Item No.	Dimensions (mm)						Clamp Screw	Wrench
		H	W	L	S	H1	Tmax		
ES□20□□	ESEH-R/L 1212-2-T08	12	12	100	12.2		8	HCR0512	W40L
	ESEH-R/L 1616-2-T08	16	16	100	16.2		8		
	ESEH-R/L 2020-2-T08	20	20	125	20.2		8		
	ESEH-R/L 2525-2-T08	25	25	150	25.2		8		
	ESEH-R/L 1616-2-T12	16	16	100	16.2		12		
	ESEH-R/L 2020-2-T12	20	20	125	20.2		12		
	ESEH-R/L 2525-2-T12	25	25	150	25.2		12		
	ESEH-R/L 1616-2-T17	16	16	100	16.2		17		
	ESEH-R/L 2020-2-T17	20	20	125	20.2		17		
	ESEH-R/L 2525-2-T17	25	25	150	25.2		17		
ES□30□□	ESEH-R/L 1616-3-T10	16	16	100	16.4		10	HCR0512	W40L
	ESEH-R/L 2020-3-T10	20	20	125	20.4		10		
	ESEH-R/L 2525-3-T10	25	25	150	25.4		10		
	ESEH-R/L 3232-3-T10	32	32	170	32.4		10		
	ESEH-R/L 1616-3-T13	16	16	100	16.4		13		
	ESEH-R/L 2020-3-T13	20	20	125	20.4		13		
	ESEH-R/L 2525-3-T13	25	25	150	25.4		13		
	ESEH-R/L 1616-3-T20	16	16	100	16.4		20		
	ESEH-R/L 2020-3-T20	20	20	125	20.4		20		
	ESEH-R/L 2525-3-T20	25	25	150	25.4		20		
	ESEH-R/L 3232-3-T20	32	32	170	32.4		20		
	ESEH-R/L 2525-3-T25	25	25	150	25.4		25		
ES□40□□	ESEH-R/L 1616-4-T10	16	16	100	16.4		10	HCR0616	W50L
	ESEH-R/L 2020-4-T10	20	20	125	20.4		10		
	ESEH-R/L 2525-4-T10	25	25	150	25.4		10		
	ESEH-R/L 3232-4-T10	32	32	150	32.4		10		
	ESEH-R/L 1616-4-T15	16	16	100	16.4		15		
	ESEH-R/L 2020-4-T15	20	20	125	20.4		15		
	ESEH-R/L 2525-4-T15	25	25	150	25.4		15		
	ESEH-R/L 1616-4-T20	16	16	100	16.4		20		
	ESEH-R/L 2020-4-T20	20	20	125	20.4		20		
	ESEH-R/L 2525-4-T20	25	25	150	25.4		20		
	ESEH-R/L 3232-4-T20	32	32	170	32.4		20		
	ESEH-R/L 1616-4-T25	16	16	100	16.4		25		
	ESEH-R/L 2020-4-T25	20	20	125	20.4		25		
	ESEH-R/L 2525-4-T25	25	25	150	25.4		25		

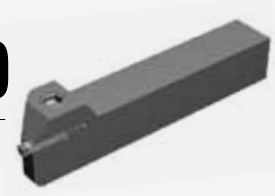
ESEH R/L

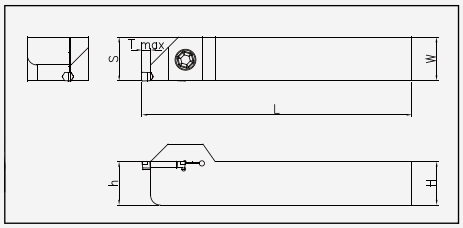
+ ESG(R,X)□□



Insert	Item No.	Dimensions (mm)						Clamp Screw	Wrench
		H	W	L	S	H1	Tmax		
ES□50□□	ESEH-R/L 2020-5-T12	20	20	125	20.5		12	HCR0616	W50L
	ESEH-R/L 2525-5-T12	25	25	150	25.5		12		
	ESEH-R/L 2020-5-T15	20	20	125	20.55		15		
	ESEH-R/L 2525-5-T15	25	25	150	25.55		15		
	ESEH-R/L 3232-5-T15	32	32	170	32.55		15		
	ESEH-R/L 2020-5-T20	20	20	125	20.5		20		
	ESEH-R/L 2525-5-T20	25	25	150	25.5		20		
	ESEH-R/L 3232-5-T20	32	32	170	32.5		20	HCR0620	W50L
	ESEH-R/L 2525-5-T32	25	25	150	25.5	7	32		
ES□60□□	ESEH-R/L 2020-6-T12	20	20	125	20.5		12	HCR0616	W50L
	ESEH-R/L 2525-6-T12	25	25	150	25.5		12		
	ESEH-R/L 2525-6-T15	25	25	150	25.55		15		
	ESEH-R/L 3232-6-T15	32	32	170	32.55		15		
	ESEH-R/L 2020-6-T20	20	20	125	20.5		20		
	ESEH-R/L 2525-6-T20	25	25	150	25.5		20		
	ESEH-R/L 3232-6-T20	32	32	170	32.5		20	HCR0620	W50L
	ESEH-R/L 2525-6-T32	25	25	150	25.5	7	32		
ES□80□□	ESEH-R/L 2525-8-T16	25	25	150	26		16	HCR0616	W50L
	ESEH-R/L 3232-8-T16	32	32	170	33.05		16		
	ESEH-R/L 2525-8-T25	25	25	150	26		25		
	ESEH-R/L 3232-8-T25	32	32	170	33		25		
	ESEH-R/L 2525-8-T36	25	25	150	26	7	36	HCR0620	W50L
	ESEH-R/L 3232-8-T36	32	32	170	33		36		

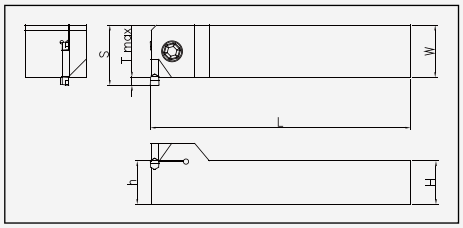
ESEH$^{R}/_{L}$-T00 + ESG(R,X)□□





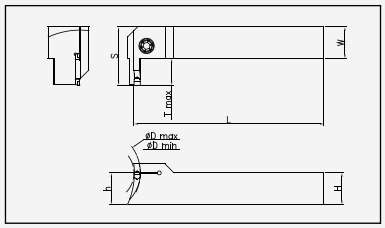
Insert	Item No.	Dimensions (mm)						Clamp Screw	Wrench
		H	W	L	S	ΦD MIN	Tmax		
ES□30□□	ESEH-R/L 1616-3-T00	16	16	100	16.4	80	4.8	HCR0512	W40L
	ESEH-R/L 2020-3-T00	20	20	125	20.4	80	4.8		
	ESEH-R/L 2525-3-T00	25	25	150	25.4	80	4.8		
ES□40□□	ESEH-R/L 1616-4-T00	16	16	100	16.4	80	4.8	HCR0616	W50L
	ESEH-R/L 2020-4-T00	20	20	125	20.4	80	4.8		
	ESEH-R/L 2525-4-T00	25	25	150	25.4	80	4.8		
ES□60□□	ESEH-R/L 2020-6-T00	20	20	125	20.5	80	6.0	HCR0616	W50L
	ESEH-R/L 2525-6-T00	25	25	150	25.5	80	6.0		

ESEV $^{R}/_{L}$ + ESG(R,X)□□



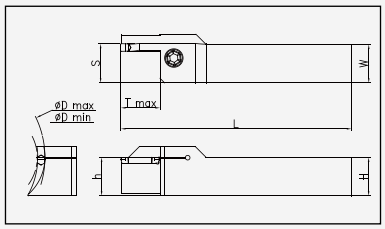
Insert	Item No.	Dimensions (mm)						Clamp Screw	Wrench
		H	W	L	S	ΦD MIN	Tmax		
ES□20□□	ESEV-R/L 2020-2-T00	20	20	125	23.5	120	3	HCR0512	W40L
	ESEV-R/L 2525-2-T00	25	25	150	28.5	120	3		
	ESEV-R/L 3232-2-T00	32	32	170	35.5	120	3		
ES□30□□	ESEV-R/L 2020-3-T00	20	20	125	25	80	4.8		
	ESEV-R/L 2525-3-T00	25	25	150	30	80	4.8		
	ESEV-R/L 3232-3-T00	32	32	170	37	80	4.8		
ES□40□□	ESEV-R/L 2020-4-T00	20	20	125	25	80	4.8	HCR0616	W50L
	ESEV-R/L 2525-4-T00	25	25	150	30	80	4.8		
	ESEV-R/L 3232-4-T00	32	32	170	37	80	4.8		
ES□50□□	ESEV-R/L 2020-5-T00	20	20	125	29.5	60	5		
	ESEV-R/L 2525-5-T00	25	25	150	31.5	60	5		
	ESEV-R/L 3232-5-T00	32	32	170	38.5	60	5		
ES□60□□	ESEV-R/L 2020-6-T00	20	20	125	26.5	60	6		
	ESEV-R/L 2525-6-T00	25	25	150	31.5	80	6		
	ESEV-R/L 3232-6-T00	32	32	170	38.5	60	6		
ES□80□□	ESEV-R/L 2525-8-T00	25	25	150	33.5	50	8		
	ESEV-R/L 3232-8-T00	32	32	170	38.5	50	8		

ESFV R/L + ESG(R,X)□□



Insert	Item No.	Dimensions (mm)							Clamp Screw	Wrench
		H	W	L	S	Tmax	ΦD MIN	ΦD MAX		
ES□40□□	ESFV-R/L 425-44/70-T20	25	25	150	45.5	20	44	70	HCR0616	W50L
	ESFV-R/L 425-60/120-T20	25	25	150	45.5	20	60	120		
	ESFV-R/L 425-112/200-T20	25	25	150	45.5	20	112	200		

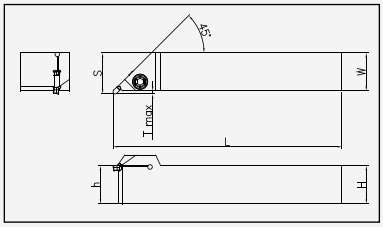
ESFH R/L + ESG(R,X)□□



Insert	Item No.	Dimensions (mm)							Clamp Screw	Wrench
		H	W	L	S	Tmax	ΦD MIN	ΦD MAX		
ES□30□□	ESFH-325-34/50-T10	25	25	150	25.5	10	34	50	HCRL0512	W40L
	ESFH-325-44/70-T15	25	25	150	25.5	15	44	70		
	ESFH-325-64/100-T15	25	25	150	25.5	15	64	100		
ES□40□□	ESFH-425-40/60-T10	25	25	150	25.5	10	40	60	HCR0616	W50L
	ESFH-425-44/70-T20	25	25	150	25.5	20	44	70		
	ESFH-425-84/92-T20	25	25	150	25.5	20	84	92		
	ESFH-425-60/120-T20	25	25	150	25.5	20	60	120		
	ESFH-425-112/200-T20	25	25	150	25.5	20	112	200		
ES□50□□	ESFH-525-190/220-T10	25	25	150	25.5	10	190	200	HCR0616	W50L
ES□60□□	ESFH-625-170/190-T10	25	25	150	25.5	10	170	190	HCR0616	W50L
	ESFH-625-190/220-T10	25	25	150	25.5	10	190	200		

ESEU R/L

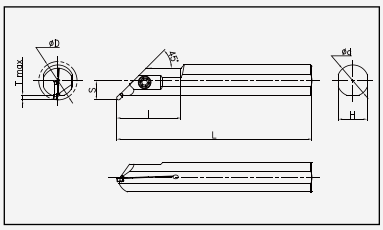
+ ESG(R,X)□□



Insert	Item No.	Dimensions (mm)					Clamp Screw	Wrench
		H	W	L	S	Tmax		
ES□30□□	ESEU-R/L 2020-3	20	20	125	23	3	HCR0616	W50L
	ESEU-R/L 2525-3	25	25	150	28	3		
	ESEU-R/L 3232-3	32	32	170	35	3		
ES□40□□	ESEU-R/L 2020-4	20	20	125	23	3		
	ESEU-R/L 2525-4	25	25	150	28	3		
	ESEU-R/L 3232-4	32	32	170	35	3		
ES□50□□	ESEU-R/L 2020-5	20	20	125	24	4		
	ESEU-R/L 2525-5	25	25	150	29	4		
	ESEU-R/L 3232-5	32	32	170	36	4		
ES□60□□	ESEU-R/L 2020-6	20	20	125	24	4		
	ESEU-R/L 2525-6	25	25	150	29	4		
	ESEU-R/L 3232-6	32	32	170	36	4		
ES□80□□	ESEU-R/L 2525-8	25	25	150	30	5		
	ESEU-R/L 3232-8	32	32	170	37	5		

ESIU R/L

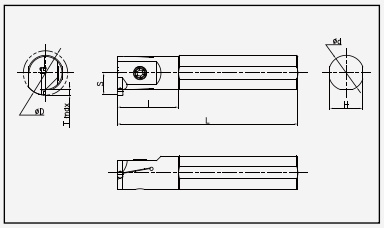
+ ESG(R,X)□□



Insert	Item No.	Dimensions (mm)							Clamp Screw	Wrench
		ΦD	Φd	L	l	Tmax	H	S		
ES□30□□	ESIU-R/L 3520-3	35	20	150	45	3.5	18	13	HCR0512	W40L
	ESIU-R/L 4025-3	40	25	200	45	3.5	23	15.5		
	ESIU-R/L 5032-3	50	32	250	65	3.5	30	19		
ES□40□□	ESIU-R/L 3520-4	35	20	150	45	3.5	18	13		
	ESIU-R/L 4025-4	40	25	200	45	3.5	23	15.5		
	ESIU-R/L 5032-4	50	32	250	65	3.5	30	19		
ES□50□□	ESIU-R/L 4025-5	40	25	200	45	3.5	23	15.5	HCR0616	W50L
	ESIU-R/L 5032-5	50	32	250	65	3.5	30	19	HCR0620	
ES□60□□	ESIU-R/L 4025-6	40	25	200	45	3.5	23	19	HCR0616	
	ESIU-R/L 5032-6	50	32	250	65	3.5	30	19	HCR0620	
ES□80□□	ESIU-R/L 4025-8	40	25	200	45	6.5	23	15.5	HCR0616	
	ESIU-R/L 5032-8	50	32	250	65	6.5	30	19	HCR0620	

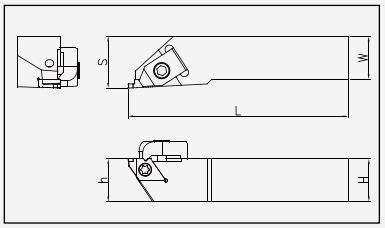
ESIV R/L

+ ESG(R,X)□□



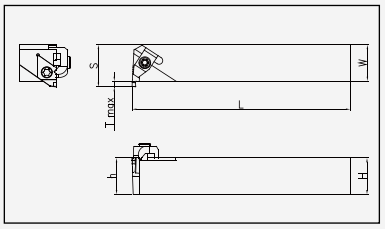
Insert	Item No.	Dimensions (mm)							Clamp Screw	Wrench
		ΦD	Φd	L	l	Tmax	H	S		
ES□20□□	ESIV-R/L 2516-2	25	16	125	35	6.5	15	14	HCR0410	W20L
	ESIV-R/L 2520-2	25	20	150	45	6.5	18	15.5	HCR0512	W30L
	ESIV-R/L 3225-2	32	25	200	45	7	23	19	HCR0410	W40L
ES□30□□	ESIV-R/L 2520-3	25	20	150	45	6.5	18	15.5	HCR0410	W30L
	ESIV-R/L 3225-3	32	25	200	45	7	23	19	HCR0512	W40L
	ESIV-R/L 4032-3	40	32	250	55	7.5	30	22.5	HCR0616	W50L
ES□40□□	ESIV-R/L 2520-4	25	20	150	45	6.5	18	15.5	HCRL0410	W30L
	ESIV-R/L 3225-4	32	25	200	45	7	23	19	HCRL0512	W40L
	ESIV-R/L 4032-4	40	32	250	55	7.5	30	22.5	HCR0616	W50L
ES□50□□	ESIV-R/L 3225-5	32	25	200	45	7.5	23	19.5	HCRL0512	W40L
	ESIV-R/L 4032-5	40	32	250	55	8.5	30	23.5	HCR0616	W50L
ES□60□□	ESIV-R/L 3225-6	32	25	200	45	7.5	23	19.5	HCRL0512	W40L
	ESIV-R/L 4032-6	40	32	250	55	8.5	30	23.5	HCR0616	W50L
ES□80□□	ESIV-R/L 4032-8	40	32	250	55	8.5	30	23.5	HCR0616	W50L
	ESIV-R/L 4540-8	45	40	300	70	8.5	37	26.5	HCR0616	W50L

EDEH R/L + EDG(R,X)□□



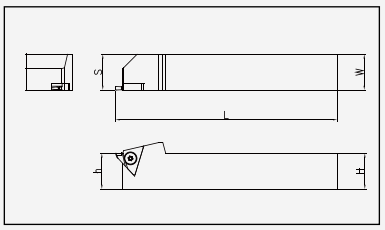
Insert	Item No.	Dimensions (mm)					Clamp	Clamp Screw	Screw	Wrench
		T	W	L	S	H				
EDG□□□□	**EDEH-R/L 2525-T00**	25	25	130	30	25	DCG4	HCRL0512	SCRL0512	W30L, T20L

EDEV R/L + EDG(R,X)□□



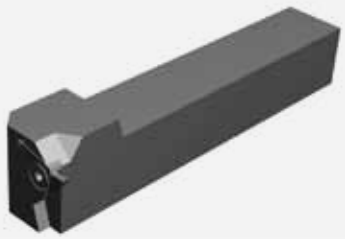
Insert	Item No.	Dimensions (mm)						Clamp	Clamp Screw	Screw	Wrench
		T	W	L	S	ΦD MIN	Tmax				
ED□15□□	**EDEV-R/L 2525-1.5-T00**	25	25	150	28	120	2.6	DCG4	HCRL0512	SCRL0512	W30L, T20L
	EDEV-R/L 3232-1.5-T00	32	32	170	35	120	2.6				
ED□20□□	**EDEV-R/L 2020-2-T00**	20	20	125	23.5	120	3				
	EDEV-R/L 2525-2-T00	25	25	150	28.5	120	3				
	EDEV-R/L 3232-2-T00	32	32	170	35.5	120	3				
ED□30□□	**EDEV-R/L 2020-3-T00**	20	20	125	25	80	4.5				
	EDEV-R/L 2525-3-T00	25	25	150	30	80	4.5				
	EDEV-R/L 3232-3-T00	32	32	170	37	80	4.5				
ED□40□□	**EDEV-R/L 2020-4-T00**	20	20	125	25	80	4.5				
	EDEV-R/L 2525-4-T00	25	25	150	30	80	4.5				
	EDEV-R/L 3232-4-T00	32	32	170	37	80	4.5				

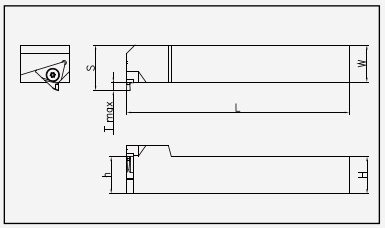
ETEH R/L + ETG(R,X) □□



Insert	Item No.	Dimensions (mm)					Screw	Wrench
		T	W	L	S	H		
ETG □□□□	**ETEH R/L 2525-T00**	25	25	130	30	25	SCR0511	T20L

ETEV R/L + ETG(R,X) □□



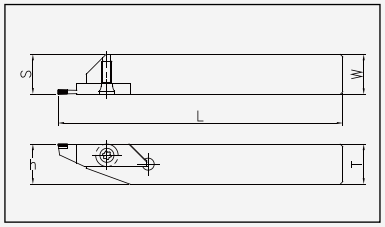


Insert	Item No.	Dimensions (mm)						Clamp Screw	Wrench
		T	W	L	S	ΦD MIN	Tmax		
ED□15□□	**EDEV-R/L 2525-1.5-T00**	25	25	150	28.5	120	3	SCRL0511	T20L
	EDEV-R/L 3232-1.5-T00	32	32	170	35.5	120	3		
ED□20□□	**EDEV-R/L 2020-2-T00**	20	20	125	24	120	3.5		
	EDEV-R/L 2525-2-T00	25	25	150	29	120	3.5		
	EDEV-R/L 3232-2-T00	32	32	170	36	120	3.5		
ED□30□□	**EDEV-R/L 2020-3-T00**	20	20	125	25	80	4.5		
	EDEV-R/L 2525-3-T00	25	25	150	30	80	4.5		
	EDEV-R/L 3232-3-T00	32	32	170	37	80	4.5		
ED□40□□	**EDEV-R/L 2020-4-T00**	20	20	125	25	80	4.5		
	EDEV-R/L 2525-4-T00	25	25	150	30	80	4.5		
	EDEV-R/L 3232-4-T00	32	32	170	37	80	4.5		

EMG Type (PCD/PCBN)

EMEH R/L

+ **EMG**(X) □□



Insert	Item No.	Dimensions (mm)					Screw	Wrench
		T	W	L	S	H		
EMG□□□□	**EMEH-R/L 1010-T00**	10	10	100	10	10	SCR02565	T07P

Milling

We are dedicated to designing and developing special milling cutters and indexable inserts for machining work-pieces that range from easy-to-machine to difficult-to-machine

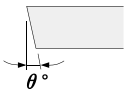
_ Design of insert and cutter for maximized productivity
_ Available in various grades such as ultra-fine, fine, medium, coarse and multi-modal to machine all material types
_ Guaranteed increased tool life and enhanced wear resistance
_ Economical, consistent, and reliable performance
_ Re-sharpening & re-tipping help the tools extend their total tool life and reduce the tool cost

Designation system | unit : metric

Insert shape

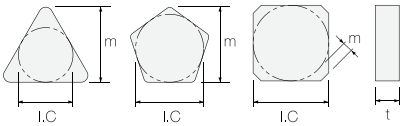
Symbol	Shape
A	
B	
C	
H	
L	
O	
P	
R	
S	
T	
W	
X	Special

Clearance angle



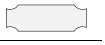
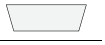
Symbol	Angle
N	0°
A	3°
B	5°
C	7°
P	11°
D	15°
E	20°
F	25°
G	30°

Tolerances



Class	I.C size (mm)	Tolerance m (mm)	t (mm)	I.C (mm)
A	6.35 9.525 12.7 15.875 19.05	±0.025	±0.025	±0.025
C		±0.025	±0.025	±0.025
G		±0.13	±0.13	±0.025
H		±0.025	±0.025	±0.013
K		±0.025	±0.025	±0.05~±0.15
M		±0.13	±0.13	±0.05~±0.15
U		±0.13	±0.13	±0.08~±0.25

Clamp type

Symbol	Shape
A	
F	
G	
M	
N	
R	
T	
W	
X	Special

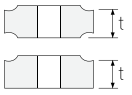
12 03 08 ED T (R)

1 2

Cutting edge length

C	R,S	T	H	O	I.C size (mm)
		09			5.56
06	06	11			6.35
08		13			7.94
09	09	16			9.525
12	12	22		05	12.7
16	15	27	09		15.875
				07	17.94
19	19	33	10		19.05
25	25				25.4

Thickness

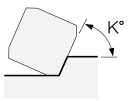


Symbol	t (mm)
01	1.59
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35
07	7.94
09	9.52

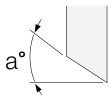
Corner radius

Symbol	R (mm)
00	Sharp
02	0.2
04	0.4
05	0.5
08	0.8
10	1.0
12	1.2
15	1.5
16	1.6
24	2.4
32	3.2
40	4.0

Parallel land



Entering angle	
A	45°
D	60°
E	75°
F	85°
P	90°
Z	Special

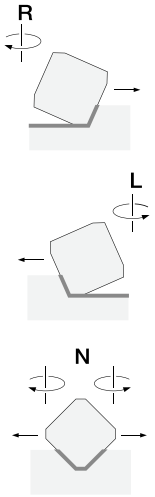


Clearance angle of land	
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
Z	Special

1 Edge shape

Symbol	Shape
F	
E	
T	
S	

2 Cutting direction

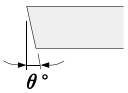


Designation system | unit : inch

Insert shape

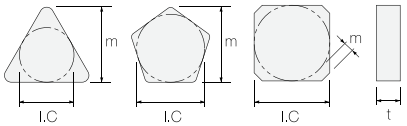
Symbol	Shape
A	85°
B	82°
C	80°
H	120°
L	
O	135°
P	108°
R	
S	
T	
W	80°
X	Special

Clearance angle



Symbol	Angle
N	0°
A	3°
B	5°
C	7°
P	11°
D	15°
E	20°
F	25°
G	30°

Tolerances



Class	I.C size (inch)	Tolerance m (inch)	t (inch)	I.C (inch)
A	6.35 9.525 12.7 15.875 19.05	±0.0002	±0.001	±0.001
C		±0.0005	±0.001	±0.001
G		±0.001	±0.005	±0.001
H		±0.0005	±0.001	±0.0005
K		±0.0005	±0.001	±0.002~±0.006
M		±0.003~±0.008	±0.005	±0.002~±0.006
U		±0.005~±0.015	±0.005	±0.003~±0.001

Clamp type

Symbol	Shape
A	
F	
G	
M	
N	
R	
T	
W	
X	Special

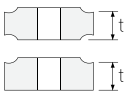
Milling

4 2 2 ED T (R)

1 2

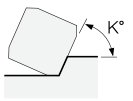
Cutting edge length | **Thickness** | **Corner radius** | **Parallel land**

C	R,S	T	H	O	Symbol	I.C size (inch)
		9			1.8	7/23
06	06	11			2	1/4
09	09	16			3	3/8
12	12	22		05	4	½
16	15	27	09		5	5/8
19	19	33	10		6	¾
25	25				8	1
					10	1-1/4

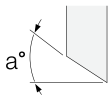


Symbol	t (inch)
1	1/16
1.5	3/32
2	1/8
2.5	5/32
3	3/16
3.5	7/32
4	1/4
5	5/16
6	3/8

Symbol	R (inch)
0	Sharp
1	1/64
2	1/32
3	3/64
4	1/16
6	3/32
8	1/8



Entering angle	
A	45°
D	60°
E	75°
F	85°
P	90°
Z	Special

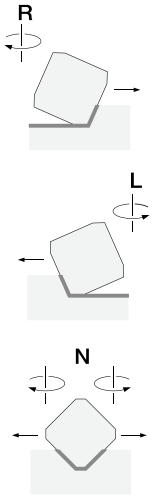


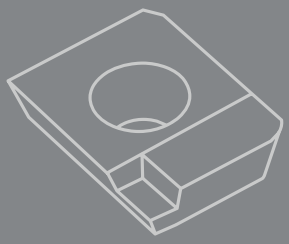
Clearance angle of land	
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
Z	Special

1 Edge shape

Symbol	Shape
F	
E	
T	
S	

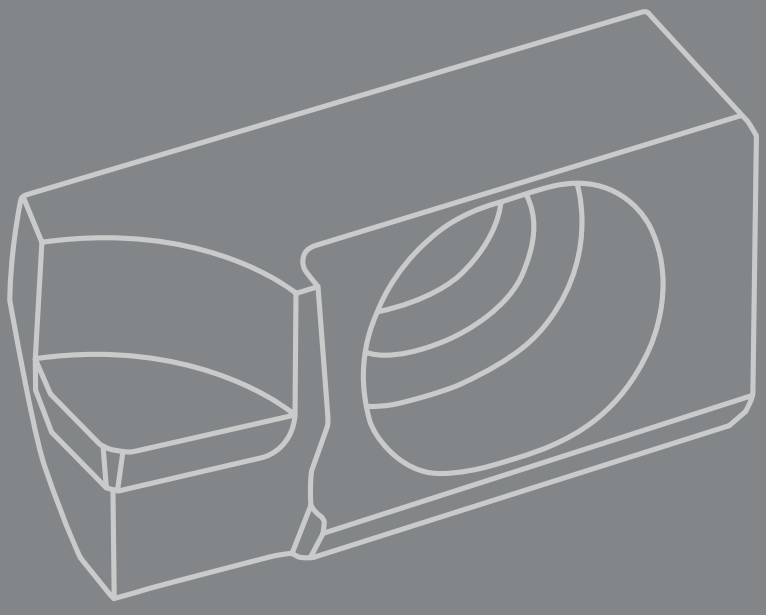
2 Cutting direction



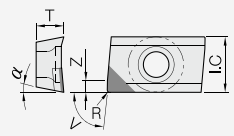


*Milling_*

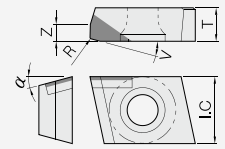
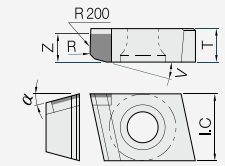
PCD



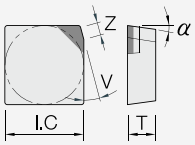
APKT

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**APKT** 1604PDFR		9.525	2	11			4.76								

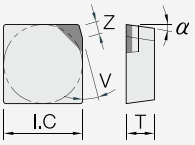
CDEW

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**CDEW** 1204R-R		12.7	2.4	15	15	-	4.76								
	**CDEW** 1204R-F		12.7	4.5	15	15	200	4.76								

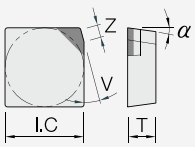
SPGN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**SPGN** 1203EDR	**SPGN** 42EDR	12.7	1.4	11	15		3.18								
	1203EDL	42EDL	12.7	1.4	11	15		3.18								
	1504EDR	53EDR	15.875	1.4	11	15		3.18								

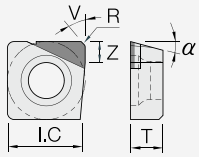
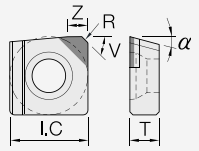
SEGN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**SEGN** 1203AFN	**SEGN** 42AFN	12.7	2	20	45		3.18								
	1203EFR	42EFR	12.7	2	20	15		3.18								
	1504AFN	53AFN	15.875	2	20	45		4.76								
	1504EFR	53EFR	15.875	2	20	15		4.76								

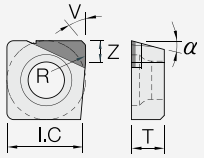
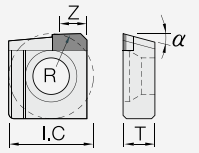
SFGN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**SFGN** 1203EFR	**SFGN** 42EFR	12.7	2	25	15		3.18								

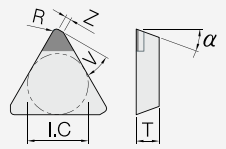
SNEW

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	NF-SNEW 09T3ADTR		9.525	2.35	15	45		3.97								
	09T3ADTR-R		9.525	2.35	15		0.5	3.97								
	NF-SNEW 1204AFTR		12.7	3.3	15	45		4.76								
	1204AFTR-R		12.7	3.3	15		1	4.76								

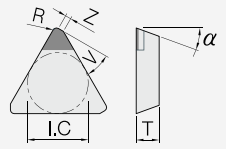
SNEW(W)

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	NF-SNEW 09T3ADTR-W		9.525	2.6	15	45	100	3.97								
	NF-SNEW 1204ADFR-W		12.7	5	15	45	300	4.76								

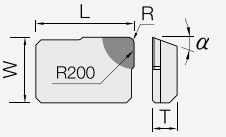
TPGN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**TPGN** 1603PDR	**TPGN** 32PDR	12.7	1.2	11	30		3.18								
	1603PDL	32PDL	12.7	1.2	11	30		3.18								
	2204PDR	43PDR	15.88	1.4	11	30		4.76								

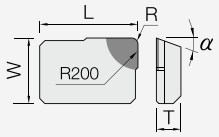
TEGN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**TEGN** 1603PER	**TEGN** 32PER	12.7	1.2	20	30	0.8	3.18								
	2204PER	43PER	15.88	1.4	20	30	0.8	4.76								

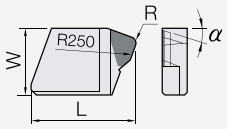
LDCN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	L	R	T	EP20	EP55	EP750	EP58	EP29			
	**LDCN** 190412R	**LDCN**	12.7		15	19.05	1.2	4.76								
	190412L		12.7		15	19.05	1.2	4.76								

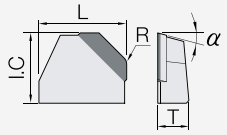
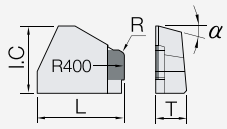
LFCN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	W	Z	α	L	R	T	EP20	EP55	EP750	EP58	EP29			
	**LFCN** 190412R	**LFCN**	12.7		25	19.05	1.2	4.76								
	190412L		12.7		25	19.05	1.2	4.76								

GDCN

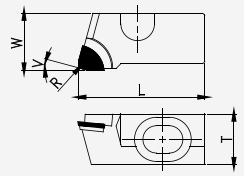
Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	W	Z	α	L	R	T	EP20	EP55	EP750	EP58	EP29			
	**GDCN** 2004PDFR	**GDCN**	12.7		15	20	1.2	4.76								
	2004PDFL		12.7		15	20	1.2	4.76								

YDEN

Shape	ISO code		Dimensions (mm)						PCD							
	Metric	Inch	I.C	Z	α	V	R	T	EP20	EP55	EP750	EP58	EP29			
	**YDEN** 1505ADFR		12.7		15	15.875	1.6	5.675								
	**YDEN** 1505ADFR-WD		12.28		15	15.925	0.8	5.675								

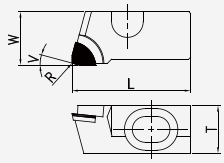
Cartridge_ SD type

SDR



Item No.	Dimensions (mm)					PCD							
	W	V	L	R	T	EP20	EP55	EP750	EP58	EP29			
SDR	13.5	15	30		12								
SDR-A	13.5	0	30		12								
SDR-R	13.5	15	30	0.4	12								
SDR-ES	13.5	15	30		12								

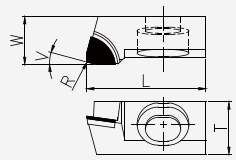
SDW



Item No.	Dimensions (mm)				PCD							
	W	L	R	T	EP20	EP55	EP750	EP58	EP29			
SDW	13	30	400	12								
SDW-ES	13	30	400	12								

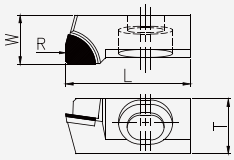
Cartridge_ High feed type

HFR



Item No.	Dimensions (mm)					PCD							
	W	V	L	R	T	EP20	EP55	EP750	EP58	EP29			
HFR	10	15	25		11								
HFR-A	10	0	25		11								
HFR-R	10	15	25	0.4	11								
HFR-ES	10	15	25		11								

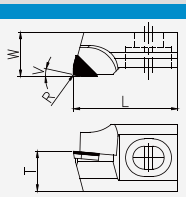
HFW

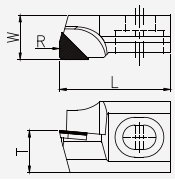


Item No.	Dimensions (mm)				PCD							
	W	L	R	T	EP20	EP55	EP750	EP58	EP29			
HFW	9.8	25	400	11								
HFW-ES	9.8	25	400	11								

SDR : standard face milling rough
SDR-A : corner milling rough
SDR-R : standard face milling rough with nose radius
SDR-ES : rough with edge hone
SDW : standard face milling wiper
SDW-ES : wiper with edge hone
CFR : CF milling rough
CFW : CF milling wiper

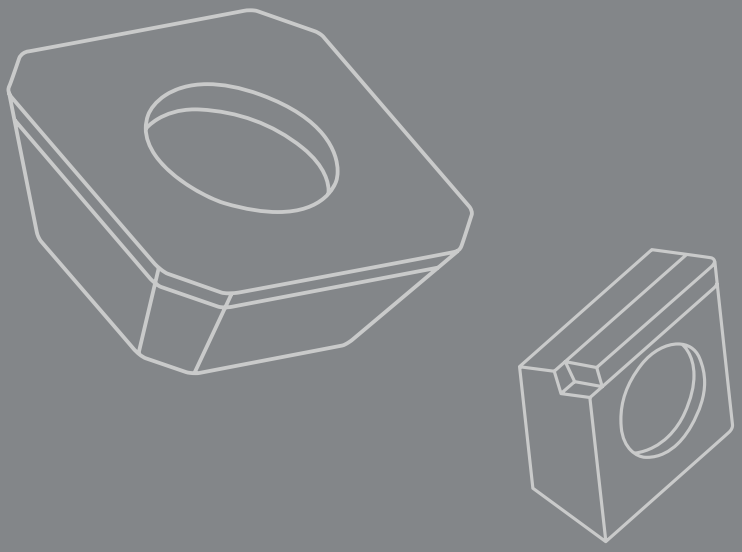
Cartridge_ CF type

CFR	Item No.	Dimensions (mm)					PCD							
		W	V	L	R	T	EP20	EP55	EP750	EP58	EP29			
	CFR	10.5	15	25		10								
	CFR-A	10.5	0	25		10								
	CFR-R	10.5	15	25	0.4	10								
	CFR-ES	10.5	15	25		10								

CFW	Item No.	Dimensions (mm)				PCD							
		W	L	R	T	EP20	EP55	EP750	EP58	EP29			
	CFW	10	25	400	10								
	CFW-ES	10	25	400	10								

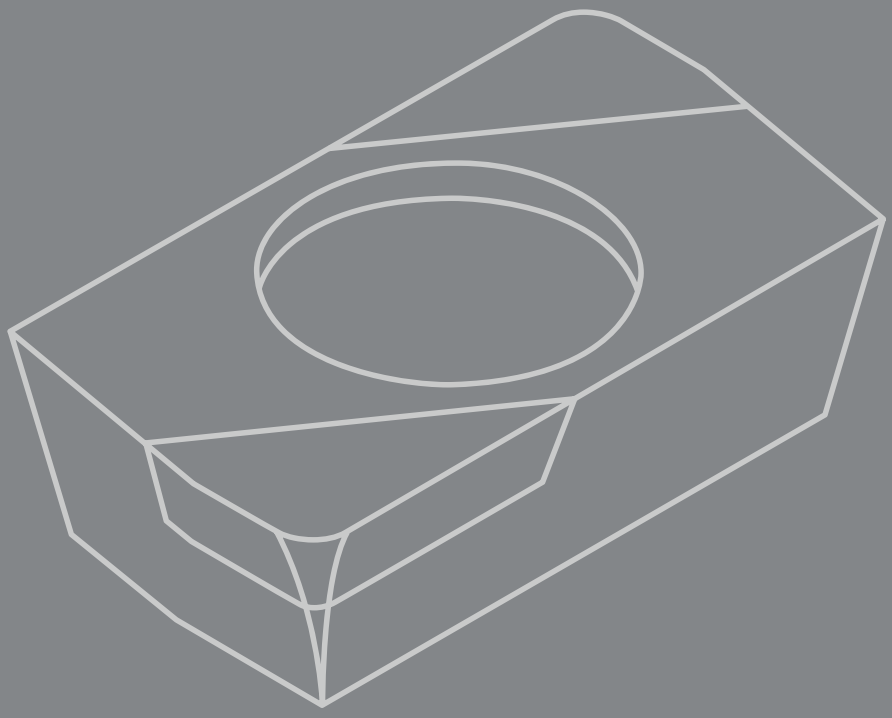
Customized design

- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.

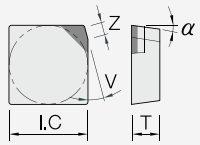


*Milling_*

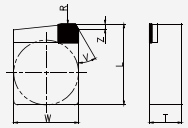
PCBN



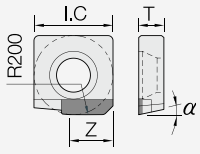
SPGN

Shape	ISO code		Dimensions (mm)						PCBN					
	Metric	Inch	I.C	Z	α	V	R	T	EB11	EB210	EB51	EB71	EB710	
	**SPGN** 1203EDR	**SPGN** 42EDR	12.7	1.4	11	15		3.18						
	1203EDL	42EDL	12.7	1.4	11	15		3.18						
	1504EDR	53EDR	15.9	1.4	11	15		3.18						

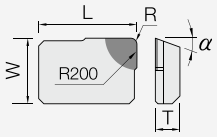
SNGN

Shape	ISO code		Dimensions (mm)						PCBN					
	Metric	Inch	W	Z	V	R	T	L	EB11	EB210	EB51	EB71	EB710	
	**SNGN** 1506APTR	**SNGN** 54APTR	12.7	2.5	30	250	6.35	15.875						
	1506APTL	54APTL	12.7	2.5	30	250	6.35	15.875						

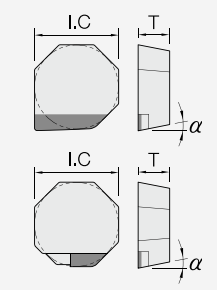
SNEW

Shape	ISO code		Dimensions (mm)						PCBN					
	Metric	Inch	I.C	Z	α	V	R	T	EB11	EB210	EB51	EB71	EB710	
	**SNEW** 09T3ADFR	**SNEW** 3(2.5)ADFR	9.525	2.6	15	45		3.97						
	1203ADTR	42ADTR	12.7	7	15	45	300	3.18						

LDCN

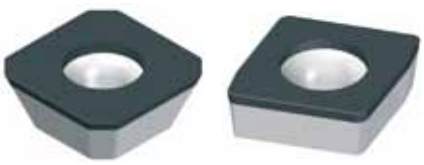
Shape	ISO code		Dimensions (mm)						PCBN					
	Metric	Inch	W	Z	α	L	R	T	EB11	EB210	EB51	EB71	EB710	
	**LDCN** 190412R		12.7		15	19.1	1.2	4.76						
	190412L		12.7		15	19.1	1.2	4.76						

OPHX

Shape	ISO code		Dimensions (mm)						PCBN					
	Metric	Inch	I.C	Z	α	V	R	T	EB11	EB210	EB51	EB71	EB710	
	**OPHX** 0504ZZN-R		12.7		11		-	4.76						
	0504ZZR		12.7		11		300	4.76						
	0504ZZL		12.7		11		300	4.76						

Customized design

- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.



*Milling_*

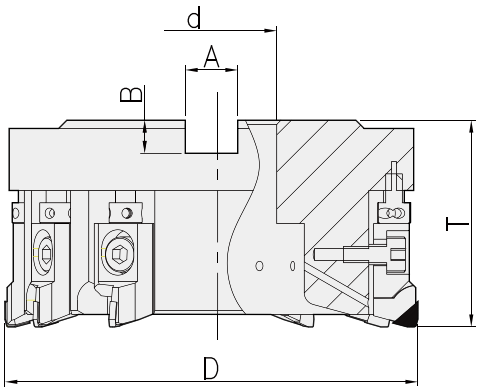
Cutter body_Aluminum

Aluminum body and special inserts designed for high- speed / high precision cutting.
The light weight body makes tool setting easy.

_ Easy setting with light aluminum body
(50% lighter than steel body)
_ Excellent milling performance and quality
Excellent durability and low cutting resistance
High productivity and process stability

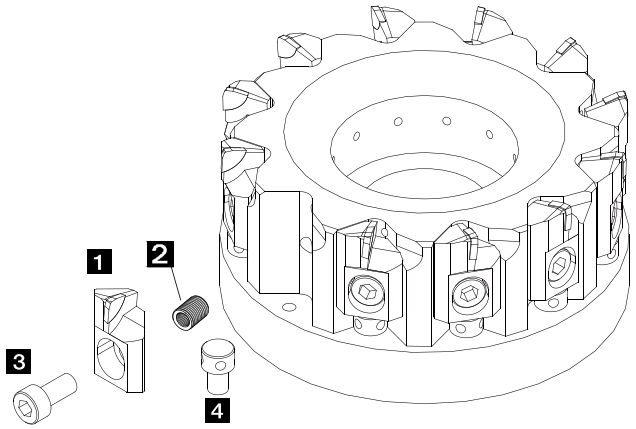
Cutter body_Aluminum & Steel

CF type



Item No.		Dimensions (mm)					Tooth		Weight	Cartridge	Arbor
Standard	High feed	ØD	Ød	A	B	T	standard	High feed	(kg)		
CF 08050-6R(L)	CF 08050-10R(L)	80	25.4	9.5	6	50	6	10	0.7	ROUGH CFR(R) CFR (L) WIPER CFW (R) CFW (L)	FMA 25.4
CF 10063-10R(L)	CF 10063-12R(L)	100	31.75	12.7	8	63	10	12	1.0		FMA 31.75
CF 12563-12R(L)	CF 12563-16R(L)	125	38.1	15.9	10	63	12	16	1.8		FMA 38.1
CF 16063-16R(L)	CF 16063-18R(L)	160	50.8	19.0	11	63	16	18	2.9		FMA 50.8
CF 20063-20R(L)	CF 20063-24R(L)	200	47.625	25.4	14	63	20	24	4.5		FMA 47.625
CF 25063-24R(L)	CF 25063-30R(L)	250	47.625	25.4	14	63	24	30	7.0		FMA 47.625

- Shoulder type cartridge can be offered by customer's demand.



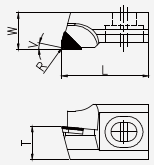
Spare parts

1 Cartridge (Rough)	1 Cartridge (Wiper)	2 Double Bolt	3 Clamp Bolt	4 Adjust Bolt	Coolant Bolt
CFR	CFW	M8M5-7	M5x12	M5x8	
					

- Every spare parts be offered by extra charge.

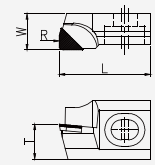
Cartridge_ CF type

CFR

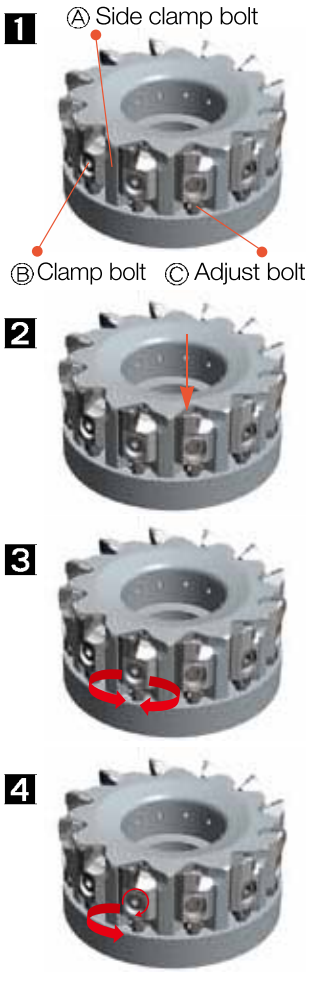


Item No.	Dimensions (mm)					PCD							
	W	V	L	R	T	EP20	EP55	EP750	EP58	EP29			
CFR	10.5	15	25		10								
CFR-A	10.5	0	25		10								
CFR-R	10.5	15	25	0.4	10								
CFR-ES	10.5	15	25		10								

CFW



Item No.	Dimensions (mm)				PCD							
	W	L	R	T	EP20	EP55	EP750	EP58	EP29			
CFW	10	25	400	10								



Setting manual

1. Installaion of cartridge

Install the Ⓒ Adjust bolt on the cutter body, and insert the cartridge. Then, gently tightening the Ⓑ Clamp bolt and Ⓐ Side clamp bolt.

2. Installaion of bolt

When tightening, secure the cartridge by pressing it downward. Then using a torque wrench. Temporarily tighten the clamp bolt and side clamp bolt to 3N.m using a torque wrench.

3. Cutting edge height adjustment

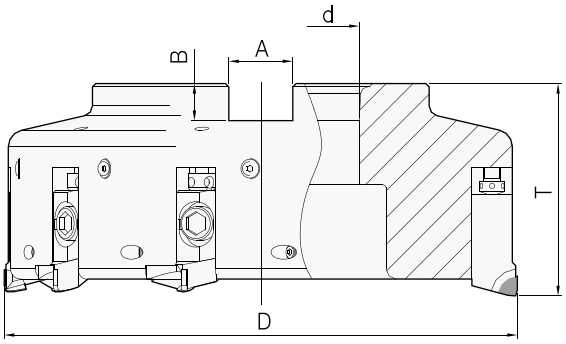
Turn the adjustment bolt and adjust so that the height of the front cutter is -10㎛ from the target value.

4. Final adjustment

Using a torque wrench, tighten the clamp bolt and side clamp bolt to 10N·m. After then turn the adjustment bolt, And adjust to the target height.

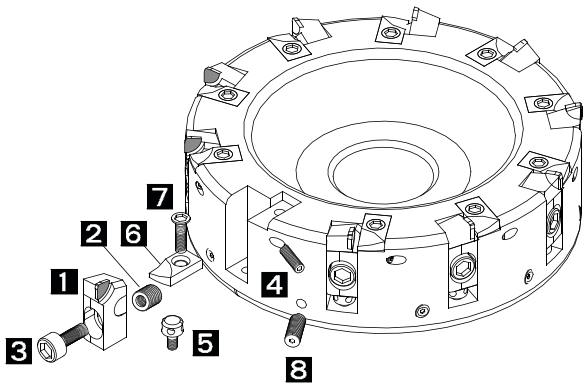
Cutter body_Aluminum & Steel

SD type



Item No. Inch type	Dimensions (mm) ØD	Ød	A	B	T	Tooth	Weight (kg)	Cartridge	Arbor
SD 08050-6R(L)	80	25.4	9.5	6	50	6	0.7	ROUGH SDR (R) SDR (L) WIPER SDW (R) SDW (L)	FMA 25.4
SD 10063-8R(L)	100	31.75	12.7	8	63	8	1.0		FMA 31.75
SD 12563-10R(L)	125	38.1	15.9	10	63	10	1.8		FMA 38.1
SD 16063-12R(L)	160	50.8	19.0	11	63	12	2.9		FMA 50.8
SD 20063-16R(L)	200	47.625	25.4	14	63	16	4.5		FMA 47.625
SD 25063-18R(L)	250	47.625	25.4	14	63	18	7.0		FMA 47.625

- Shoulder type cartridge can be offered by customer's demand.



Spare parts

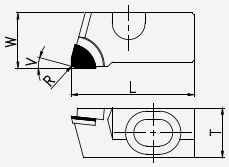
1 Cartridge (Rough) SDR	1 Cartridge (Wiper) SDW	2 Double Bolt M6xM10-8	3 Clamp Bolt M6x15	4 Side Clamp Bolt M6x10
				

5 Adjust Bolt M5x0.8	6 Chip Cover 4x9.5x18	7 Chip Cover Bolt M4x10	8 Balancing Bolt M6x10	Coolant Bolt
				

- Every spare parts be offered by extra charge.

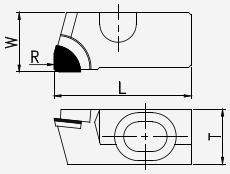
Cartridge_ SD type

SDR



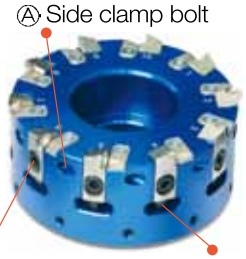
Item No.	Dimensions (mm)						PCD							
	W	V	α	L	R	T	EP20	EP55	EP750	EP58	EP29			
SDR	13.5	15	11	30		12								
SDR-A	13.5	0	11	30		12								
SDR-R	13.5	15	11	30	0.4	12								
SDR-ES (EDGE HONE)	13.5	15	11	30		12								

SDW



Item No.	Dimensions (mm)						PCD							
	W	Z	α	L	R	T	EP20	EP55	EP750	EP58	EP29			
SDW	13		11	30	400	12								
SDW-ES (EDGE HONE)	13		11	30	400	12								

1 Ⓐ Side clamp bolt



Ⓑ Clamp bolt Ⓒ Adjust bolt

2

3

4

Setting manual

1. Installaion of cartridge

Install the Ⓒ Adjust bolt on the cutter body, and insert the cartridge. After then, gently tightening the Ⓑ Clamp bolt and Ⓐ Side clamp bolt.

2. Installaion of bolt

When tightening, secure the cartridge by pressing it downward. And using a torque wrench, temporarily tighten the clamp bolt and side clamp bolt to 3N·m.

3. Cutting edge height adjustment

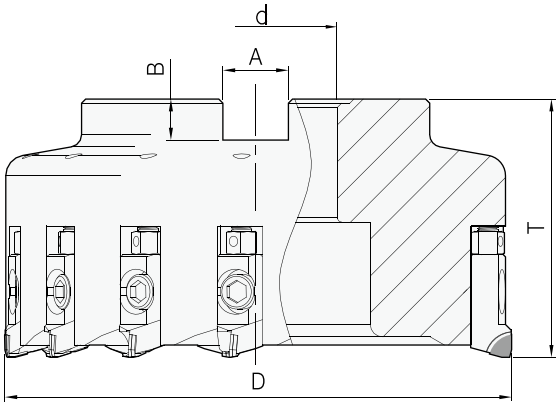
Turn the adjustment bolt and adjust so that the height of the front cutter is -10㎛ from the target value.

4. Final adjustment

Using a torque wrench, tighten the clamp bolt and Side clamp bolt to 10N·m. And turn the adjustment bolt, then adjust to the target height.

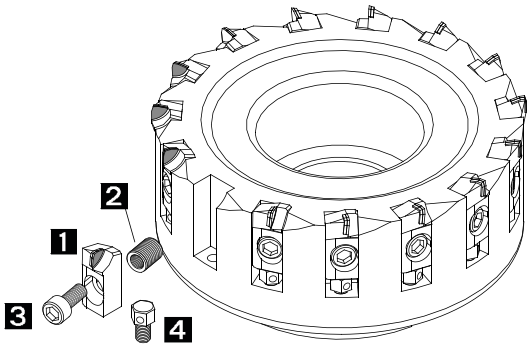
Cutter body_Aluminum & Steel

HF type



Item No. Inch type	Dimensions (mm) ØD	Ød	A	B	T	Tooth	Weight (kg)	Cartridge	Arbor
HF 08050-10R(L)	80	25.4	9.5	6	50	10	0.7	ROUGH HFR(R) HFR(L)	FMA 25.4
HF 10063-12R(L)	100	31.75	12.7	8	63	12	1.0		FMA 31.75
HF 12563-15R(L)	125	38.1	15.9	10	63	15	1.8		FMA 38.1
HF 16063-18R(L)	160	50.8	19.0	11	63	18	2.9	WIPER HFW(R) HFW(L)	FMA 50.8
HF 25063-24R(L)	200	47.625	25.4	14	63	24	4.5		FMA 47.625
HF 25063-30R(L)	250	47.625	25.4	14	63	30	7.0		FMA 47.625

- Shoulder type cartridge can be offered by customer's demand.



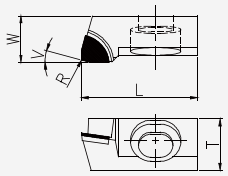
Spare parts

1 Cartridge (Rough) HFR	1 Cartridge (Wiper) HFW	2 Double Bolt M8M5-7	3 Clamp Bolt M5x12	4 Adjust Bolt M5x8	Coolant Bolt
					

- Every spare parts be offered by extra charge.

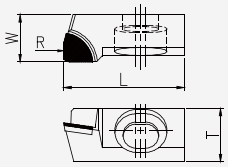
Cartridge_ High feed type

HFR



Item No.	Dimensions (mm)						PCD							
	W	Z	α	L	R	T	EP20	EP55	EP750	EP58	EP29			
HFR	10	15	11	25		11								
HFR-A	10	0	11	25		11								
HFR-R	10	15	11	25	0.4	11								
HFR-ES	10	15	11	25		11								

HFW



Item No.	Dimensions (mm)						PCD							
	W	Z	α	L	R	T	EP20	EP55	EP750	EP58	EP29			
HFW	9.8			25	400	11								
HFW-ES	9.8			25	400	11								

1

2

3

4

Setting manual

1. Installaion of cartridge

Install the Ⓑ adjust bolt on the cutter body, and insert the cartridge.
After then, gently tightening the Ⓐ Clamp bolt.

2. Installaion of bolt

When tightening, secure the cartridge by pressing it downward.
And using a torque wrench, temporarily tighten the clamp bolt 3N·m.

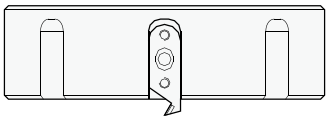
3. Cutting edge height adjustment

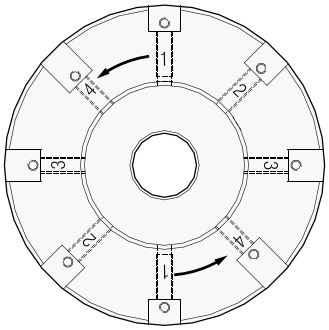
Turn the adjustment bolt and adjust so that the height of the front cutter is -10㎛ from the target value.

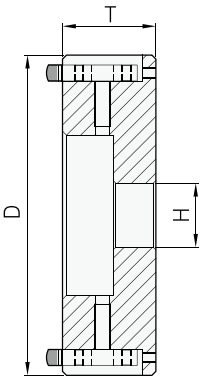
4. Final adjustment

Using a torque wrench, tighten the clamp Bolt to 10N·m.
And turn the adjustment bolt, then adjust to the target height.

Cutter body_Aluminum



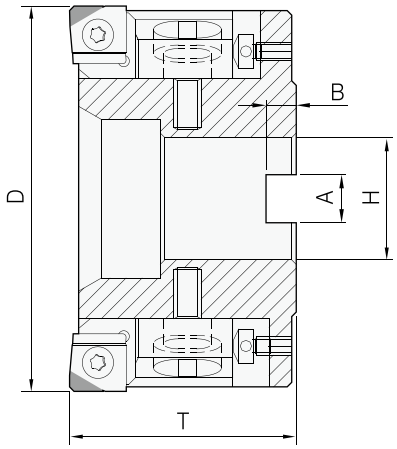




Item No. Inch type	Dimensions (mm) D	Z	H	T
120D-35T-24H-10Z-RH	120	10	24	35
120D-35T-24H-10Z-LH	120	10	24	35
158D-40T-70H-6Z-RH	158	6	70	40
158D-40T-70H-6Z-LH	158	6	70	40
198D-45T-40H-6Z-RH	198	6	40	45
198D-45T-40H-6Z-LH	198	6	40	45
220D-40T-65H-6Z-RH	220	6	65	40
220D-40T-65H-6Z-LH	220	6	65	40
248D-45T-40H-12Z-RH	248	12	40	45
248D-45T-40H-12Z-LH	248	12	40	45

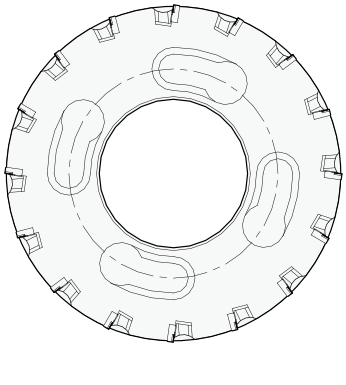
Order made

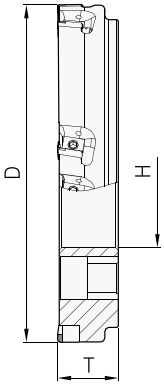
- PCD inserts and Cartridges can be customized.
- Samples are requested for Cartridge production.



*Milling_*

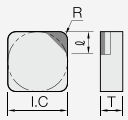
Cutter body_Steel





Item No. Inch type	Dimensions (mm) D	Z	H	T
125D-63T-40H-16Z	125	16	40	63
160D-63T-40H-18Z	160	18	40	63
200D-63T-60H-12Z	200	12	60	63
250D-63T-50H-24Z	250	24	50	63
250D-45T-109.88H-16Z	250	16	109.88	45

SNGN

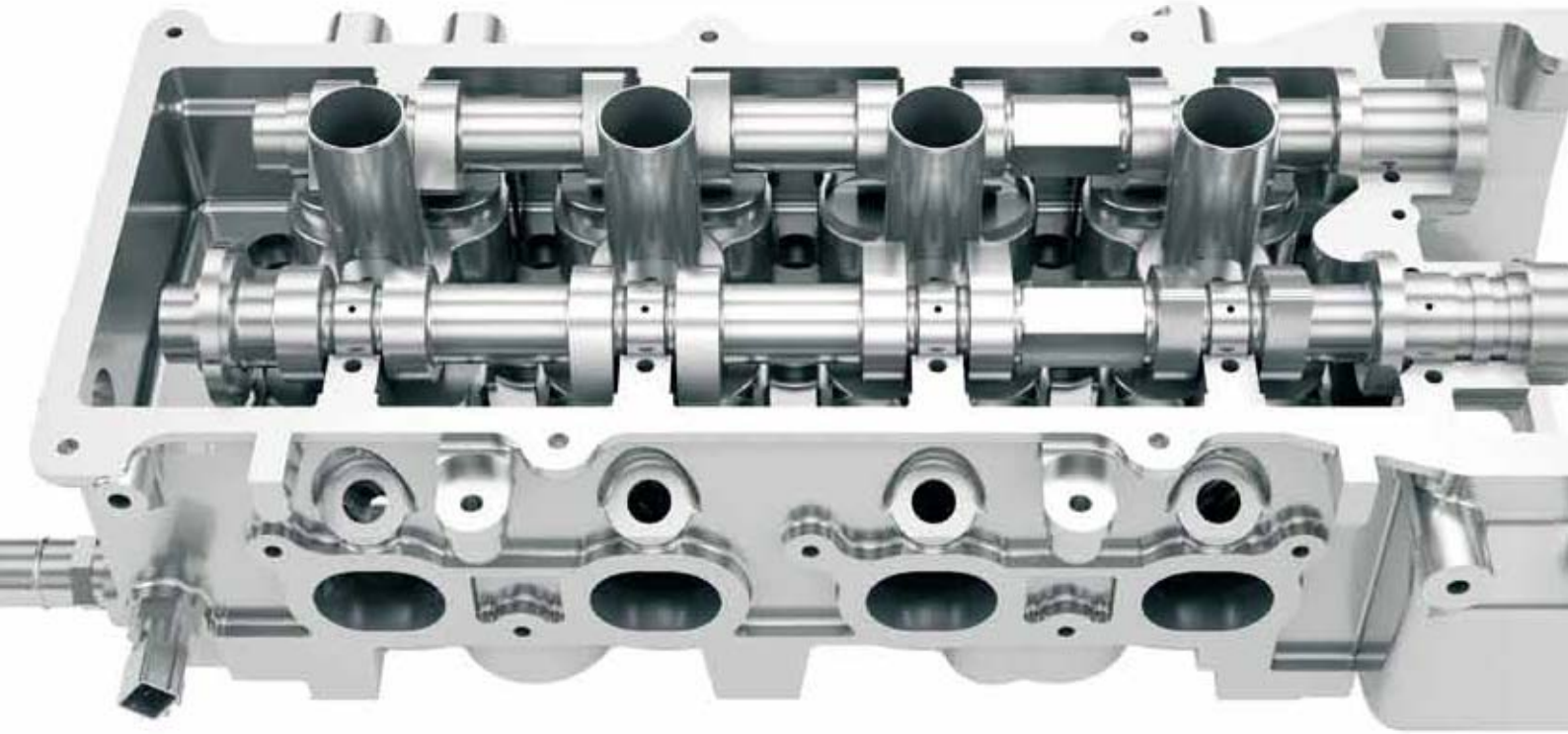
Shape	ISO code Metric	Inch	Dimensions (mm) W	Z	α	V	R	T	L	PCBN EB11	EB210	EB51	EB71	EB710
	**SNGN** 1506APTR	**SNGN** 54APTR	12.7	5	11	45	250	6.35	15.9					
	1506APTL	54APTL	12.7	5	11	45	250	6.35	15.9					

Customized design

- Customized PCBN inserts and Cartridges
- Must have either samples or drawings of current tool in use


Rotating

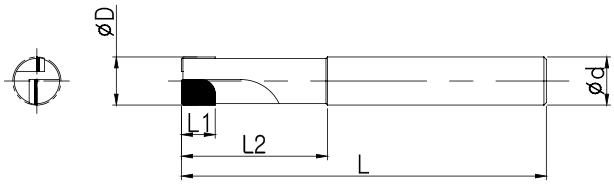
Applicable to all general cutting tools
such as high-speed steel, solid carbide, carbide-tipped,
cermet, PCD, and PCBN with or without internal coolant.



Rotating_ Endmill

Square endmill

The range from D3 to D20 with various edge length is common in use.

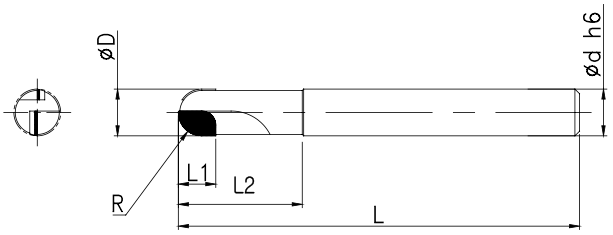


Item No.		Dimensions (mm)					
		D	d	L1	L2	L	Z
EDES	10303-0515-60	3	3	5	15	60	1
	10404-0715-60	4	4	7	15	60	1
	10505-1020-60	5	5	10	20	60	1
	10606-1020-60	6	6	10	20	60	1
	20808-1020-60	8	8	10	20	60	2
	21010-1030-75	10	10	10	30	75	2
	21212-1035-85	12	12	10	35	85	2
	21616-1035-85	16	16	10	35	85	2
	22020-1040-100	20	20	10	40	100	2

- Over center, Oil hole: Please contact separately for further discussion.
- EDES: Ehwa pcD/cvD Endmill Square

Ball nose endmill

Teeth, 1Z or 2Z can be determined by diameter.

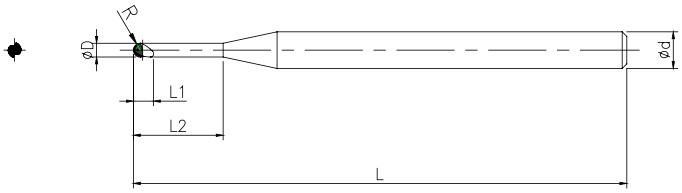


Item No.		Dimensions (mm)					
		D	d	L1	L2	L	Z
EDEB	10303-0515-60	3	3	5	15	60	1
	10404-0715-60	4	4	7	15	60	1
	10505-1020-60	5	5	10	20	60	1
	10606-1020-60	6	6	10	20	60	1
	20606-1020-60	6	6	10	20	60	2
	20808-1020-60	8	8	10	20	60	2
	21010-1020-80	10	10	10	20	80	2
	21212-1020-80	12	12	10	20	80	2

- Oil hole : Please contact separately for further discussion.
- EDEB : Ehwa pcD/cvD Endmill Ballnose

Ball nose endmill

The range from D3 to D20 with various edge length is common in use.

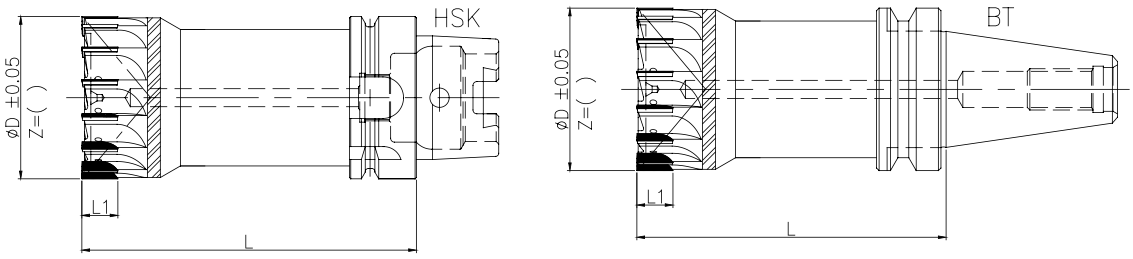


- Design:
- Diameter: 2,0~3,0mm
- N of blades: 2
- Helix angle: 35

Item No.		Dimensions (mm)					
		D	R	L1	L2	L	d
EBEB	20204-0104-50	2	1	1.2	4	50	4
	20204-0106-50	2	1	1.2	6	50	4
	20204-0108-50	2	1	1.2	8	50	4
	20204-0110-50	2	1	1.2	10	50	4
	20204-0112-50	2	1	1.2	12	50	4
	20204-0114-50	2	1	1.2	14	50	4
	20204-0116-50	2	1	1.2	16	50	4
	20204-0118-50	2	1	1.2	18	50	4
	20204-0120-50	2	1	1.2	20	50	4
	20306-1.508-66	3	1.5	1.8	8	66	6
	20306-1.510-66	3	1.5	1.8	10	66	6
	20306-1.512-66	3	1.5	1.8	12	66	6
	20306-1.516-66	3	1.5	1.8	16	66	6
	20306-1.520-66	3	1.5	1.8	20	66	6
	20306-1.525-66	3	1.5	1.8	25	66	6
	20306-1.530-66	3	1.5	1.8	30	66	6

- EBEB : Ehwa pcBn Endmill Ballnose

Monoblock type

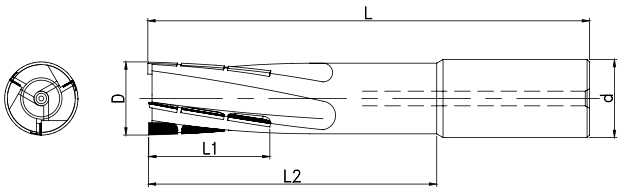


Item No.	Dimensions (mm)				
	ØD	d	L1	L	type
EDEM 0832-HSKA63	30	8	14	150	HSKA63
0840-HSKA63	40	8	14	150	HSKA63
0850-HSKA63	50	8	14	150	HSKA63
1463-HSKA63	63	14	14	150	HSKA63
1463-HSKA100	63	14	14	150	HSKA100
1463-BT40	63	14	14	150	BT40

- EDEM : Ehwa pcD/cvD Endmill Monoblock
- Available type : HSK type - HSK 32, 40, 50, 63, 100
  Taper type - BT 30, 40, 50 / SK 30, 40, 50 / CAT 30, 40, 50

Special Helical endmill

This special helical endmill can achieve high performance with long tool life. The cutting force of the helical design is outstanding. Therefore, it is suitable for high removal rate.

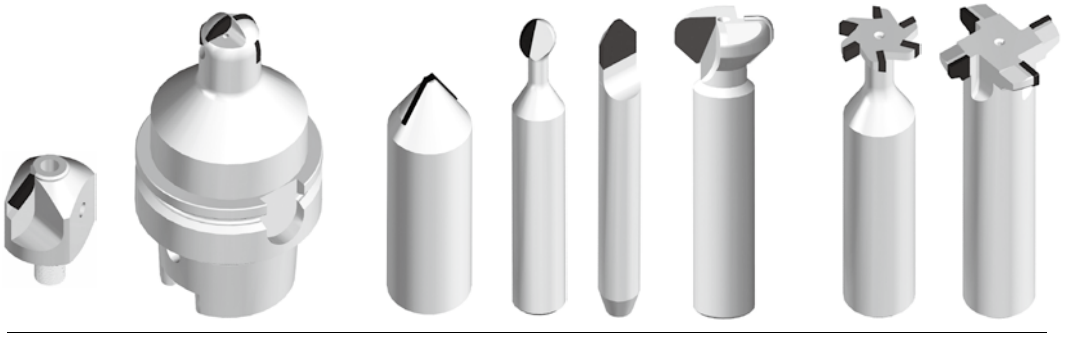


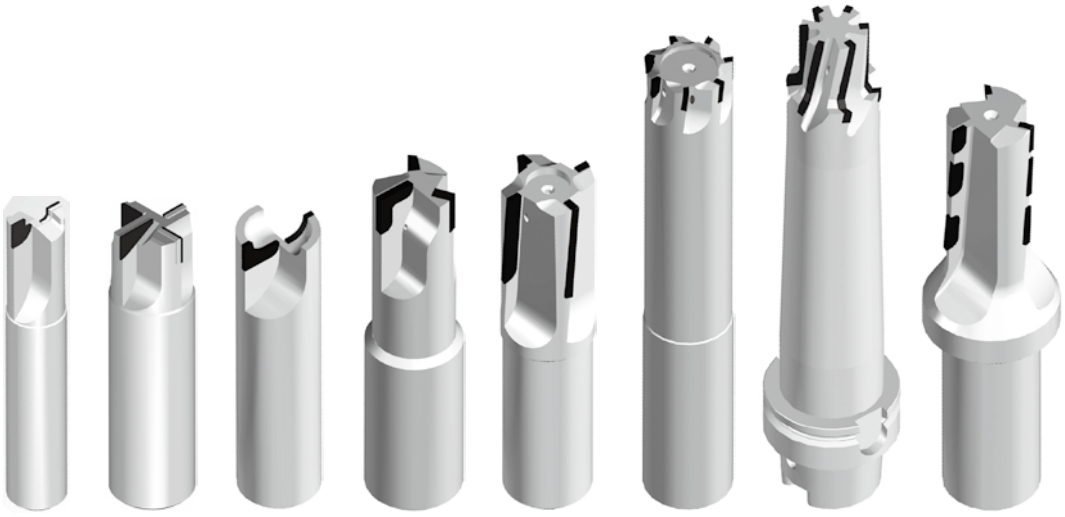
Item No.	Dimensions (mm)					
	D	d	L1	L2	L	F
EDEH 31616-30-120	16	16	30	50	120	3
32020-30-120	20	20	30	50	120	3
32525-30-120	25	25	30	50	120	3
33032-30-120	30	32	30	50	120	4

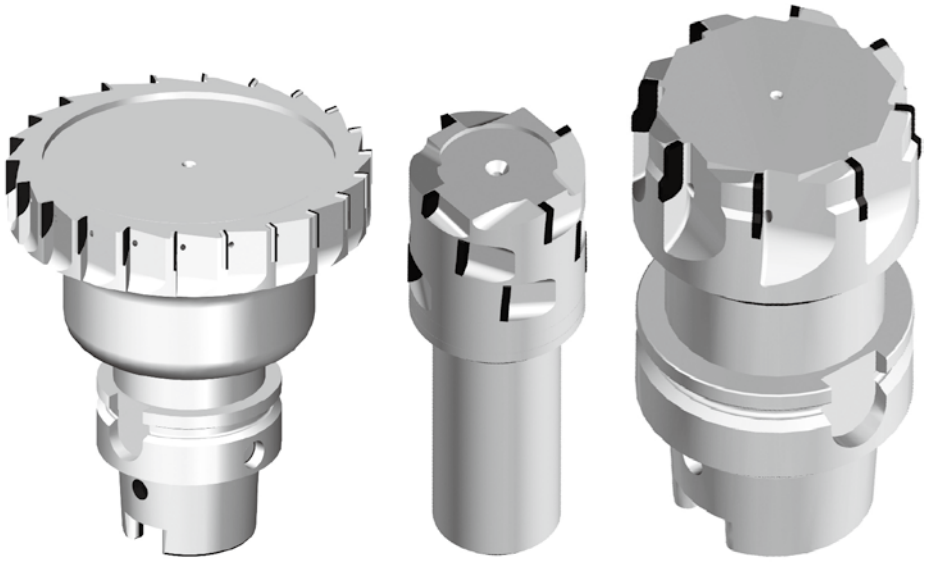
■ EDEH : Ehwa pcD Endmill Helix

Customized design

- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.



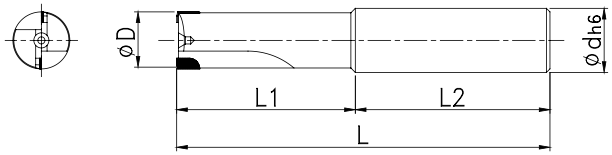




Rotating_

Reamer

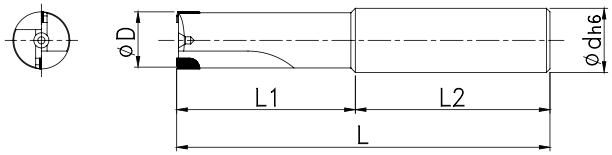
Normal type



Item No.		Dimensions (mm)					
		ØD	Ød	L1	L2	L	Z
EDRS	20406-15-60	4	6	15	45	60	2
	20506-15-60	5	6	15	45	60	2
	20606-25-80	6	6	25	55	80	2
	20808-25-80	8	8	25	55	80	2
	21010-40-100	10	10	40	60	100	2
	21212-40-100	12	12	40	60	100	2

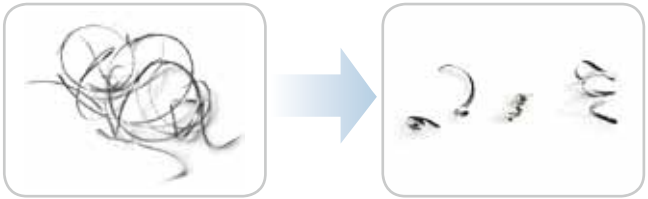
- EDRS : Ehwa pcD Reamer Straight flute

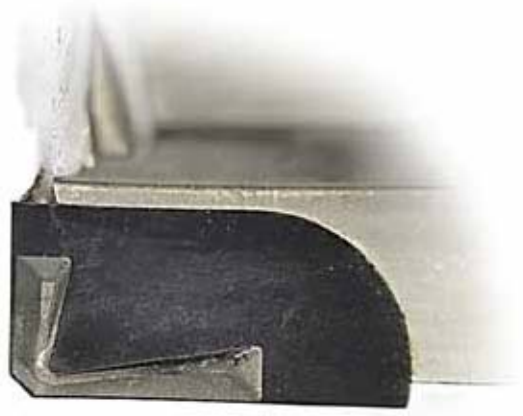
Chip breaker type



Item No.		Dimensions (mm)					
		ØD	Ød	L1	L2	L	Z
EDRS CB	20406-15-60	4	6	15	45	60	2
	20506-15-60	5	6	15	45	60	2
	20606-25-80	6	6	25	55	80	2
	20808-25-80	8	8	25	55	80	2
	21010-40-100	10	10	40	60	100	2
	21212-40-100	12	12	40	60	100	2

- EDRS CB : Ehwa pcD Reamer Straight flute Chip Breaker
- **Chip breaker design** : varies with cutting conditions





Normal type

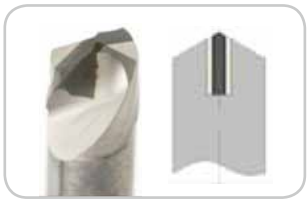
Customized design

- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.

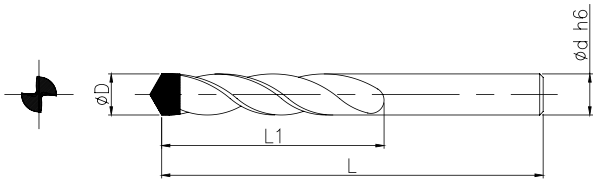
Rotating_ Drill

PCD helical drill

HELIX E



HELIX S

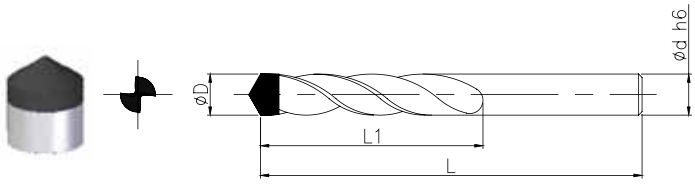


Item No.		Dimensions (mm)			
		ØD	L1	L	Ød
EDDHE(or S)	20303-30-80	3	30	80	3
	20404-30-80	4	30	80	4
	20505-30-80	5	30	80	5
	20606-30-80	6	30	80	6
	20707-35-90	7	35	90	7
	20808-35-90	8	35	90	8
	20909-40-100	9	40	100	9
	21010-40-100	10	40	100	10
	21111-50-110	11	50	110	11
	21212-50-110	12	50	110	12

■ EDDHE : Ehwa pcD Drill Helix Economic PCD / EDDHS : Ehwa pcD Drill Helix Sandwich PCD

PCD helical drill

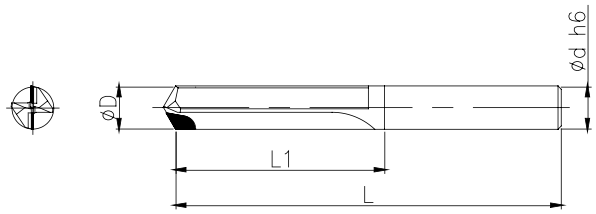
HELIX D



Item No.		Dimensions (mm)			
		ØD	L1	L	Ød
EDHDD	20303-30-80	3	30	80	3
	20404-30-80	4	30	80	4
	20505-30-80	5	30	80	5
	20606-30-80	6	30	80	6
	20707-35-90	7	35	90	7
	20808-35-90	8	35	90	8
	20909-40-100	9	40	100	9
	21010-40-100	10	40	100	10
	21111-50-110	11	50	110	11
	21212-50-110	12	50	110	12

■ EDDHD : Ehwa pcD Drill Helix Dom PCD

PCD burnishing drill



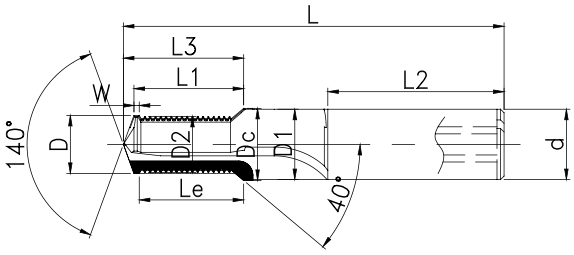
Item No.	Dimensions (mm)			
	ØD	L1	L	Ød
EDDS 20505-30-80	5	30	80	5
20606-30-80	6	30	80	6
20707-35-90	7	35	90	7
20808-35-90	8	35	90	8
20909-40-100	9	40	100	9
21010-40-100	10	40	100	10
21111-50-110	11	50	110	11
21212-50-110	12	50	110	12

■ EDDS : Ehwa pcD Drill Straight flute

Customized design

- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.

Drill thread milling tool

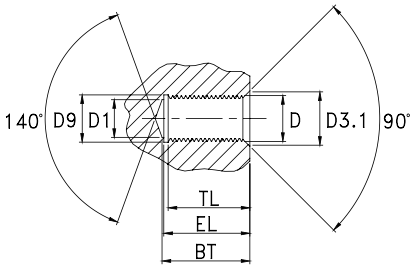


Item No.		Dimensions (mm)										
		L	L3	L1	L2	W	D	d	D1	Dc	D2	Z
EDTMS	1.5D M8-1.25	70.3	14.4	13.4	40	1.3	6.8	10	9	8.3	6.45	2
	1.5D M10-1.5	74.5	18.9	17.6	45	1.5	7.5	12	11	10.3	8.08	2
	1.5D M12-1.75	83.8	21.8	20.2	45	1.5	10.3	14	13.5	12.3	9.74	2
	2.0D M8-1.25	74	18.2	17.1	40	1.3	6.8	10	9	8.3	6.45	2
	2.0D M10-1.5	79	23.4	22.1	45	1.5	8.5	12	11	10.3	8.08	2
	2.0D M12-1.75	89	27.1	25.5	45	1.5	10.3	14	13.5	12.3	9.74	2
	2.0D M14-2.00	102	32.8	30.9	48	1.5	12	16	15.5	14.3	11.35	2
	2.0D M16-2.00	102	37.1	35	48	1.5	14	18	17.5	16.3	13.28	2
	2.5D M8-1.25	74	23.2	22.1	40	1.3	6.8	10	9	8.3	6.45	2
	2.5D M10-1.50	79	27.9	26.6	45	1.5	8.5	12	11	10.3	8.08	2
	2.5D M12-1.75	89	34.1	32.5	45	1.5	10.3	14	13.5	12.3	9.74	2
	2.5D M14-2.00	102	38.8	36.9	48	1.5	12	16	15.5	14.3	11.35	2
	2.5D M16-2.00	102	45.1	43	48	1.5	14	18	17.5	16.3	13.28	2

■ EDTMS : Ehwa Dia Thread Mill Straight flute

Thread engaments for BGF

(for metric ISO thread DIN13, DIN 8140)



BT = Drill depth
EL = Thread engagement
TL = Full thread length

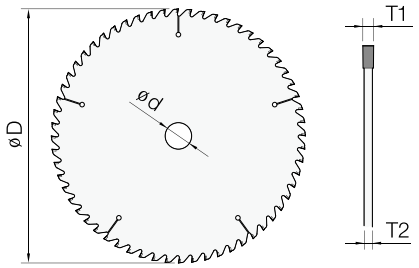
M	1.5 x D						2.0 x D						2.5 x D					
	D1	BT	D3.1	D9	EL	TL	D1	BT	D3.1	D9	EL	TL	D1	BT	D3.1	D9	EL	TL
M8	6,75	13,35	8,30	8,41	12,15	10,45	6,75	17,10	8,30	8,41	15,90	14,20	6,75	22,10	8,30	8,41	20,90	19,20
M10	8,50	17,60	10,30	10,54	16,06	14,00	8,50	22.10	10,30	10,54	20,60	18,50	8,50	26,60	10,30	10,54	25,10	23,00
M12	10,30	20,25	12,30	12,65	18,45	16,35	10,30	25,50	12,30	12,65	23,70	21,60	10,30	32,50	12,30	12,65	30,70	28,60
M14	12,00	22,90	14,30	14,81	20,90	18,60	12,00	30,90	14,30	14,81	28,90	26,60	12,00	36,90	14,30	14,81	34,90	32,60
M16	14,00	27,00	16,30	16,88	25,00	22,60	14,00	35,00	16,30	16,88	33,00	30,60	14,00	43,00	16,30	16,88	41,00	38,60

Rotating_

Cutter

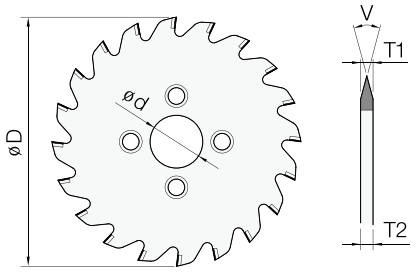
Cutter - PCD

PCD saw



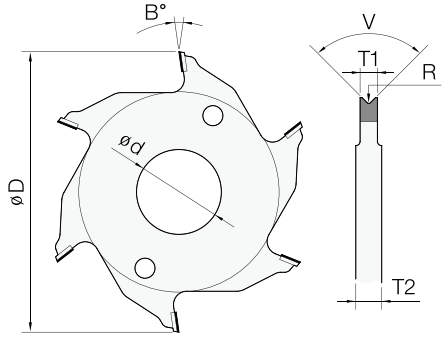
Item No.	Dimensions (mm)				
	øD	ød	T1	T2	Z
EDSC-255	255	25.4 / 31.75	2.2 / 2.5 / 3 / 3.2	2.2	40 / 60 / 80
EDSC-305	305	25.4 / 31.75	2.2 / 2.5 / 3 / 3.2	2.2	40 / 60 / 80
EDSC-355	355	25.4 / 31.75	2.2 / 2.5 / 3 / 3.2	2.2	40 / 60 / 80

PCD V-cutter



Item No.	Dimensions (mm)					
	ØD	Ød	T1	T2	V	Z
EDVC 100-V	100	20 / 25.4	2	2	35° / 40° / 45°	20 / 30
EDVC 105-V	105	20 / 25.4	2	2	35° / 40° / 45°	20 / 30
EDVC 110-V	110	20 / 25.4	2	2	35° / 40° / 45°	20 / 30
EDVC 120-V	120	20 / 25.4	2	2	35° / 40° / 45°	20 / 30

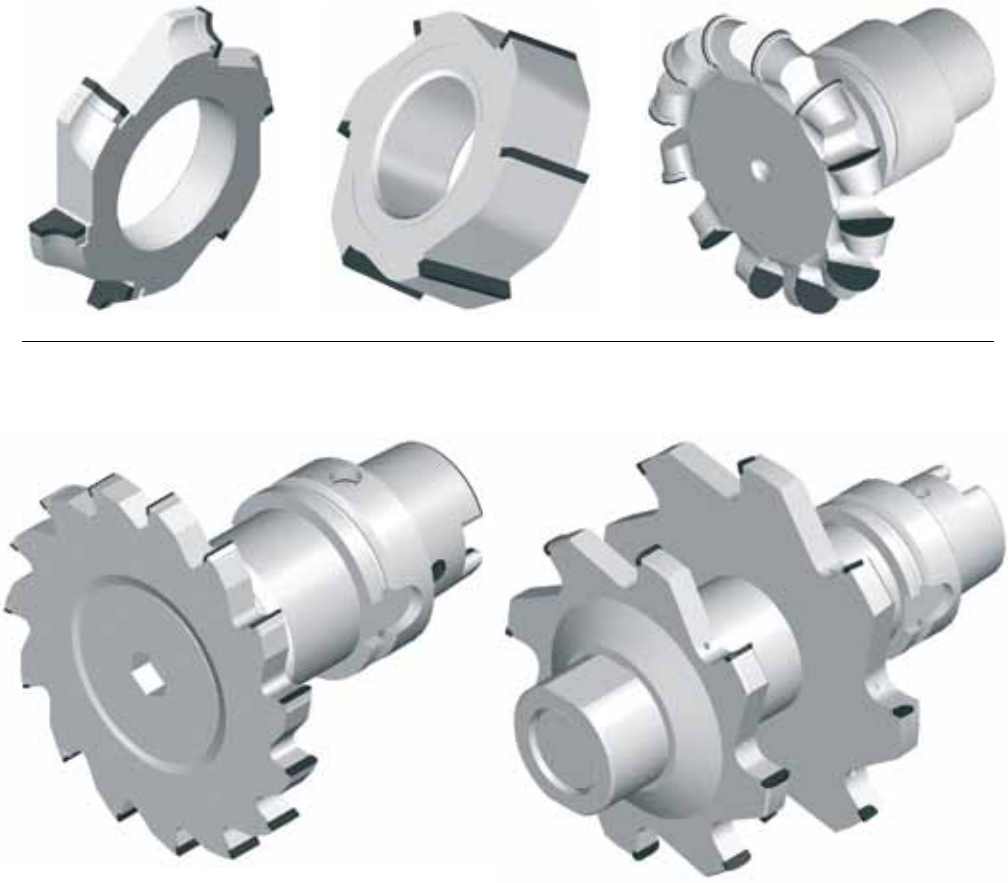
PCD bevel cutter

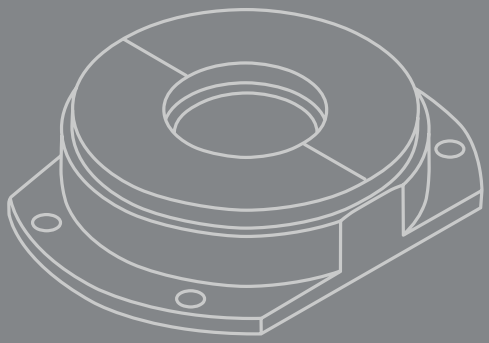


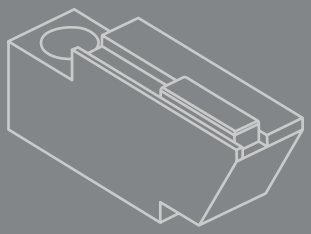
Item No.	Dimensions (mm)						
	ØD	Ød	T1	T2	V	R	B
EDBC 80-B	80	25.4	5	6.5 / 7 / 7.5	40°/60°/90°	0.2 / 0.5 / 1	3°/4°/6°/8°
EDBC 83-B	83	25.4	5	6.5 / 7 / 7.5	40°/60°/90°	0.2 / 0.5 / 1	3°/4°/6°/8°
EDBC 90-B	90	25.4	5	6.5 / 7 / 7.5	40°/60°/90°	0.2 / 0.5 / 1	3°/4°/6°/8°

Customized design

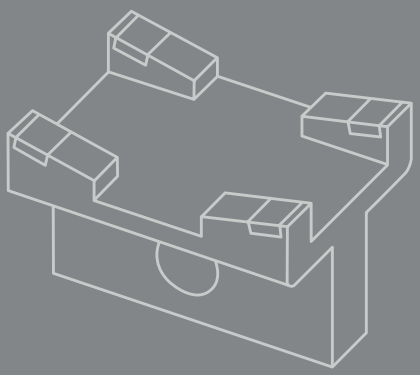
- Face, slot, chamfer, profile, etc.
- Optimized tooling service depending on the customer's demand.





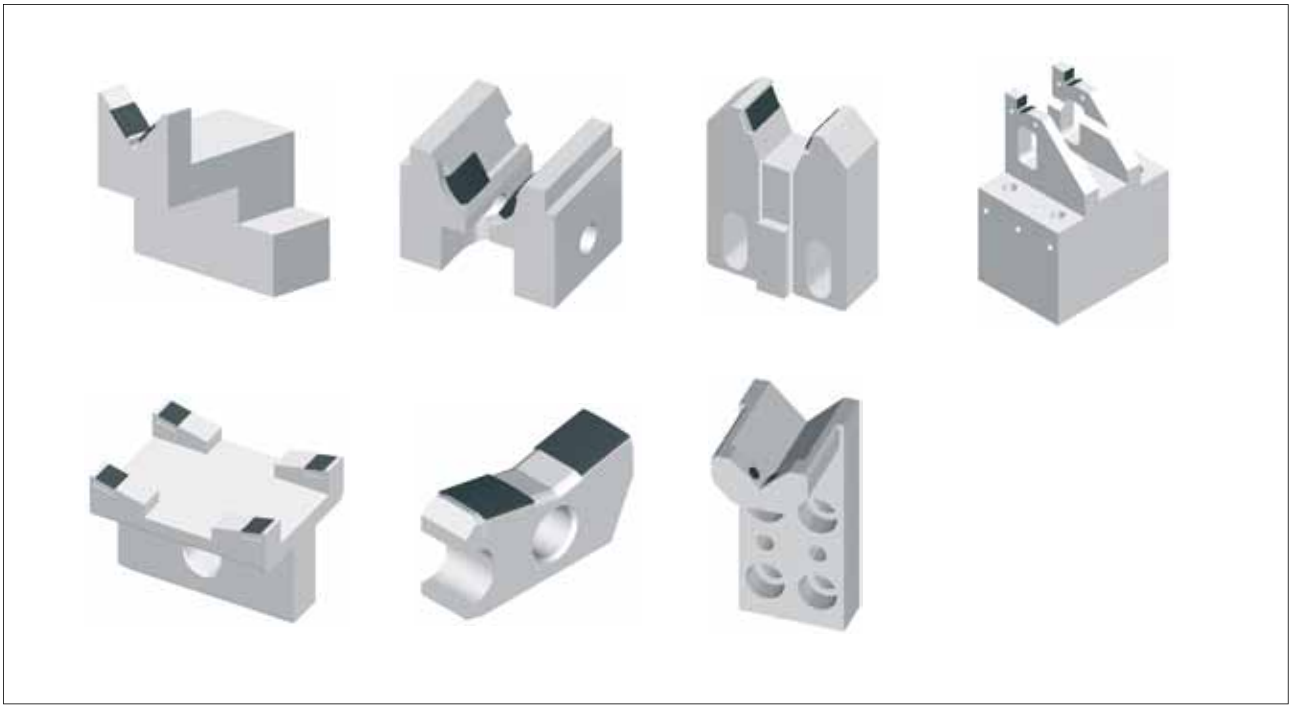


Wearless



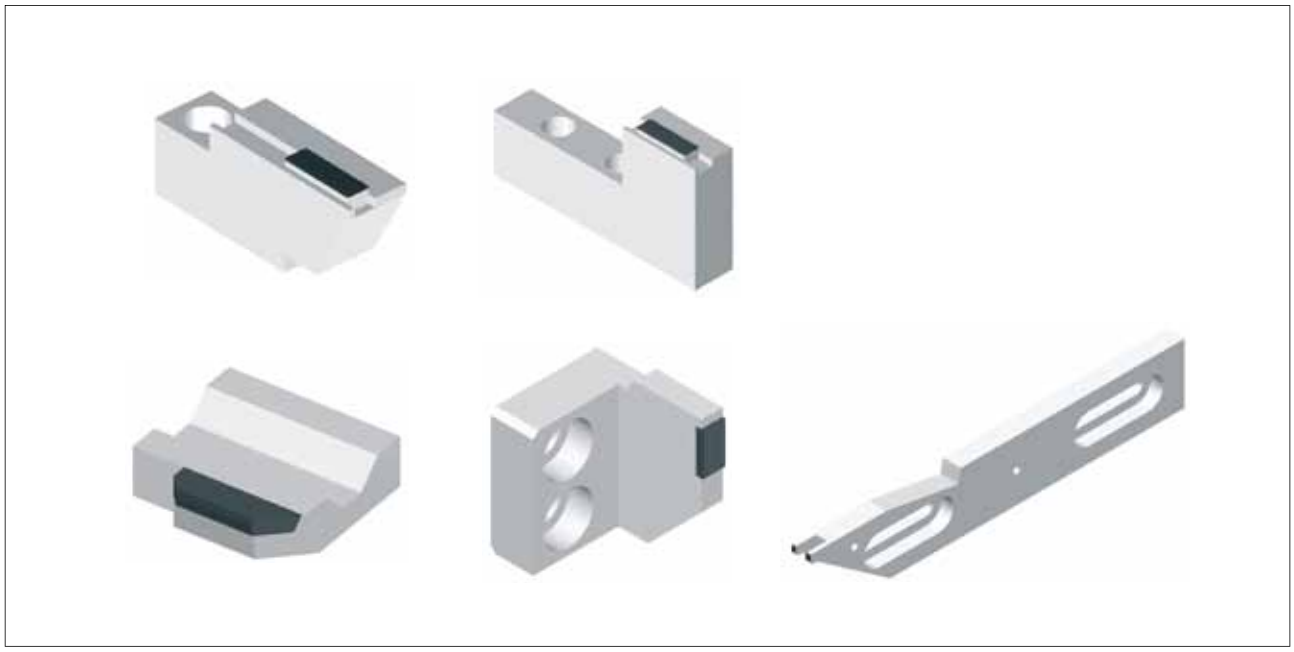
Bearing backing plate

V-block



Wearless

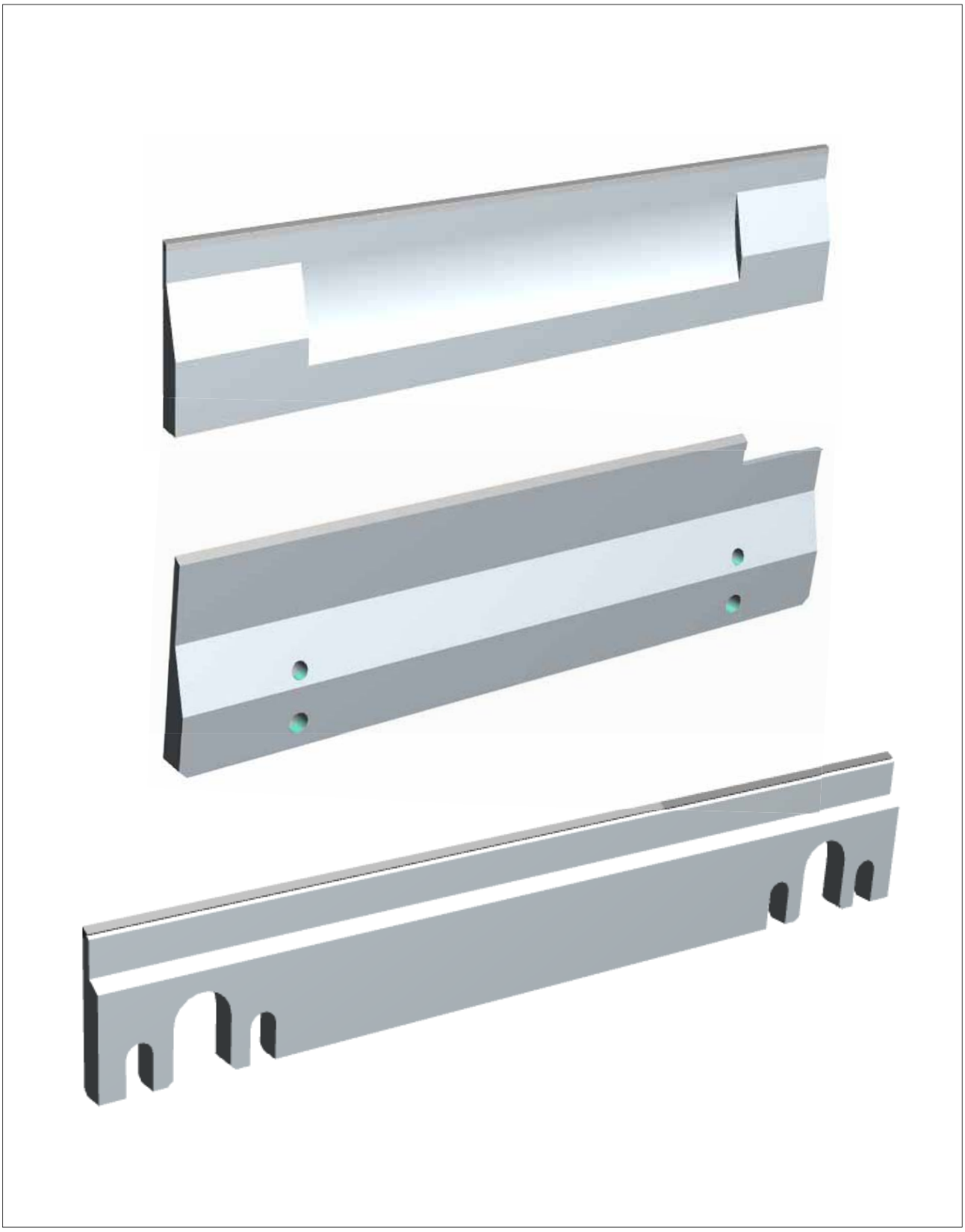
Shoe



Dead center

Special gauges

Guide blade



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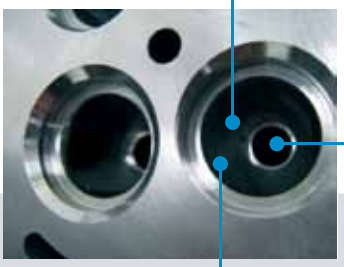
Applications

Cylinder head (Al alloy)

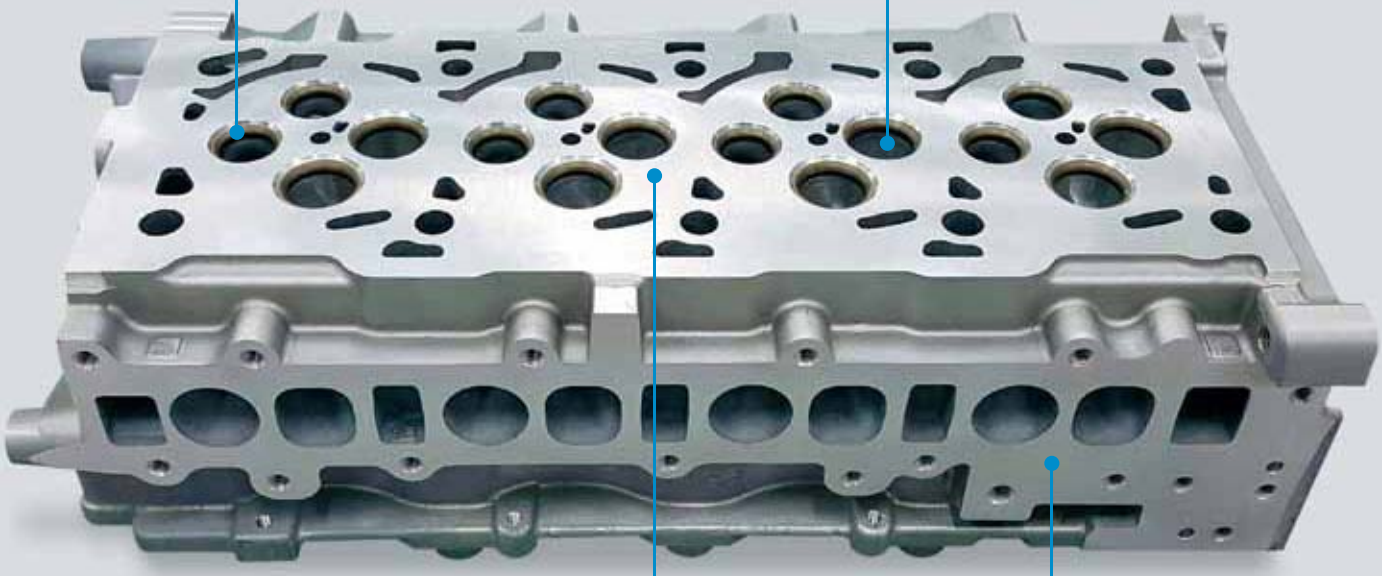
PCBN tool
Valve seat chamfering

PCD reamer
Valve guide reaming

PCD endmill
Valve seat port hole cutting (rough)



PCD step reamer
Valve guide parent bore & valve seat spot machining



PCD cutter
Mold excess cutting

PCD milling cutter
Top face milling
(rough & finish)

PCD milling cutter
Manifold face milling
(rough & finish)

Cylinder head (Al alloy)

PCD boring tool
Oil seal bore spot boring
(rough & finish)

PCD milling cutter
Bottom face milling
(rough & finish)

PCD step reamer
Inject hole reaming
(finish)

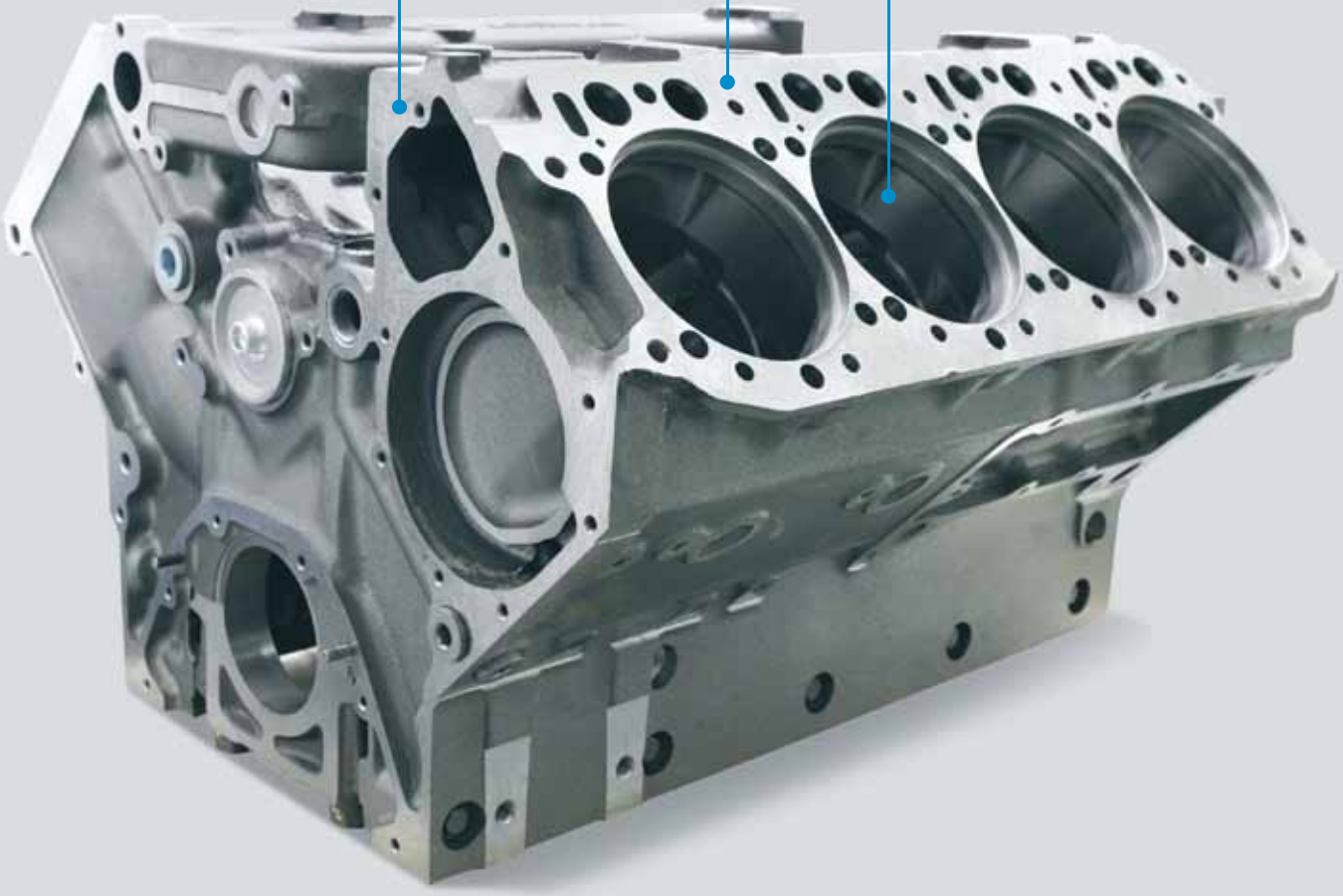
PCD tool & insert
Cam bore journal (finish)

PCD ball endmill
Cam bore journal (rough)

Cylinder block (cast iron)

PCBN milling cutter
Top, front & rear face milling (finish)

PCBN insert
Cylinder boring (rough & finish)



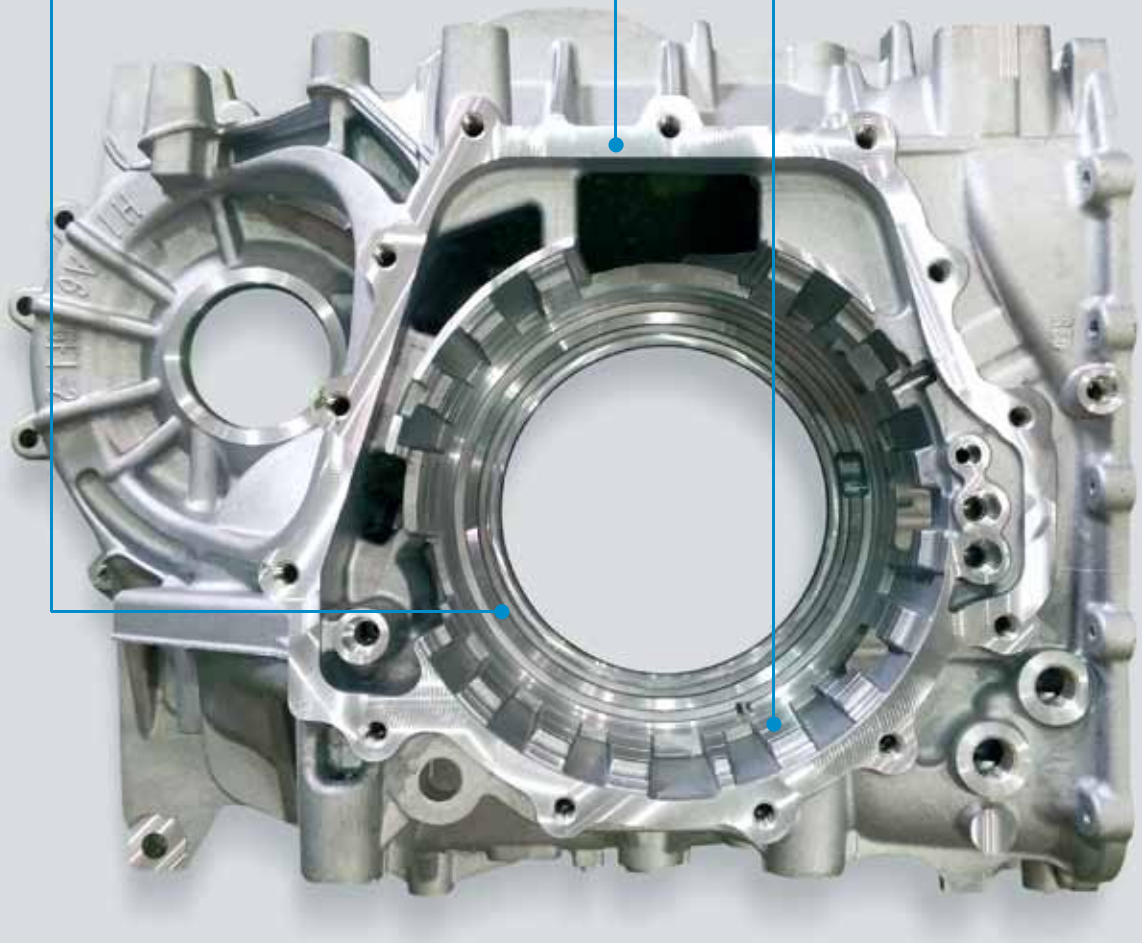
Transmissionhousing (Al alloy)

PCD reamer
Reaming

PCD milling cutter
Face milling (rough & finish)

PCD monoblock endmill
Face milling (rough & finish)

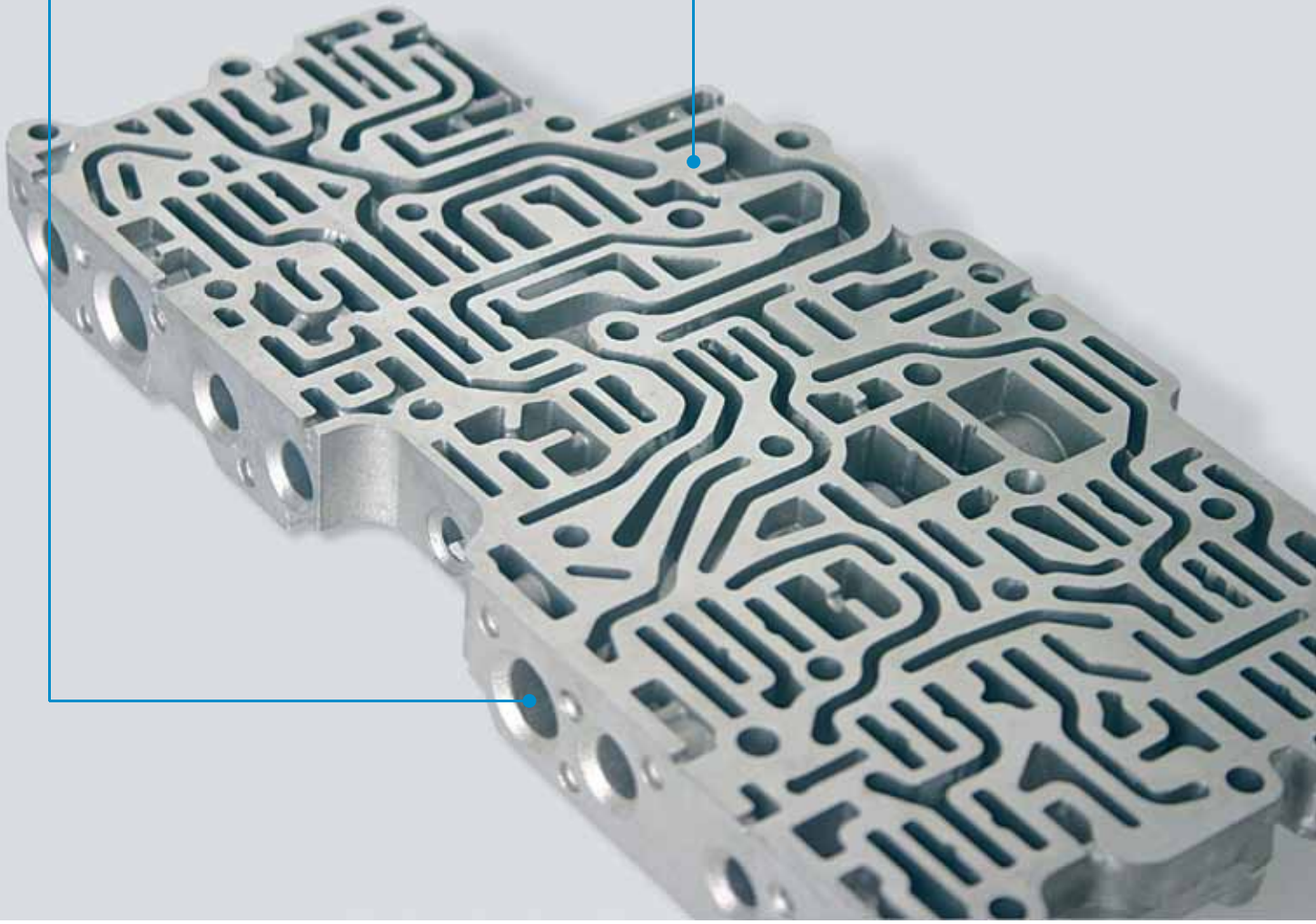
PCD monoblock cutter
Grooving



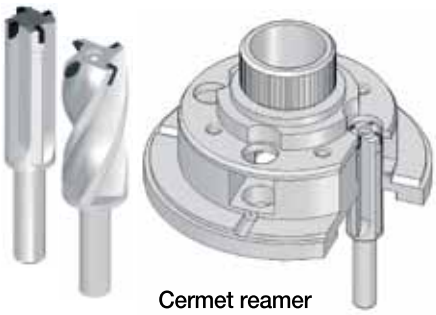
Valve bodies (Al alloy)

PCD insert & reamer
Reaming (rough & finish)

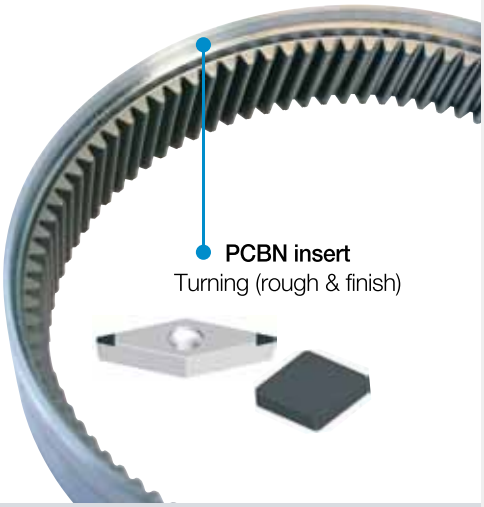
PCD milling cutter
Top face milling (rough & finish)



D-burnishing tool
Auto clutch burnishing (finish)



Cermet reamer
Carrier reaming (finish)

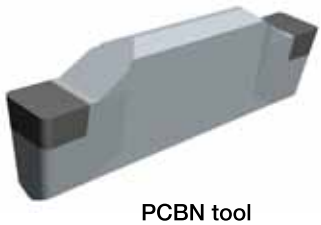


PCBN insert
Turning (rough & finish)

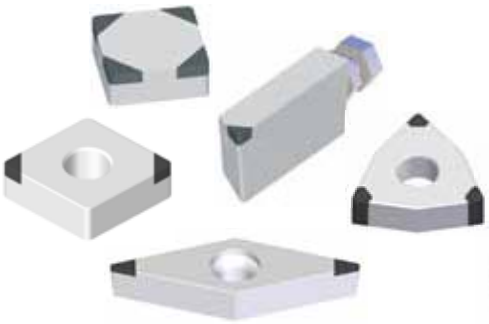
PCBN insert
Interrupted turning/facing & inner diameter boring (finish)

Automotive

Transmission shaft



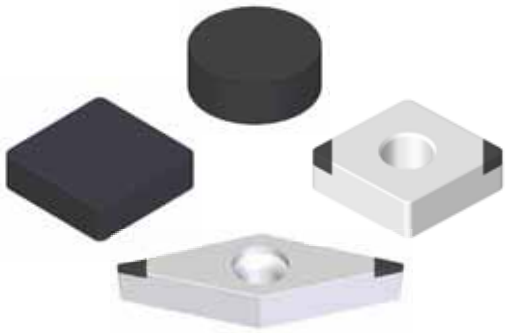
PCBN tool
Grooving (finish)



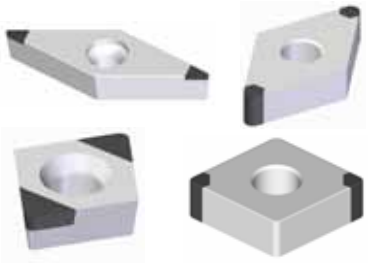
PCBN insert & tool
Main shaft turning (finish)

PCBN insert
for diff gear & case

Transmission | planetary gear



PCBN insert
for planetary gear, ring gear and sun gear

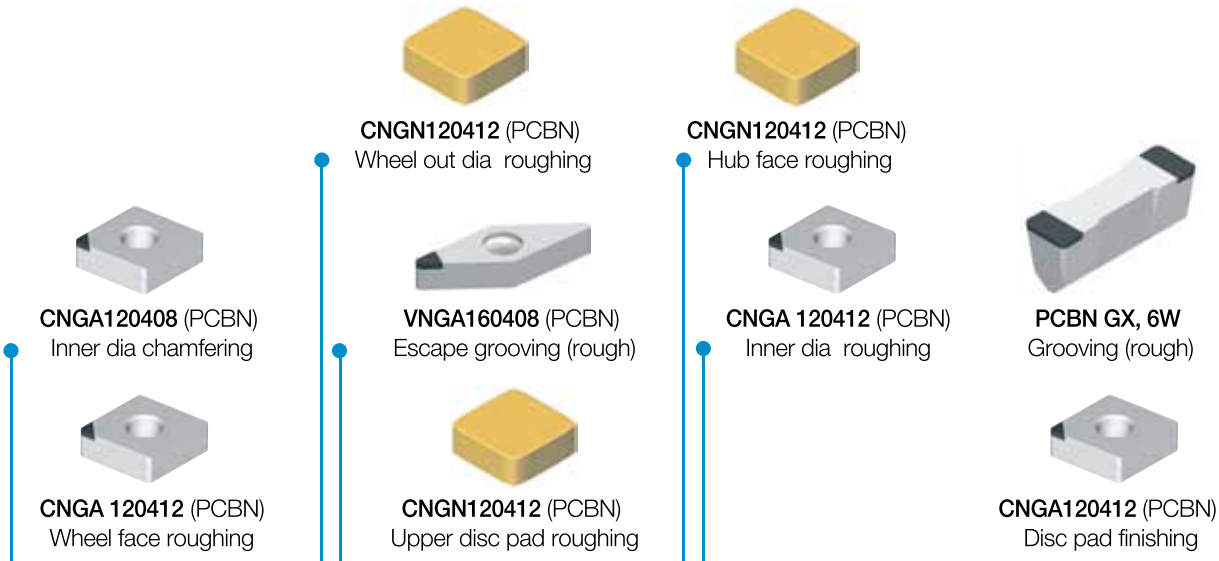


PCBN insert
for hub bearing

D-guage

PCD backing plate

Brake disc



CNGN120412 (PCBN)
Wheel out dia roughing

CNGN120412 (PCBN)
Hub face roughing

CNGA120408 (PCBN)
Inner dia chamfering

VNGA160408 (PCBN)
Escape grooving (rough)

CNGA 120412 (PCBN)
Inner dia roughing

PCBN GX, 6W
Grooving (rough)

CNGA 120412 (PCBN)
Wheel face roughing

CNGN120412 (PCBN)
Upper disc pad roughing

CNGA120412 (PCBN)
Disc pad finishing

PCD, MONO insert & tool
Turning

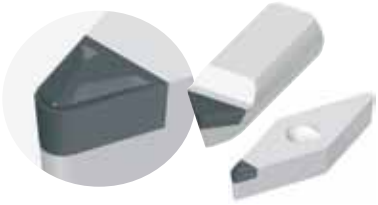
PCD grooving tool
Ring grooving

PCD special tool
Combustion chamber cutting

PCD reamer
Pin boring & chamfering

PCD cutter
Circlip & R boss cutting

Compressor piston & housing



PCD boring tool (chip breaker)
Piston OD turning

PCD endmill
Piston ball seat chamfer cutting

PCD ball endmill
Piston ball seat cutting

PCD reamer & blade
Pistion bore & shaft bore reaming

PCD double cutter
Piston side cutting

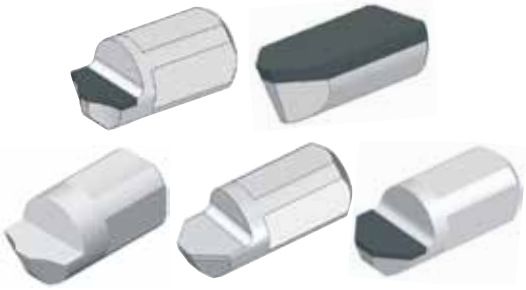
PCD milling cutter
Pistion housing face milling

Steering box

PCD step reamer
Steering housing reaming

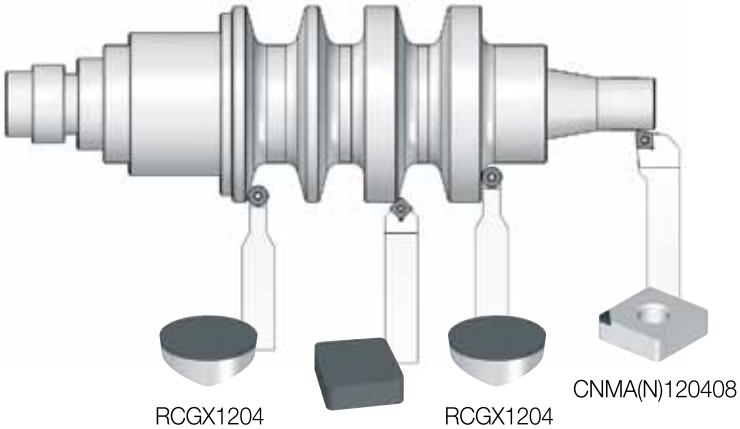
Pump housing

PCD step reamer, endmill
Pump housing cutting



Notch tool
(PCD, PCBN, carbide)

Grooving & turning
(PCD, PCBN, carbide, ceramic)



Engraving
(PCD, TC)

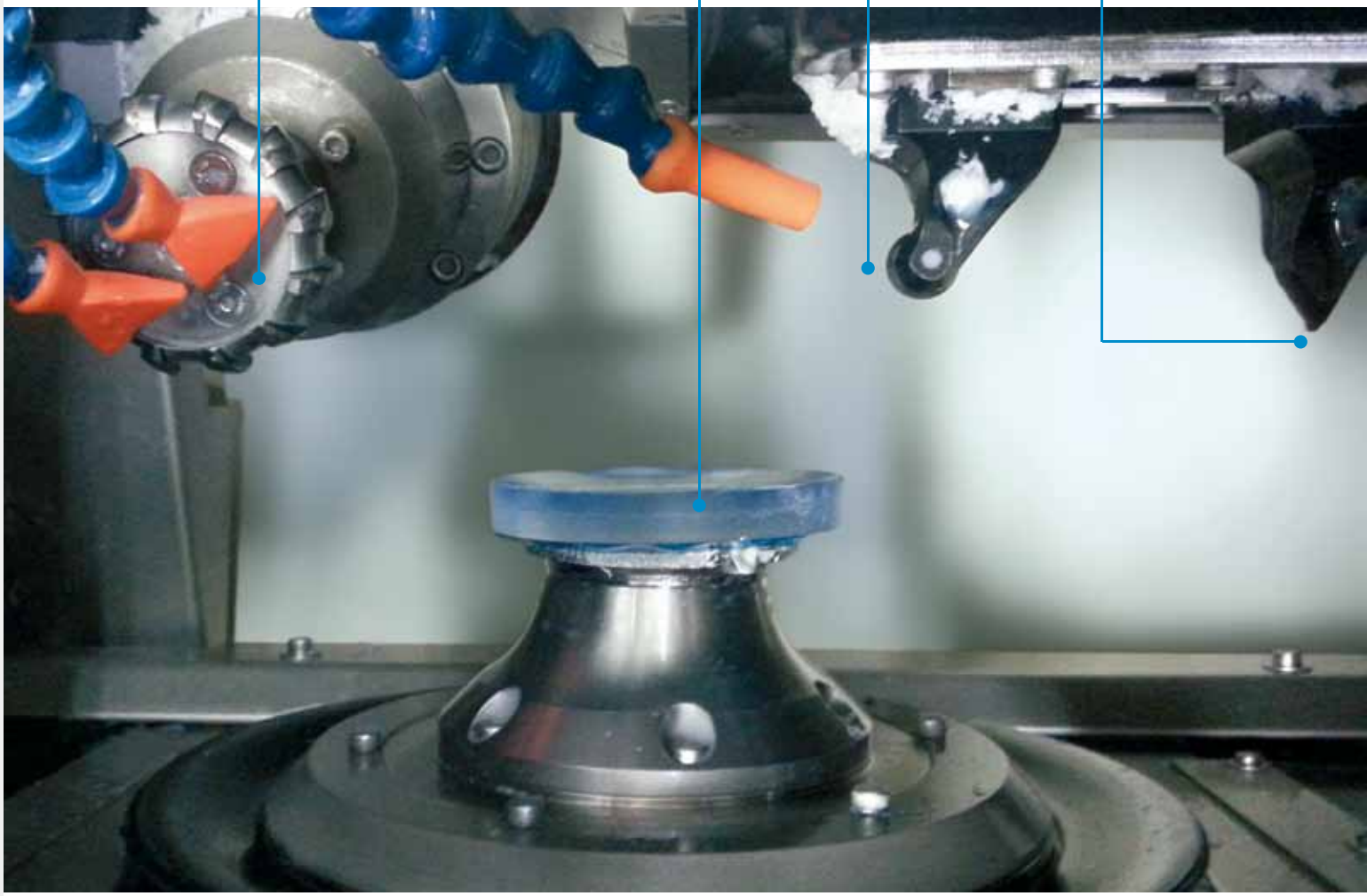
Ophthalmic lens

PCD milling cutter
Milling (rough)

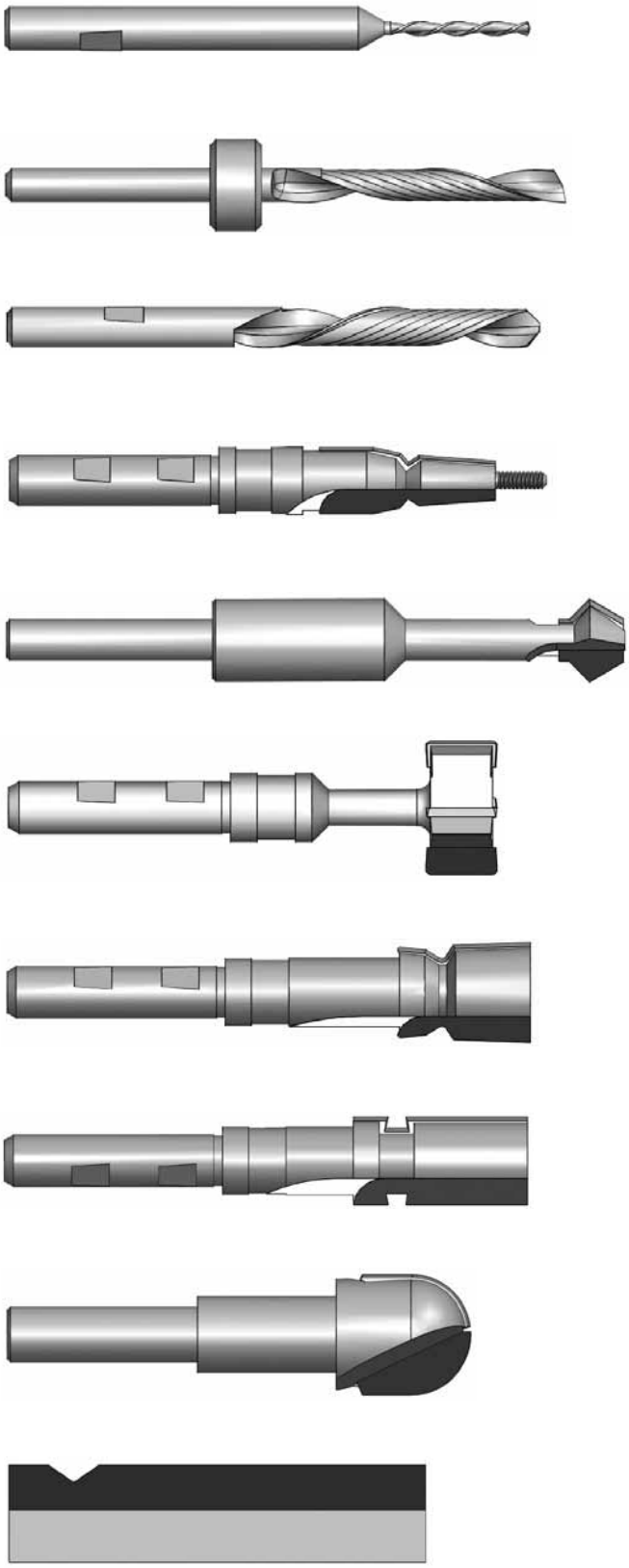
PCD insert
Out diameter Turning

PCD insert
Turning (finish)

MONO insert
Turning (finish)



Edge machining



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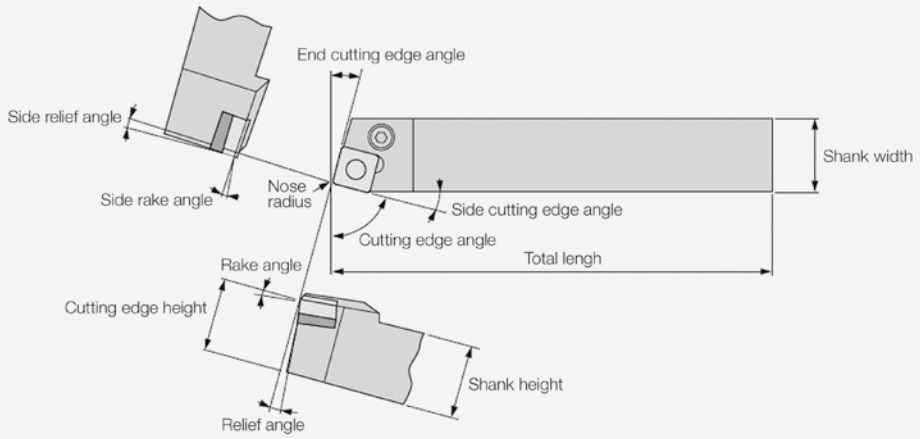
Technical information

Insert shape and terms



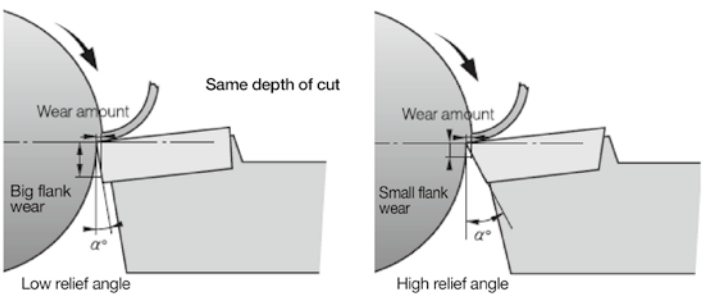
Role of edge angle

Angle	Defination	Function	Features
Rake angle	Side rake angle Rake angle	Cutting force, cutting heat, chip flow and tool life	* Positive angle : excellent machine-ability (reduce the cutting load, whereas weaken edge strength) * Positive angle : proper for "easy to cut" and thin workpieces * Negative angle : proper for mill scale or interrupted cutting demanding strong edge strength.
Relief angle	Relief angle Side relief angle	Eliminate unnecessary interference	* Must be designed considering the tool life and edge
Cutting edge angle	Cutting edge angle	Control chip size and cutting direction	* As the angle becomes bigger, chip thickness becomes thicker, resulting easy chip flow.
	Side cutting edge angle	Control chip size and cutting direction	* As the angle becomes bigger, cutting edge becomes wider, resulting strong edge strength. * As the angle becomes smaller, chip thickness becomes thinner, resulting easy chip flow.
	End cutting edge angle	Prevent friction between cutting edge and cutting face	* Small angle strengthens edge strength, whereas shortens tool life by flank wear.

Relief angle

Relief angle makes move of the cutting edge easily by avoiding the friction between workpiece and relief face.

Relationship between various relief angle and flank wear



Features

- Big relief angle causes less flank wear.
- Big relief angle weakens cutting edge strength.
- Small relief angle causes chattering.

Recommendation

- For hard workpiece or strong edge strength
  => low relief angle
- For soft workpiece or "easy to work hardening" workpiece
  => high relief angle

End cutting edge angle

It influences the surface finish by preventing friction between the machined face and the tool.

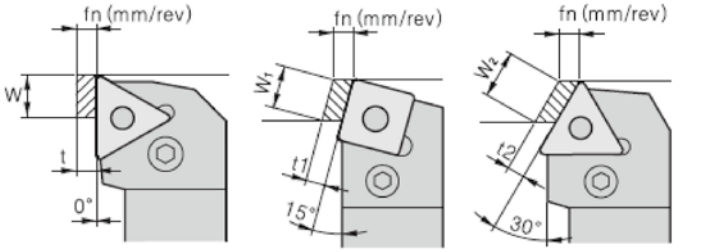
Effects

- If end cutting edge angle reduces cutting edge get stronger but cutting heat generated by machining increases.
- Small end cutting edge angle can cause chattering due to the increases cutting force.

Side cutting edge angle

Side cutting edge angle influences chip flow and cutting load. Therefore, it is necessary to design proper angle considering the tool strength.

Side cutting edge angle and chip thickness

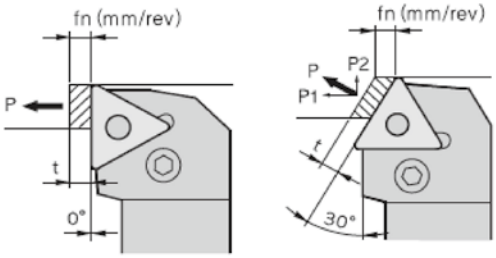


Approach angle 0° Approach angle 15° Approach angle 30°

As approach angle becomes bigger, chip thickness becomes thinner and tip width becomes wider.
When the feed and depth of cut are the same, and approach angle is 0°, chip thickness is the same as the feed rate and chip width is the same as depth of cut. (t=fn) and chip width is equal to depth of cut (W=ap).

t1 = 0.97t, W1 = 1.04W
t2 = 0.87t, W2 = 1.15W

Side cutting edge angle and cutting load



Force P is loaded Force P is scattered to P1, P2

As approach angle becomes bigger, radial cutting force becomes bigger, whereas feed component force becomes smaller.

Side cutting edge angle and cutting performance

Low	**Lead angle**	High
High	**Wear rate**	Low
Easy to cut material	**Workpiece**	Difficult to cut material
Small	**Machining power**	Big
Hard to occur	**Chatter**	Easy to occur
Finishing	**How to machine**	Roughing
Long thin workpiece	**Workpiece rigidity**	Thick workpiece
In case of low rigidity	**Machine rigidity**	In case of high rigidity

Nose-R

Nose radius influences not only the surface finish but also the edge strength.
generally, it is designed with 2~3 times bigger than the feed.

Features
- Big nose radius makes a good surface finish.
- Big nose radius strengthens the edge strength.
- Big nose radius reduces flank and crater wears.
- But if the radius is too big, it would cause chattering by big cutting load.

Recommendation
- For small depth of cut or thin and long workpiece => small nose R
- For interrupted cutting, big size workpiece or roughing => big nose R

Cutting edge shape and the affects

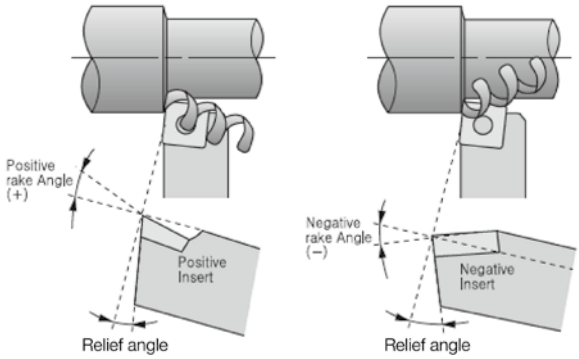
Rake angle

Rake angle influences cutting force, chip flow and tool life.

Features
- High rake angle makes a good surface finish.
- As the rake angle becomes bigger by 1°, spindle power becomes decrease by 1%.
- High rake angle weakens cutting edge.

Recommendation
- For hard workpiece or interrupted cutting => small rake angle
- For soft workpiece or “easy to cut” material => big rake angle

Rake angle and the direction of chip flow

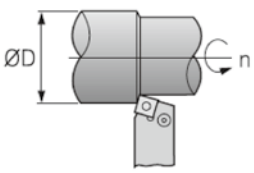


Major cutting formulas

Cutting speed

$$Vc = \frac{\pi \times D \times N}{1{,}000} \text{ (m/min)}$$

- Vc : Cutting speed (m/min)
- D : Diameter (mm)
- N : Revolution per minute (min^{-1})
- π : Circular constant (3.14)



Feed

$$fn = \frac{Vf}{N} \text{ (mm/rev)}$$

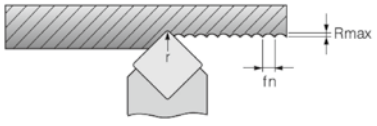
- fn : Feed per revolution(mm/rev)
- vf : Table feed (mm/min)
- N : Revolution per minute (min^{-1})

Theoretical surface roughness

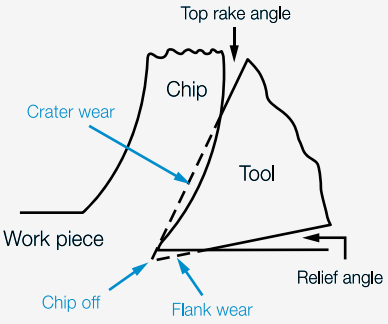
$$Rmax = \frac{fn2}{8r} \times 1{,}000$$

Practical surface roughness
- Steel : Rmax × (1.5~3)
- Cast iron : Rmax × (3~5)

- Rmax : Profile depth (μm) (Maximum height roughness)
- fn : feed (mm/rev)
- r : nose radius



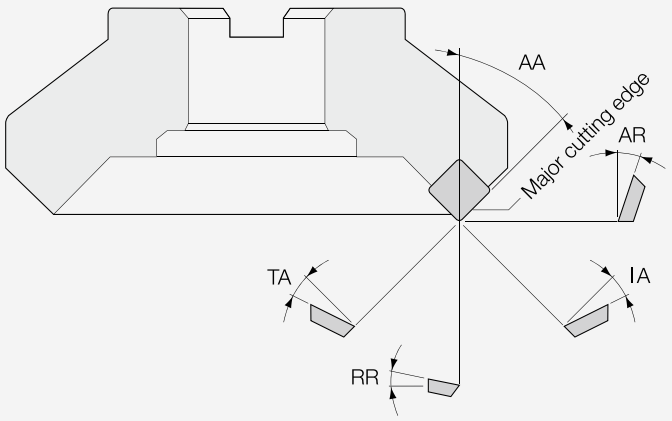
Wear behavior



Trouble shooting by wear behavior

Wear type	Trouble shooting
Crater wear	• Reduce cutting speed • Reduce feed rate • Add coating on the insert • Coolant
Flank wear	• Increase cutting speed (for grey cast iron) • Reduce cutting speed (for hardened steel) • Increase feed rate • Increase depth of cut • Check tool center height
Notching	• Increase cutting speed • Reduce feed rate • Increase approach angle • Increase chamfer angle • Change D.O.C
Chipping	• Use chamfered or horned edge preparation • Change cutting speed to eliminate vibration
Flaking (continuous cut)	• Increase cutting speed reduce feed rate • Use chamfered and horned edge preparation • Reduce insert approach angle • Check tool center height
Flaking (interrupted cut)	• Dry cutting • Reduce feed rate • Use chamfered and horned edge preparation • Reduce insert approach angle • Check cutting tool center height
Breakage	• Increase cutting speed • Reduce feed rate • Increase approach angle • Use chamfered edge preparation

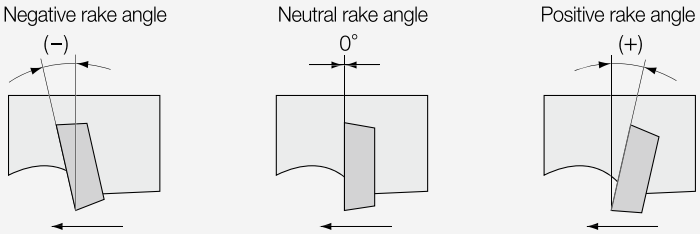
Milling cutter shape and designation



Role of cutting edge angle

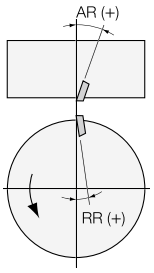
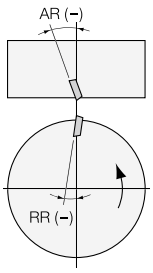
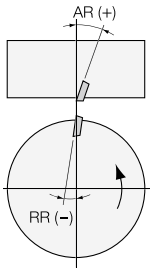
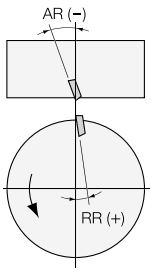
Tool failure	Symbol	Function	Features
Axial rake angle	A.R	Direction of chip flow, machinability	–
Radial rake angle	R.R	Direction of chip flow, machinability	–
Approach angle	A.A	Chip thickness, direction of chip flow	As A.A becomes bigger, chip thickness becomes thinner and cutting load becomes lower.
True rake angle	T.A	Effective rake angle	As T.A becomes bigger, machinability becomes better, whereas weaken edge strength. As T.A becomes smaller, it strengthens the edge strength, whereas machinability becomes worse.
Cutting edge inclination angle	I.A	Direction of chip flow, Machinability	As I.A becomes bigger, machinability becomes better and it helps easy chip flow, whereas weakens edge strength.
Face angle	F.A	Surface finish	As it approaches to 0deg, surface becomes better.
Relief angle	R.A	Edge strength, tool life, chattering	–

Positive and negative rake angle

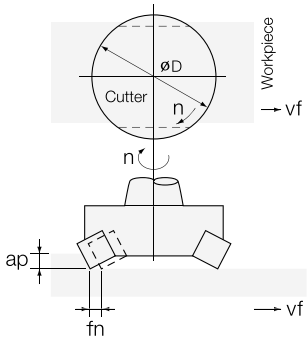


- Insert shape whose cutting edge precedes is a positive rake angle (+)
- Insert shape whose cutting edge follows is a negative rake angle (–)

Features by combination of rake angle

	Double positive angle	Double negative angle	Posi - negative angle	Nega - positive angle
				
Application	• For steel, cast iron, stainless steel • For soft steel to prevent built-up edge • For better surface finish	• For interrupted cutting • Roughing of cast iron and steel	• For " difficult to cut" material • For roughing of steel and cast iron (big D.O.C)	–
Advantages	• Excellent surface finish by preventing built-up edge for soft material • Proper design for low cutting load and good machinability	• Strong cutting edge • Proper for roughing of mill scale or bad surface condition • Cost saving by double side • Easy chip flow	• Easy chip flow and good machinability. • Suitable for "hard-to-cut" material • Proper design to prevent the chattering by special design	–
Disadvantages	• Weak cutting edge • Only available with single side	• Not recommended for low machine power and rigidity	• Only available with single side	• Bad chip flow

Major cutting formulas



Cutting speed

$$Vc = \frac{\pi \times D \times N}{1{,}000} \ (m/min)$$

- Vc : Cutting speed (m/min)
- D : Diameter of tool (mm)
- N : Revolution per minute (min^{-1})
- π : Circular constant (3.14)

Feed

$$fz = \frac{Vf}{N \times z} \ (mm/tooth)$$

- fz : Feed per tooth (mm/tooth)
- vf : Feed per minute (mm/min)
- N : Revolution per minute (min^{-1})
- z : Number of tooth

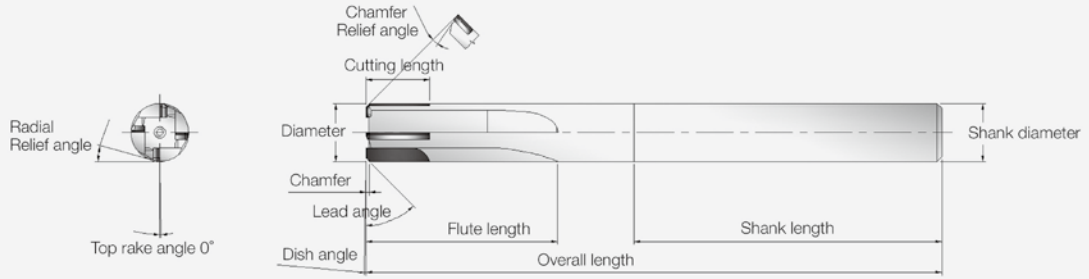
Machining time

$$T = \frac{60 \times Lt}{Vf} \ (sec)$$

- T : Machining time (sec)
- Lt : Total length of table feed (mm) (=Lw+D+2R)
- Lw : The length of workpiece (mm)
- D : Diameter of cutter body (mm)
- vf : Table feed (mm/min)
- R : Relief length (mm)

Endmill

Endmill shape and terms



The comparison by number of flute

Flute	2 flutes	3 flutes	4 flutes
Shape			
Chip flow	Good ←	←	← Bad
Tool rigidity	Weak →	→	→ High
Purpose	hole, side, General purpose	Side, Finishing	Hard meterial, Side, finishing

Specification	Major features	2 flutes	4 flutes
Tool rigidity	Torsional rigidity	○	◎
	Bending rigidity	○	◎
Surface finish	Surface roughness	○	◎
	Machining precision	○	◎
Chip control	Chip clogging	◎	○
	Chip evacuation	◎	○
Grooving	Chip evacuation	◎	○
	Grooving	◎	○
Side facing	Surface finish	○	◎
	Vibration	◎	○

○ Good ◎ Excellent

Formula of cutting condition

Calculations of cutting speed

$$Vc = \frac{\pi \times D \times N}{1{,}000} \text{ (m/min)}$$

- Vc : Cutting speed (m/min)
- π : Circular constant (3.14)
- D : Endmill diameter (mm)
- N : Revolution per minute (min^{-1})

Calculations of feed speed

$$fz = \frac{Vf}{N \times Z} = \frac{fn}{Z} \text{ (mm/tooth)}$$

$$Vf = N \times fz \times Z = N \times fn \text{ (m/min)}$$

$$fn = \frac{Vf}{N} = fz \times Z \text{ (mm/rev)}$$

- Vf : Feed speed (m/min)
- fn : Feed per revolution (mm/rev)
- fz : Feed per tooth (mm/tooth)
- Z : Number of flute

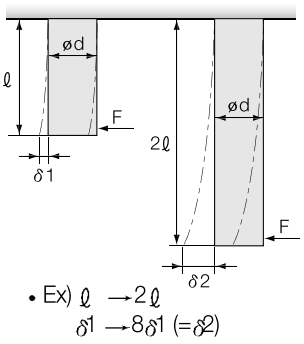
The effect of flute length

Expression of aspect ratio

- Aspect ratio
- ℓ/d
- Ex) 3d, 5d, 10d

Deformation rate by length

- Deformation rate is "reaction force" against external force
- The more flute, the better rigidity



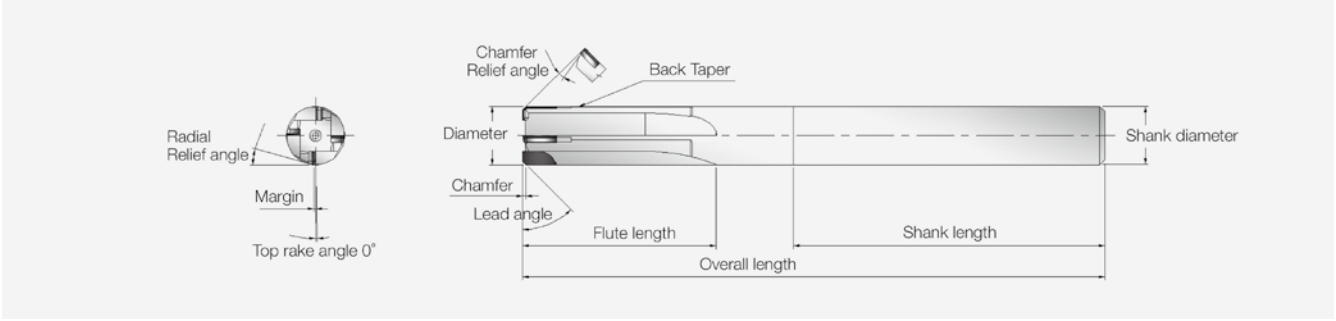
$$\delta = \frac{P\ell^3}{3EI} \qquad I = \frac{\pi d^4}{64}$$

- δ : Deformation volume
- P : Cutting force
- ℓ : Length of cut
- E : Elasticity coefficient
- I : Inertia moment

- Ex) $\ell \rightarrow 2\ell$
  $\delta 1 \rightarrow 8\delta 1 \ (=\delta 2)$

Technical information

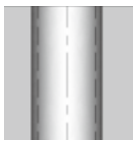
Reamer shape and terms



Margin	A tiny cylindrical area of the outer diameter for better dimensional accuracy and surface finish		
	· Decrease the cutting load · Generate less heat · Bad roughness & guide	Low ← **Margin** → High	· Increase the cutting load · Generate more heat · Good roughness & guide
Lead angle	Major cutting edge		
	· Good straightness · Bad roughness & Guide · Thicker chip	Low ← **Lead angle** → High	· Bad straightness · Good roughness & Guide · Thinner chip
Back taper	Slight angle to the shank to prevent unnecessary friction between the work piece and the tool O.D.		
	· Bad machinability · Good roughness · Refurbish multiple times	Low ← **Back taper** → High	· Good machinability · Bad roughness · Refurbish few times
Relief angle	Angle for preventing the interference between the edge and workpiece and for effective cutting		
	· Decrease edge sharpnes · Better edge strength · Proper for hard material	Low ← **Relief angle** → High	· Increase edge sharpness · Better cutting ability · Proper for soft material

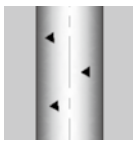
Trouble shooting

Too large diameter



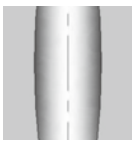
- Tool diameter may be too large
- Cutting speed too high
- Feed too high
- Run-out error too high
- Cuttig lead uneven
- Coolant unsuitable

Bad surface



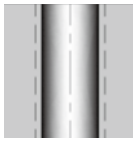
- Coolant unsuitable
- Build-up on cutting edge
- Tool blunt-possible fracturing on blade
- Chip removal bad
- Residual imbalance too large

Deformed hole



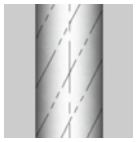
- Workpiece not correctly clamped

Too small diameter



- Tool worn
- Cutting speed too low
- Feed too low
- Ductile material - contracts after machining
- Allowance insufficient

Chatter marks



- Build-up on cutting edge
- Tool blunt
- Coolant unsuitable
- Run-out error too high
- Residual imbalance too great
- Clamping set-up not correct

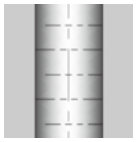
Curved hole

- Wrong lead geometry
- Wrong axial position of blade

Tapered hole

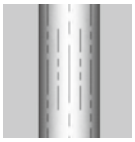
- Run-out error too high
- Cutting lead not correct
- Pre-machining not correct

Feed grooves



- Tool blunt, possible fracturing on blade
- Build-up on cutting edge
- Coolant unsuitable

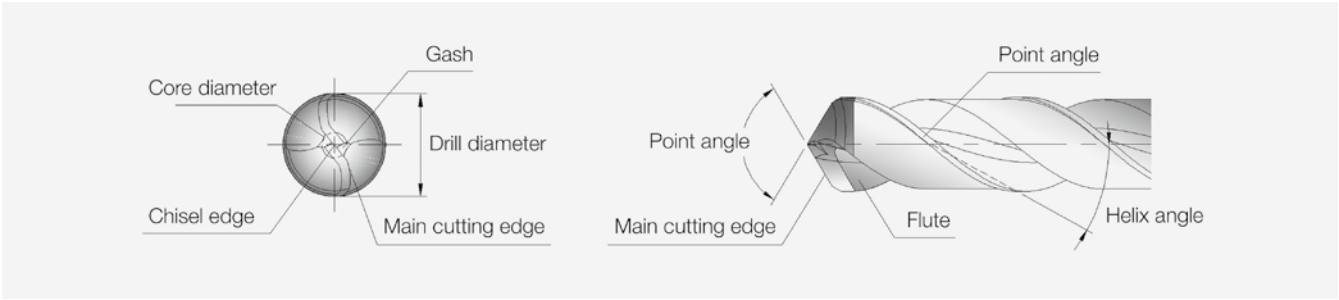
Facets



- Centering error
- Too small back taper

Drill

Drill's shape and terms



Point angle	Point angle has big influence on cutting performance. It mainly depends on workpiece. In case of standard drills Point angle is generally 118°. • Thrust resistance decrease • Torque increase, Burr on exit increase • Soft material (aluminum etc) Low ← **Point angle** → High • Thrust resistance increase • Torque decrease, Burr on exit decrease • Hard workpiece (hardened steel)
Helix angle	Plays rake angle of cutting edge's role. If helix angle increases Cutting force decreases. on the other hand If helix angle is too big drill rigidity decreases. • Poor machinability • Hard workpiece (hardened steel) Low ← **Helix angle** → High • Smooth chip evacuation • Soft material (aluminum etc)
Flute	The path of both chip evacuation and cooling lubricant. too big length of flute weakens drill rigidity and too small length of flute worsens chip evacuation to breakage.
Relief angle	Angle for preventing the interference between the edge and workpiece and for effective drilling • Decrease edge sharpness • Better edge strength • Proper for hard material Low ← **Relief angle** → High • Increase edge sharpness • Better drilling ability • Proper for soft material
Gash (thinning)	The chisel edge is determined by web thickness and chisel angle. Thinner web weakens the drill strength. Therefore, we recommend to add thinning instead of reducing the web thickness to modify the chisel edge for less trust.

Helical and burnishing type comparison

	Helical drill	Burnishing drill
		
Cutting load	Good (small)	Bad (big)
Roughness	Bad	Good
Chip flow	Good	Bad
Heat generation	Good (small)	Bad (big)
Purpose	Deep hole, ferrous materials, etc.	Al, non-ferrous materials, shallow hole

Major cutting formulas

Cutting speed

$$Vc = \frac{\pi \times D \times N}{1{,}000} \text{ (m/min)}$$

- Vc : Cutting speed (m/min)
- D : Diameter (mm)
- N : Revolution per minute (min^{-1})
- π : Circular constant (3.14)

Feed

$$fn = \frac{Vf}{N} \text{ (mm/rev)}$$

- fn : Feed per revolution(mm/rev)
- vf : Table feed (mm/min)
- N : Revolution per minute (min^{-1})

Machining time

$$T = \frac{L}{N \times fn} \text{ (min)}$$

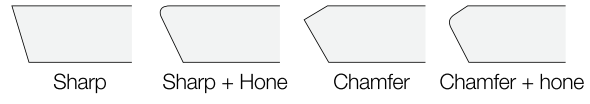
- T : Machining time (min)
- n : Revolution per minute (min^{-1})
- L : Length of drilling (mm)
- fn : Feed (mm/rev)

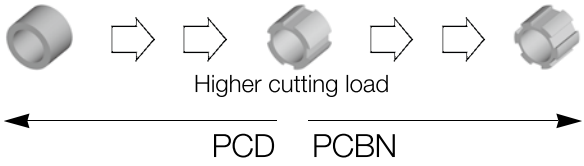
Tool shapes

- Cutting load & vibration ⇨⇨⇨⇨⇨ Higher
- Rigidity
- Toughness
- Tool life

⇨⇨⇨⇨⇨ Better

Edge preparations





- Rigidity
- Toughness
- Tool life

⇨⇨⇨⇨⇨ Better

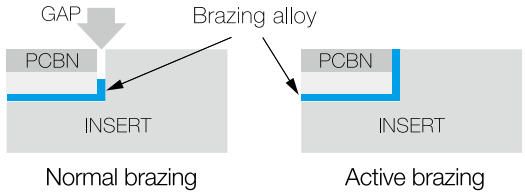
Advantages of solid PCBN & sandwich PCBN

For cast iron machining

Advantages

- Better tool strength due to solid design
- Full cutting edge available
- Cost saving
- Eco friendly

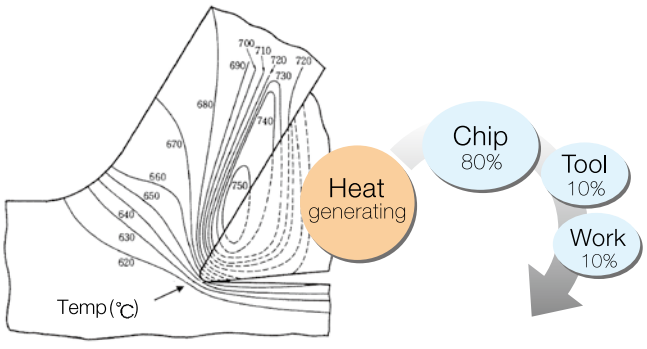
Benefits of active brazing



Advantages

- No oxidation due to vacuum condition
- Less GAP between PCD/PCBN blank and carbide insert
- Higher blazing strength

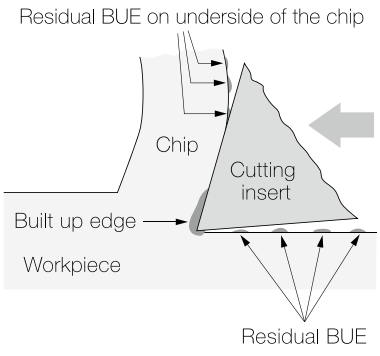
Effect of Heat generation



- Weaken tool rigidity
- Accelerate tool wear
- Cause tool deformation

⇨⇨⇨ Poor tool life & precision

Built-up edge (BUE)



Cause

- low cutting speed
- Too soft workpiece

Trouble shooting

- Increase cutting speed
- Increase feed rate
- Make the edge sharper

Effect on cutting process

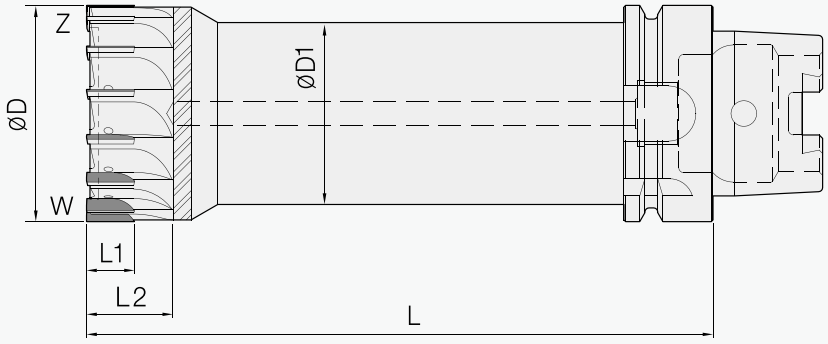
- Good - Protect the tool head against wear
- Bad - Poor surface finish
  - Hard to control the dimensions
  - Cause more chipping or flaking on the edge

Endmill order sheet

Date.

Custormer		End_user	
Workpiece	Part name	Hardness	HRc / HRB
	Material	Roughness	Ra / Rz / Rmax

Tool information



Tool size

D	Diameter, tolerance	mm
D1	Diameter of shank body	mm
L1	Length of tip	mm
L2	Width of tip	mm
W	Length of tool	mm
L	No. of teeth	mm
Z	No. of flute	ea
F	Length of flute	ea

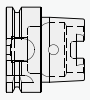
Shank

Solid carbide	☐
Solid carbide + steel	☐
Steel	☐

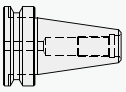
Coolant hole

Yes	☐
No	☐

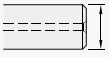
Holder & adaptor



HSKA	☐
Size	32, 40, 50, 63, 80, 100



BT	☐
SK	☐
Size	30, 40, 50



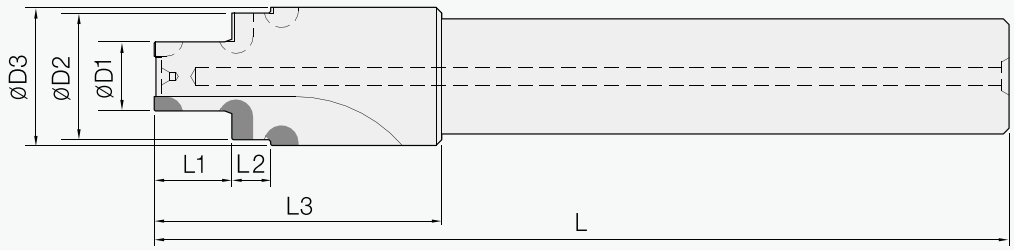
Ø	mm

Reamer order sheet

Date.

Custormer		End_user	
Workpiece	Part name	Hardness	HRc / HRB
	Material	Roughness	Ra / Rz / Rmax

Tool information

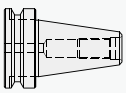


Tool size

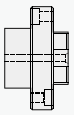
D1	Diameter, tolerance	mm
D2	Diameter, tolerance	mm
D3	Diameter, tolerance	mm
L1	Length of step	mm
L2	Length of step	mm
L3	Length of clearlance	mm
L	Length of tool	mm
F	No. of flute	ea

Holder & adaptor

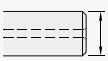
HSKA	☐
Size	32, 40, 50, 63, 80, 100



BT	☐
SK	☐
Size	30, 40, 50



Module	☐
Size	60, 70



Ø	mm

Shank

Solid carbide	☐
Solid carbide + steel	☐
Steel	☐

Coolant hole

Yes (Y-hole)	☐
Yes (through)	☐
No	☐

Hole type

Through hole	☐
Blind hole	☐

Guide

Yes	☐
No	☐

Interrupted cut

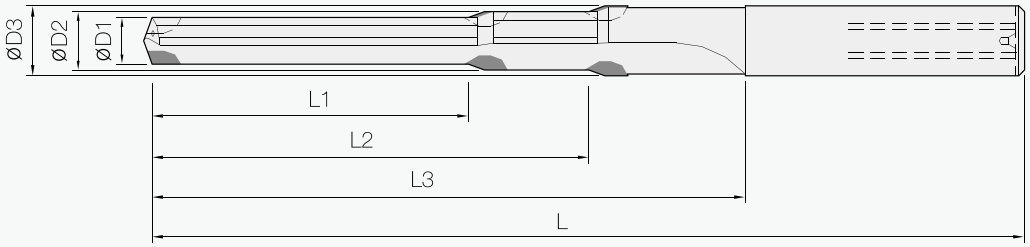
Yes	☐
No	☐

Drill order sheet

Date.

Custormer		End_user	
Workpiece	Part name	Hardness	HRc / HRB
	Material	Roughness	Ra / Rz / Rmax

Tool information

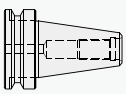


Tool size

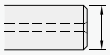
D1	Diameter, tolerance	mm
D2	Diameter, tolerance	mm
D3	Diameter, tolerance	mm
L1	Length of step	mm
L2	Length of step	mm
L3	Length of clearlance	mm
L	Length of tool	mm
F	No. of flute	ea

Holder & adaptor

HSKA	☐
Size	32, 40, 50, 63, 80, 100



BT	☐
SK	☐
Size	30, 40, 50



Ø	mm

Shank

Solid carbide	☐
Solid carbide + steel	☐
Steel	☐

Coolant hole

Yes (Y-hole)	☐
Yes (through)	☐
No	☐

Hole type

Through hole	☐
Blind hole	☐

Guide

Yes	☐
No	☐

Interrupted cut

Yes	☐
No	☐

Test information

Date.

Custormer		End_user	
Workpiece	Part name	Hardness	HRc / HRB
	Material *	Roughness	Ra / Rz / Rmax
Work figure Drawing			
Machine	M.C.T ☐	C.N.C turnig / milling ☐	
	Manual ☐	Machine maker	

Cutting data

Speed (V)		(m/min)
RPM (N)		(rev/min)
Feed (F)		(mm/rev)
		(mm/min)
D.O.C *		(pass)
		(mm)

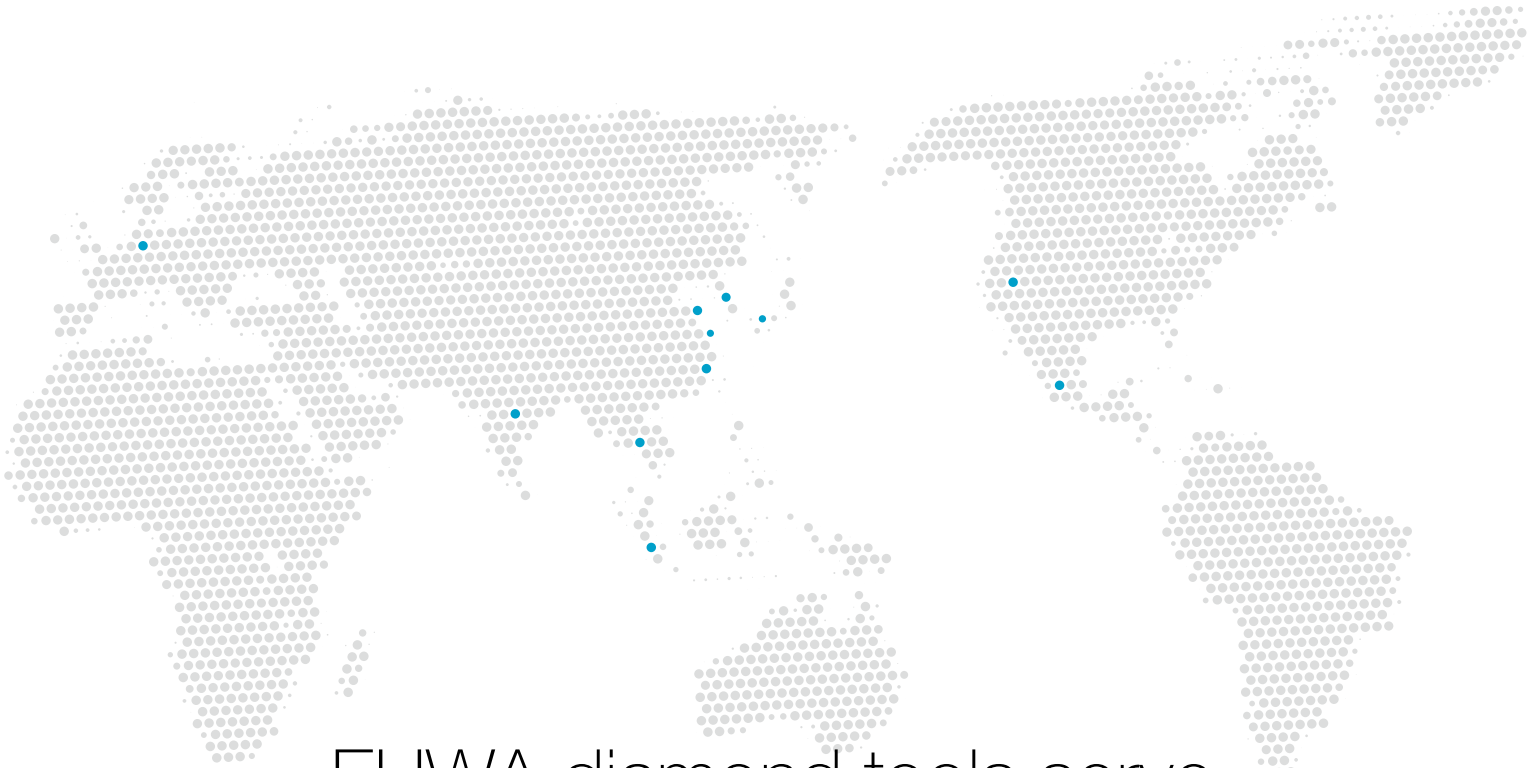
Cutting condition

Continuous *	Continuous	●	☐
Interrupt *	Light	●	☐
	Medium	●	☐
	Heavy	●	☐
Coolant*	Dry		☐
	Inner ☐	Out (Wet)	☐

Tool information

Tool material *	PCD		☐
	PCBN		☐
	CVD		☐
	SCD	natural	☐
		mono	☐
	TC		☐
	Cermet		☐
	Ceramic		☐
	Others		☐
Shank *	T.C		☐
	STEEL		☐
	T.C+STEEL		☐
Mono block			☐

SPEC *		
Competitor *		
Tool life		(time)
		(EA)
Operation *	turning	☐
	milling	☐
	boring	☐
	grooving / cutting	☐
	reaming	☐
	endmill	☐
	drilling	☐
Wearless		☐
Need to be determined *		☐



EHWA diamond tools serve as a promoter of globalization

Since 1975, EHWA DIAMOND has been growing by developing long-term partnerships with customers worldwide and across the industries. EHWA is tirelessly striving to provide the very best customer satisfaction through continuous product innovation and world class service.

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Osan 2


Dongtan


Pyeongtaek


Seocheon


Cheongju

Overseas


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China Shanghai


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Japan


Thailand


Germany


India


Mexico

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Printed by Ehwa diamond.08 / 2018