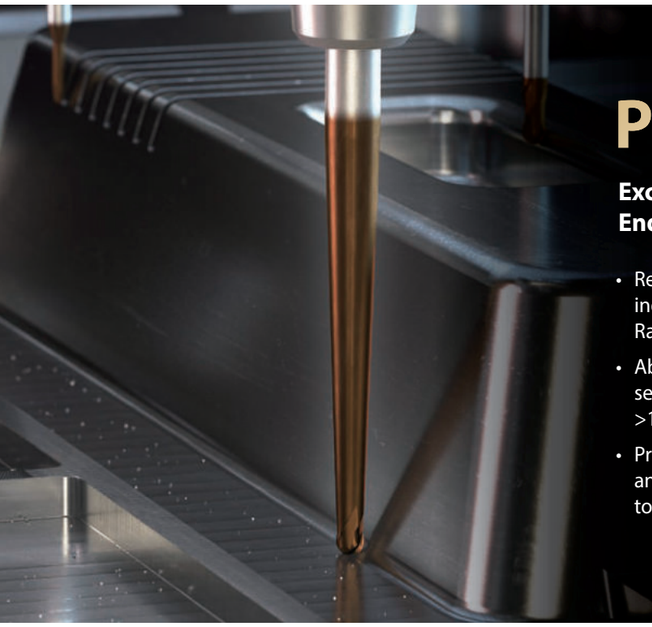
YE-X1EH25 METRIC

X1-EH

FINE-FINISHING SOLID CARBIDE END MILLS FOR HIGH HARDENED STEEL

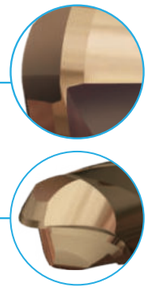
- Highest Accuracy for all Semi/Fine-Finishing application challenges
- Extensive Portfolio perfectly serving the Die&Mold Industry needs
- Latest Substrate and Coating Technology for predictive and extraordinary Tool Life



PREMIUM X1-EH

Exceptionally Accurate Nano Grain Solid Carbide End Mills For Hardened Steel

- Reducing Try-out and Re-Work time after machining due to industry leading small Tolerances with Ball Nose and Corner Radius Tools for more accurate workpieces
- Able to serve all application needs along the manufacturing sequence from roughing, semi-finishing to fine-finishing with >1.800 different tool variants
- Providing exceptional edge stability using nano grain carbide and proprietary C-Coating technology for extraordinary high tool life and respective unseen surface qualities



Ball Nose Gash Transition

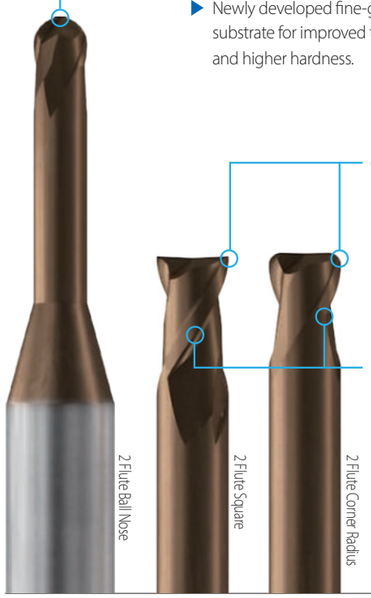
▶ Optimized transition from end mill center to flute for improved chip flow.

Reinforced Back Relief

▶ Strengthened cutting edge design for greater stability while not interfering with chip flow.

Raw Material

▶ Newly developed fine-grain nanostructure substrate for improved thermal shock stability and higher hardness.



Corner Geometries

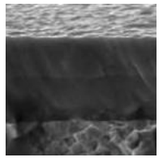
▶ YG-1's High performance corner geometries, including corner radius, for longer tool life in high-hardness machining.

Edge Preparation

▶ Optimal edge preparation applied to prevent chipping and achieve excellent surface finishes with longer tool life in high speed machining.

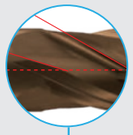
Special High Technology Coating

▶ Excellent wear and heat resistance with improved thermal shock stability. The nanolayer structure prevents the propagation of microcracks and coating elasticity promotes increased tool life.



NEW

3&4&6&8 FLUTE END MILLS

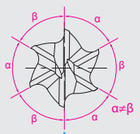


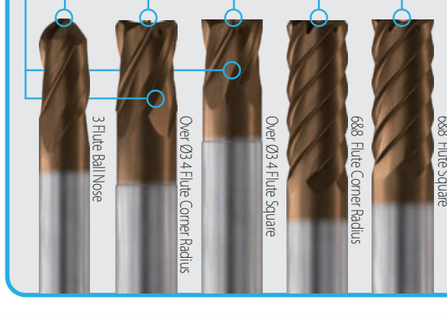
Multiple Helix

▶ Decreasing chatter to provide optimized surface qualities

Unequal Indexing

▶ Avoiding harmonics to achieve highest tool life





Flutes	SERIES	TYPE	OD Range min	OD Range max	HRc Range 40-60	HRc Range 50-70	Accurarcy	Helix	Applications
2	HPI90 / HPK44	Ball Nose	R0.05	R10.0	○ / ●	● / ○	≤Ø6mm ±1μm~5μm; >Ø6mm ±3μm~7μm	30°	3D (Profiling)
	HPI91 / HPK45	Ball Nose for Rib Processing	R0.05	R6.0	○ / ●	● / ○			
	HPI92 / HPK47	Ball Nose for Rib Processing with Taper Neck	R0.05	R6.0	○ / ●	● / ○			
	HPK10 / HPK46	Ball Nose with Neck	R0.5	R12.5	○ / ●	● / ○			
	HPI89	Corner Radius for Rib Processing	D0.2	D12.0	○	●	≤Ø6mm ±5μm; >Ø6mm ±8μm	35°	Side cutting, Sloting, Face milling
	HPK15	Corner Radius with Extended Neck-Stub Length	D0.3	D20.0	○	●			
	HPK14	Miniature Corner Radius	D0.3	D2.0	○	●	±5μm		
	HPI88	Square for Rib Processing	D0.1	D6.0	○	●	-		
	HPK19	Square with Extended Neck	D0.1	D20.0	○	●	-		
3	HPK11	Ball Nose - Center Match	R1.5	R10.0	○	●	≤Ø6mm ±5μm; >Ø6mm ±8μm	30°	3D (Profiling)
4	HPK12	Ball Nose - Center Match	R1.5	R10.0	○	●			
	HPK13	Ball Nose with Neck - Center Match	R0.5	R6.0	○	●			
	HPK16	Corner Radius for Rib Processing with Neck	D0.5	D6.0	○	●	±5μm	30° up to Ø3; 27°/30° Over Ø3	Side cutting, Sloting, Face milling
	HPK17	Corner Radius with Neck	D1.0	D20.0	○	●	≤Ø6mm ±5μm; >Ø6mm ±8μm		
	HPK20	Square for Rib Processing with Neck	D1.0	D6.0	○	●	-		
	HPK21	Square with Extended Neck	D1.0	D20.0	○	●	-		
6	HPK18	Corner Radius	D6.0	D20.0	○	●	±8μm	45°	
4&6&8	HPK23	Multi Flute Square	D1.0	D25.0	○	●	-		
4	HPK22	Corner Radius - High Feed	D2.0	D16.0	○	●	±5μm	0°	

Size	Shank Dia. Tolerance
up to Ø6	h4
over Ø6	h5

GUIDE TO ICONS

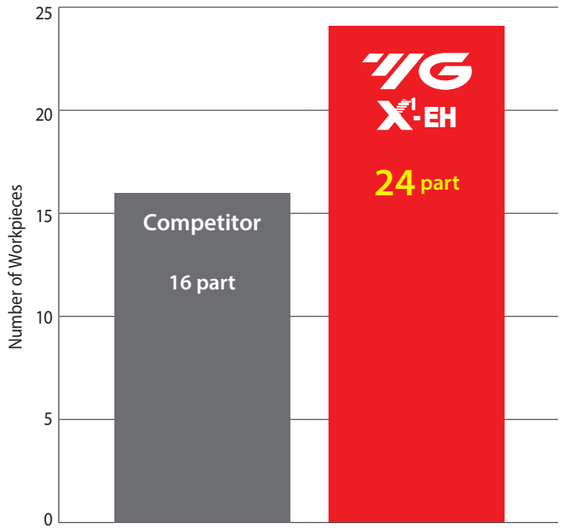
- CARBIDE — The tool is made of Nanograin carbide
- 2, 3, 4, 6, 4&6&8 — No. of Flutes
- R +0.001 ~-0.005 / R +0.003 ~-0.007 — Tolerance of Ball Radius
- R ±0.005 — Tolerance of Corner Radius
- PLAIN — Type of Shank
- C Coating — Type of Coating
- Cutting Conditions

PREMIUM SOLID CARBIDE END MILLS
for HIGH HARDENED STEEL X1-EH

CASE STUDY

TEST I Contouring

Ø6(R0.2) 4 Flute Corner Radius

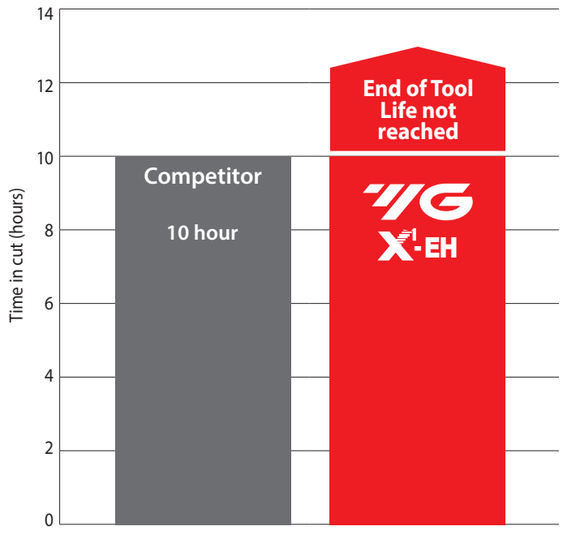


Cutting Condition (Contour Milling)

Tool	Ø6(R0.2) × Ø6 × 7(14) × 50
Work Material	- DIN : X30Cr13 (1.2083) - JIS : Stavax (HRc56) - AISI : 420
R.P.M (rev./min.)	5,000 rev./min.
Feed (mm/min.)	950 mm/min.
Milling Depth (mm)	4.0mm (0.7xD) (Axial Depth) 3.5mm (0.6xD) (Radial Depth)
Coolant	Water Soluble
Machine	Machining Center

TEST II Finishing

Ø5 4 Flute Square

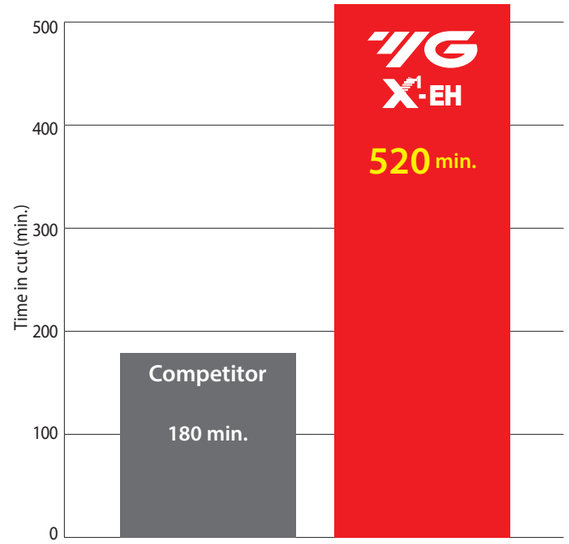


Cutting Condition (Finish Milling)

Tool	Ø5 × Ø6 × 5(13) × 55
Work Material	Steel HRc 52 - 54
R.P.M (rev./min.)	7,0450 rev./min.
Feed (mm/min.)	1.940 mm/min.
Milling Depth (mm)	0.5mm (0.1xD) (Axial Depth) 2.5mm (0.5xD) (Radial Depth)
Coolant	Dry Machining
Machine	Machining Center

TEST III Shoulder Milling

Ø12(R1) 4 Flute Corner Radius

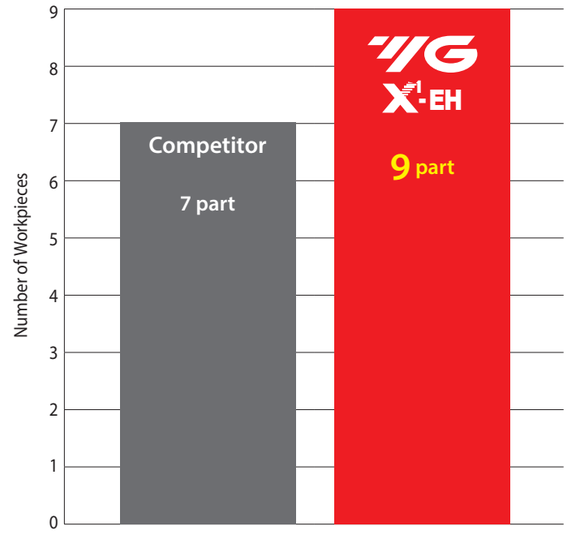


Cutting Condition (Shoulder Milling)

Tool	Ø12(R1) × Ø12 × 16 × 73
Work Material	- DIN : X210Cr12 (1.2080) - JIS : SKD1 (HRc60) - AISI : D3
R.P.M (rev./min.)	1,800 rev./min.
Feed (mm/min.)	216 mm/min.
Milling Depth (mm)	10.0mm (0.8xD) (Axial Depth) 0.5mm (0.04xD) (Radial Depth)
Coolant	Dry Machining
Machine	Machining Center

TEST IV Contouring

Ø6(R0.5) 4 Flute Corner Radius



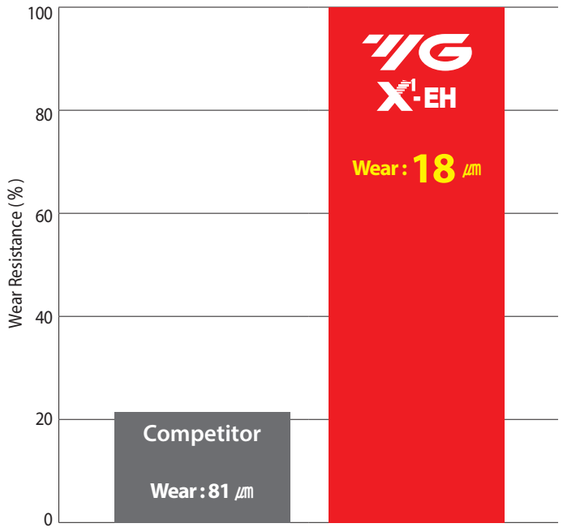
Cutting Condition (Contour Milling)

Tool	Ø6(R0.5) × Ø6 × 7(20) × 60
Work Material	Tool Steel HRc 52
R.P.M (rev./min.)	4,000 rev./min.
Feed (mm/min.)	800 mm/min.
Milling Depth (mm)	0.6mm (0.1xD) (Axial Depth) 2.5mm (0.4xD) (Radial Depth)
Coolant	Water Soluble
Machine	Machining Center

CASE STUDY

TEST V Profiling

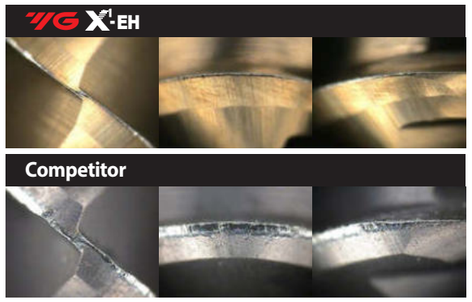
Ø3(R1.5) 2 Flute Ball Nose



Cutting Condition (Profiling)

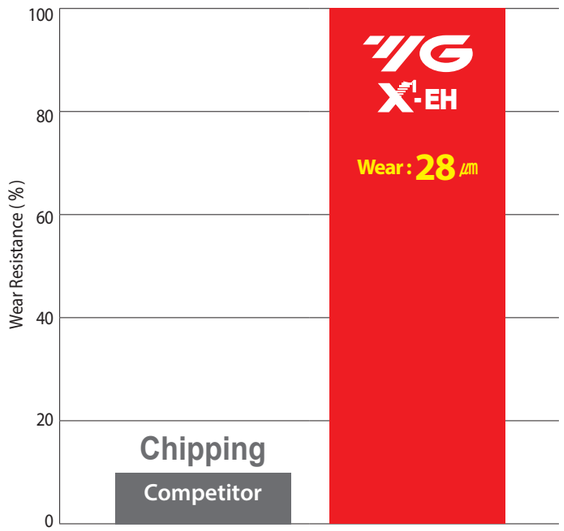
Tool	Ø3(R1.5) × Ø6 × 2.5(6) × 60
Work Material	- DIN : 1.2379 - JIS : SKD11(HRc63) - AISI : D2
R.P.M (rev./min.)	21,000 rev./min.
Feed (mm/min.)	2,800 mm/min.
Milling Depth (mm)	0.06mm (0.02xD) (Axial Depth) 0.15mm (0.05xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Total Milling Length : 248m



TEST VI Side Cutting

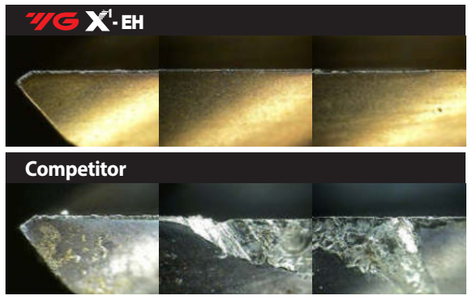
Ø6 2 Flute Square



Cutting Condition (Side Cutting)

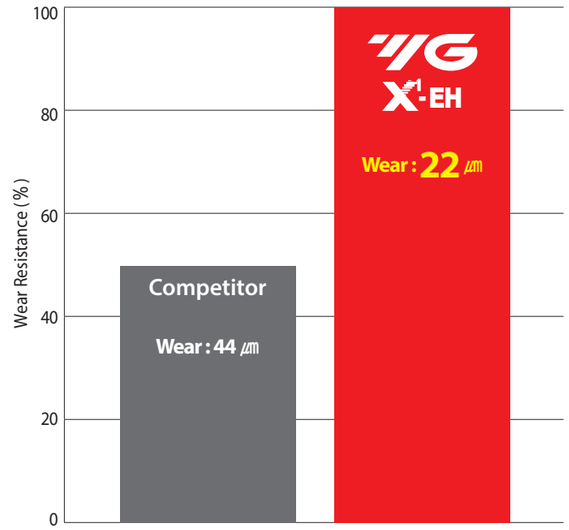
Tool	Ø6 × Ø6 × 15 × 50
Work Material	- DIN : 1.2379 - JIS : SKD11(HRc63) - AISI : D2
R.P.M (rev./min.)	4200 rev./min.
Feed (mm/min.)	255 mm/min.
Milling Depth (mm)	6mm (1.0xD) (Axial Depth) 0.18mm (0.03xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Milling Length : 2m



TEST VII Profiling

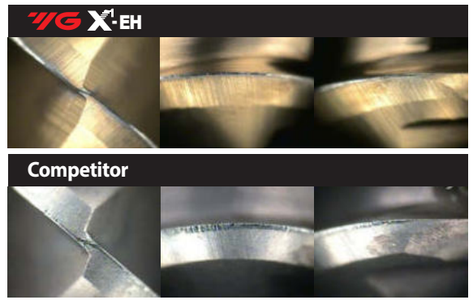
Ø3(R1.5) 2 Flute Ball Nose



Cutting Condition (Profiling)

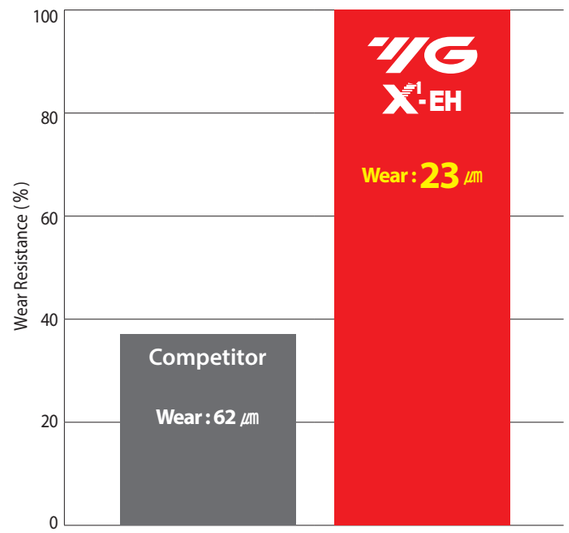
Tool	Ø3(R1.5) × Ø6 × 2.5(6) × 60
Work Material	- DIN : X30Cr13 - JIS : STAVAX(HRc52) - AISI : 420
R.P.M (rev./min.)	26,500 rev./min.
Feed (mm/min.)	4,000 mm/min.
Milling Depth (mm)	0.06mm (0.02xD) (Axial Depth) 0.15mm (0.05xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Total Milling length : 620m



TEST VIII Face Milling

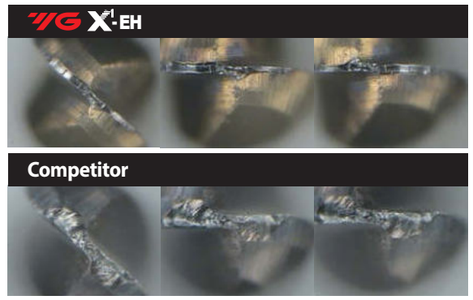
Ø0.6(R0.3) 2 Flute Ball Nose



Cutting Condition (Face Milling)

Tool	Ø0.6(R0.3) × Ø4 × 0.45(1) × 45
Work Material	- DIN : X30Cr13 - JIS : STAVAX(HRc52) - AISI : 420
R.P.M (rev./min.)	40,000 rev./min.
Feed (mm/min.)	1,400 mm/min.
Milling Depth (mm)	0.05mm (0.08xD) (Axial Depth) 0.1mm (0.16xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Total Milling length : 80m



SELECTION GUIDE

C-COATED SOLID CARBIDE

X1-EH END MILLS

Please visit globalyg1.com/mat for material search

Recommended cutting conditions : p.88-139

◎ : Excellent ○ : Good

ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment		HB	HRc	HPI91	HPI92	HPK10	HPI90	HPK45
	SERIES						HPI91	HPI92	HPK10	HPI90	HPK45
	FLUTE						2	2	2	2	2
	HELIX ANGLE						30°	30°	30°	30°	30°
	CUTTING EDGE SHAPE						BALL NOSE	BALL NOSE	BALL NOSE	BALL NOSE	BALL NOSE
	SIZE MIN						R0.05	R0.05	R0.5	R0.05	R0.05
	SIZE MAX						R6.0	R6.0	R12.5	R10.0	R6.0
	PAGE						11	21	30	31	32
							RIB PROCESSING	TAPER NECK	NECK	-	RIB PROCESSING
							C-Coating	C-Coating	C-Coating	C-Coating	C-Coating
P	1	Non-alloy steel	About 0.15% C	Annealed	125						
P	2	Non-alloy steel	About 0.45% C	Annealed	190	13					
P	3	Non-alloy steel	About 0.45% C	Quenched & tempered	250	25					
P	4	Non-alloy steel	About 0.75% C	Annealed	270	28					
P	5	Non-alloy steel	About 0.75% C	Quenched & tempered	300	32	○	○	○	○	○
P	6	Low alloy steel		Annealed	180	10					
P	7	Low alloy steel		Quenched & tempered	275	29					
P	8	Low alloy steel		Quenched & tempered	300	32	○	○	○	○	○
P	9	Low alloy steel		Quenched & tempered	350	38	○	○	○	○	◎
P	10	High alloyed steel, and tool steel		Annealed	200	15					
P	11.1	High alloyed steel, and tool steel		Quenched & Tempered	325	35	○	○	○	○	○
P	11.2	High alloyed steel, and tool steel		Quenched & Tempered	409	44	○	○	○	○	◎
M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15					
M	13	Stainless steel	Martensitic	Quenched & Tempered	240	23					
M	14.1	Stainless steel		Austenitic	180	10					
M	14.2	Stainless steel		PH Stainless Steel	180	10					
K	15	Grey cast iron	Pearlitic / ferritic		180	10					
K	16	Grey cast iron	Pearlitic (Martensitic)		260	26					
K	17	Nodular cast iron	Ferritic		160	3					
K	18	Nodular cast iron	Pearlitic		250	25					
K	19	Malleable cast iron	Ferritic		130						
K	20	Malleable cast iron	Pearlitic		230	21					
N	21	Aluminum-wrought alloy	Not Curable		60						
N	22	Aluminum-wrought alloy	Curable	Hardened	100						
N	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75						
N	24	Aluminum-cast, alloyed	≤ 12% Si, Curable	Hardened	90						
N	25	Aluminum-cast, alloyed	> 12% Si, Not Curable		130						
N	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%		110						
N	27	Copper and Copper Alloys (Bronze / Brass)	CuZn, CuSnZn (Brass)		90						
N	28	Copper and Copper Alloys (Bronze / Brass)	CuSn, lead-free copper and electrolytic copper		100						
N	29.1	Non Metallic Materials	Duroplastic								
N	29.2	Non Metallic Materials	GRAPHITE								
N	29.3	Non Metallic Materials	CFRP, GFRP								
N	30	Non Metallic Materials	Rubber, Wood, etc.								
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15					
S	32	Heat Resistant Super Alloys	Fe Based	Cured	280	30					
S	33	Heat Resistant Super Alloys	Ni or Co Based	Annealed	250	25					
S	34	Heat Resistant Super Alloys	Ni or Co Based	Cured	350	38					
S	35	Heat Resistant Super Alloys	Ni or Co Based	Cast	320	34					
S	36	Titanium Alloys	Pure Titanium		400 Rm						
S	37	Titanium Alloys	Alpha + Beta Alloys	Hardened	1050 Rm						
H	38.1	Hardened steel		Hardened	421-469	45-49	◎	◎	◎	◎	◎
H	38.2	Hardened steel		Hardened	481-560	50-55	◎	◎	◎	◎	◎
H	39.1	Hardened steel		Hardened	577-654	56-60	◎	◎	◎	◎	
H	39.2	Hardened steel		Hardened	670-739	61-65	◎	◎	◎	◎	
H	39.3	Hardened steel		Hardened		66-70	◎	◎	◎	◎	
H	40	Chilled Cast Iron		Cast	400	42	○	○	○	○	◎
H	41	Hardened Cast Iron		Hardened	550	55	◎	◎	◎	◎	◎

HPK47	HPK46	HPK44	HPK11	HPK12	HPK13	HPI89	HPK15	HPK14	HPK16	HPK17	HPK18
2	2	2	3	4	4	2	2	2	4	4	6
30°	30°	30°	30°	30°	30°	35°	35°	35°	27°/30° (up to Ø3: 30°)	27°/30° (up to Ø3: 30°)	45°
BALL NOSE	BALL NOSE	BALL NOSE	BALL NOSE CENTER MATCH	BALL NOSE CENTER MATCH	BALL NOSE CENTER MATCH	CORNER RADIUS	CORNER RADIUS	CORNER RADIUS	CORNER RADIUS	CORNER RADIUS	CORNER RADIUS
R0.05	R0.5	R0.05	R1.5	R1.5	R0.5	D0.2	D0.3	D0.3	D0.5	D1.0	D6.0
R6.0	R12.5	R10.0	R10.0	R10.0	R6.0	D12.0	D20.0	D2.0	D6.0	D20.0	D20.0
42	51	52	53	54	55	56	66	68	69	74	76
TAPER NECK	NECK	-	-	-	NECK	RIB PROCESSING	EXTENDED NECK	MINIATURE	RIB PROCESSING	NECK	-
C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating
○	○	○	○	○	○	○	○	○	○	○	○	5	P
○	○	○	○	○	○	○	○	○	○	○	○	8	P
◎	◎	◎	○	○	○	○	○	○	○	○	○	9	P
○	○	○	○	○	○	○	○	○	○	○	○	11.1	P
◎	◎	◎	○	○	○	○	○	○	○	○	○	11.2	P
												12	M
												13	M
												14.1	M
												14.2	M
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												37	S
◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	38.1	H
◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	38.2	H
			◎	◎	◎	◎	◎	◎	◎	◎	◎	39.1	H
			◎	◎	◎	◎	◎	◎	◎	◎	◎	39.2	H
			◎	◎	◎	◎	◎	◎	◎	◎	◎	39.3	H
◎	◎	◎	○	○	○	○	○	○	○	○	○	40	H
◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	41	H

SELECTION GUIDE

SERIES	HPI88	HPK19	HPK20	HPK21	HPK23	HPK22
FLUTE	2	2	4	4	4&6&8	4
HELIX ANGLE	35°	35°	27°/30° (up to Ø3: 30°)	27°/30° (up to Ø3: 30°)	45°	0°
CUTTING EDGE SHAPE	SQUARE	SQUARE	SQUARE	SQUARE	SQUARE	CORNER RADIUS
SIZE MIN	D0.1	D0.1	D1.0	D1.0	D1.0	D2.0
SIZE MAX	D6.0	D20.0	D6.0	D20.0	D25.0	D16.0
PAGE	77	83	84	85	86	87
	RIB PROCESSING	EXTENDED NECK	RIB PROCESSING	EXTENDED NECK	-	HIGH FEED
	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating	C-Coating

C-COATED SOLID CARBIDE X1-EH END MILLS

Please visit globalyg1.com/mat for material search

Recommended cutting conditions : p.88-139

◎ : Excellent ○ : Good

ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment		HB	HRc						
P	1	Non-alloy steel	About 0.15% C	Annealed	125							
	2		About 0.45% C	Annealed	190	13						
	3		About 0.45% C	Quenched & tempered	250	25						
	4		About 0.75% C	Annealed	270	28						
	5		About 0.75% C	Quenched & tempered	300	32	○	○	○	○	○	○
	6	Low alloy steel		Annealed	180	10						
	7			Quenched & tempered	275	29						
	8			Quenched & tempered	300	32	○	○	○	○	○	○
	9			Quenched & tempered	350	38	○	○	○	○	○	○
	10	High alloyed steel, and tool steel		Annealed	200	15						
	11.1			Quenched & Tempered	325	35	○	○	○	○	○	○
	11.2			Quenched & Tempered	409	44	○	○	○	○	○	○
M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15						
	13		Martensitic	Quenched & Tempered	240	23						
	14.1			Austenitic	180	10						
	14.2			PH Stainless Steel	180	10						
K	15	Grey cast iron	Pearlitic / ferritic		180	10						
	16		Pearlitic (Martensitic)		260	26						
	17	Nodular cast iron	Ferritic		160	3						
	18		Pearlitic		250	25						
	19	Malleable cast iron	Ferritic		130							
	20		Pearlitic		230	21						
N	21	Aluminum-wrought alloy	Not Curable		60							
	22		Curable	Hardened	100							
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75							
	24		≤ 12% Si, Curable	Hardened	90							
	25		> 12% Si, Not Curable		130							
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%		110							
	27		CuZn, CuSnZn (Brass)		90							
	28		CuSn, lead-free copper and electrolytic copper		100							
	29.1	Non Metallic Materials	Duroplastic									
	29.2		GRAPHITE									
	29.3		CFRP, GFRP									
	30		Rubber, Wood, etc.									
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15						
	32			Cured	280	30						
	33		Ni or Co Based	Annealed	250	25						
	34			Cured	350	38						
	35			Cast	320	34						
	36	Titanium Alloys	Pure Titanium		400 Rm							
	37		Alpha + Beta Alloys	Hardened	1050 Rm							
H	38.1	Hardened steel		Hardened	421-469	45-49	◎	◎	◎	◎	◎	◎
	38.2			Hardened	481-560	50-55	◎	◎	◎	◎	◎	◎
	39.1			Hardened	577-654	56-60	◎	◎	◎	◎	◎	◎
	39.2			Hardened	670-739	61-65	◎	◎	◎	◎	◎	◎
	39.3			Hardened		66-70	◎	◎	◎	◎	◎	◎
	40	Chilled Cast Iron		Cast	400	42	○	○	○	○	○	○
	41	Hardened Cast Iron		Hardened	550	55	◎	◎	◎	◎	◎	◎

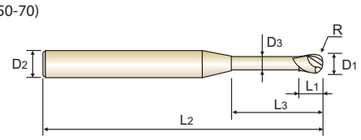
C-COATED SOLID CARBIDE END MILLS

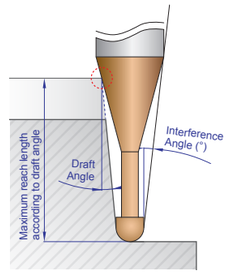
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI91**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91001	R0.05	**0.1**	4	0.07	0.2	45	0.085	14.66	0.25	0.26	0.28	0.29	0.32
HPI91901	R0.05	**0.1**	4	0.07	0.3	45	0.085	14.47	0.36	0.37	0.39	0.41	0.47
HPI91902	R0.05	**0.1**	4	0.07	0.5	45	0.085	14.11	0.57	0.60	0.63	0.66	0.75
HPI910015	R0.075	**0.15**	4	0.1	0.3	45	0.135	14.51	0.36	0.37	0.39	0.41	0.46
HPI91903	R0.075	**0.15**	4	0.1	0.5	45	0.135	14.15	0.57	0.59	0.62	0.66	0.74
HPI91904	R0.075	**0.15**	4	0.1	1	45	0.135	13.31	1.09	1.15	1.21	1.28	1.45
HPI91002	R0.1	**0.2**	4	0.15	0.3	45	0.17	14.50	0.40	0.42	0.43	0.46	0.51
HPI91905	R0.1	**0.2**	4	0.15	0.5	45	0.17	14.13	0.61	0.64	0.67	0.70	0.79
HPI91906	R0.1	**0.2**	4	0.15	0.75	45	0.17	13.70	0.87	0.92	0.96	1.02	1.15
HPI91907	R0.1	**0.2**	4	0.15	1	45	0.17	13.29	1.14	1.19	1.26	1.33	1.50
HPI91908	R0.1	**0.2**	4	0.15	1	50	0.17	13.29	1.14	1.19	1.26	1.33	1.50
HPI91909	R0.1	**0.2**	4	0.15	1.25	45	0.17	12.90	1.40	1.47	1.55	1.64	1.86
HPI91910	R0.1	**0.2**	4	0.15	1.5	45	0.17	12.53	1.66	1.75	1.84	1.95	2.21
HPI91911	R0.1	**0.2**	4	0.15	1.75	45	0.17	12.19	1.93	2.03	2.14	2.26	2.57
HPI91912	R0.1	**0.2**	4	0.15	2	45	0.17	11.86	2.19	2.30	2.43	2.58	2.92
HPI91913	R0.1	**0.2**	4	0.15	2.5	45	0.17	11.26	2.71	2.86	3.02	3.20	3.64
HPI91914	R0.1	**0.2**	4	0.15	3	45	0.17	10.71	3.24	3.41	3.61	3.82	4.35
HPI91915	R0.1	**0.2**	4	0.2	0.5	35	0.17	14.13	0.61	0.64	0.67	0.70	0.79
HPI91916	R0.1	**0.2**	4	0.2	0.5	50	0.17	14.13	0.61	0.64	0.67	0.70	0.79
HPI91917	R0.1	**0.2**	6	0.2	0.5	50	0.17	14.42	0.61	0.64	0.67	0.70	0.79
HPI91003	R0.15	**0.3**	4	0.2	0.5	45	0.27	14.20	0.61	0.63	0.66	0.69	0.77
HPI91918	R0.15	**0.3**	4	0.2	0.6	45	0.27	14.02	0.71	0.74	0.78	0.82	0.91
HPI91919	R0.15	**0.3**	4	0.2	0.75	45	0.27	13.75	0.87	0.91	0.95	1.00	1.12
HPI91920	R0.15	**0.3**	4	0.2	1	45	0.27	13.33	1.13	1.19	1.25	1.32	1.48
HPI91921	R0.15	**0.3**	4	0.2	1.25	45	0.27	12.93	1.40	1.47	1.54	1.63	1.84
HPI91922	R0.15	**0.3**	4	0.2	1.5	45	0.27	12.55	1.66	1.74	1.84	1.94	2.19

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel			High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

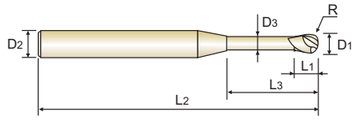
C-COATED SOLID CARBIDE END MILLS

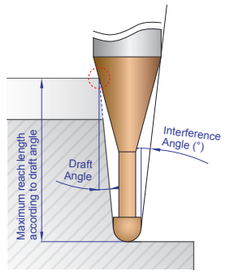
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI91**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91923	R0.15	**0.3**	4	0.2	1.75	45	0.27	12.19	1.92	2.02	2.13	2.25	2.55
HPI91924	R0.15	**0.3**	4	0.2	2	45	0.27	11.86	2.19	2.30	2.42	2.56	2.90
HPI91925	R0.15	**0.3**	4	0.2	2.25	45	0.27	11.54	2.45	2.58	2.72	2.87	3.26
HPI91926	R0.15	**0.3**	4	0.2	2.5	45	0.27	11.24	2.71	2.85	3.01	3.19	3.61
HPI91927	R0.15	**0.3**	4	0.2	3	45	0.27	10.68	3.24	3.41	3.60	3.81	4.33
HPI91928	R0.15	**0.3**	4	0.2	3.5	45	0.27	10.17	3.76	3.96	4.18	4.43	5.04
HPI91929	R0.15	**0.3**	4	0.2	4	45	0.27	9.71	4.29	4.52	4.77	5.06	5.75
HPI91930	R0.15	**0.3**	6	0.2	1.5	50	0.27	13.31	1.66	1.74	1.84	1.94	2.19
HPI91004	R0.2	**0.4**	4	0.3	0.5	45	0.37	14.28	0.61	0.63	0.65	0.68	0.75
HPI91931	R0.2	**0.4**	4	0.3	0.8	45	0.37	13.72	0.92	0.96	1.00	1.05	1.17
HPI91932	R0.2	**0.4**	4	0.3	1	45	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPI91933	R0.2	**0.4**	4	0.3	1.5	45	0.37	12.57	1.66	1.74	1.83	1.93	2.17
HPI91934	R0.2	**0.4**	4	0.3	2	45	0.37	11.86	2.18	2.29	2.41	2.55	2.88
HPI91935	R0.2	**0.4**	4	0.3	2.5	45	0.37	11.22	2.71	2.85	3.00	3.17	3.59
HPI91936	R0.2	**0.4**	4	0.3	3	45	0.37	10.65	3.24	3.40	3.59	3.80	4.31
HPI91937	R0.2	**0.4**	4	0.3	3.5	45	0.37	10.13	3.76	3.96	4.18	4.42	5.02
HPI91938	R0.2	**0.4**	4	0.3	4	45	0.37	9.66	4.29	4.51	4.76	5.04	5.73
HPI91939	R0.2	**0.4**	4	0.3	4.5	45	0.37	9.23	4.81	5.07	5.35	5.67	6.44
HPI91940	R0.2	**0.4**	4	0.3	5	45	0.37	8.84	5.34	5.62	5.94	6.29	7.15
HPI91941	R0.2	**0.4**	4	0.3	6	45	0.37	8.15	6.39	6.73	7.11	7.54	8.57
HPI91942	R0.2	**0.4**	4	0.4	1	35	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPI91943	R0.2	**0.4**	4	0.4	1	50	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPI91944	R0.2	**0.4**	6	0.3	1	50	0.37	13.91	1.13	1.18	1.24	1.30	1.46
HPI91945	R0.2	**0.4**	6	0.3	2	50	0.37	12.82	2.18	2.29	2.41	2.55	2.88
HPI91946	R0.2	**0.4**	6	0.4	1	50	0.37	13.91	1.13	1.18	1.24	1.30	1.46
HPI91005	R0.25	**0.5**	4	0.35	1	45	0.45	13.35	1.19	1.24	1.30	1.36	1.52

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	○		○	○											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK HPI91

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
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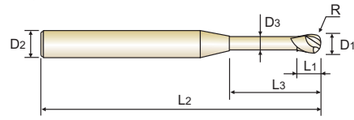
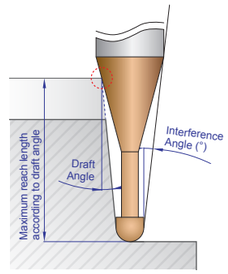




CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91947	R0.25	**0.5**	4	0.35	1.5	45	0.45	12.53	1.71	1.79	1.88	1.99	2.23
HPI91948	R0.25	**0.5**	4	0.35	2	45	0.45	11.80	2.24	2.35	2.47	2.61	2.94
HPI91949	R0.25	**0.5**	4	0.35	2.5	45	0.45	11.16	2.77	2.90	3.06	3.23	3.65
HPI91950	R0.25	**0.5**	4	0.35	3	45	0.45	10.57	3.29	3.46	3.65	3.86	4.36
HPI91951	R0.25	**0.5**	4	0.35	3.5	45	0.45	10.05	3.82	4.01	4.23	4.48	5.08
HPI91952	R0.25	**0.5**	4	0.35	4	45	0.45	9.57	4.34	4.57	4.82	5.10	5.79
HPI91953	R0.25	**0.5**	4	0.35	4.5	45	0.45	9.14	4.87	5.12	5.41	5.73	6.50
HPI91954	R0.25	**0.5**	4	0.35	5	45	0.45	8.75	5.40	5.68	5.99	6.35	7.21
HPI91955	R0.25	**0.5**	4	0.35	5.5	45	0.45	8.38	5.92	6.23	6.58	6.97	7.92
HPI91956	R0.25	**0.5**	4	0.35	6	45	0.45	8.05	6.45	6.79	7.17	7.60	8.63
HPI91957	R0.25	**0.5**	4	0.35	8	45	0.45	6.94	8.55	9.01	9.52	10.09	11.43
HPI91958	R0.25	**0.5**	4	0.35	10	45	0.45	6.10	10.66	11.23	11.87	12.58	13.76
HPI91959	R0.25	**0.5**	4	0.5	1.25	50	0.45	12.93	1.45	1.52	1.59	1.67	1.87
HPI91960	R0.25	**0.5**	6	0.5	1.25	50	0.45	13.61	1.45	1.52	1.59	1.67	1.87
HPI91006	R0.3	**0.6**	4	0.45	1	45	0.55	13.40	1.19	1.23	1.29	1.35	1.50
HPI91961	R0.3	**0.6**	4	0.45	1.5	45	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPI91962	R0.3	**0.6**	4	0.45	2	45	0.55	11.80	2.24	2.34	2.46	2.60	2.92
HPI91963	R0.3	**0.6**	4	0.45	2.5	45	0.55	11.13	2.76	2.90	3.05	3.22	3.63
HPI91964	R0.3	**0.6**	4	0.45	3	45	0.55	10.54	3.29	3.45	3.64	3.84	4.34
HPI91965	R0.3	**0.6**	4	0.45	3.5	45	0.55	10.00	3.82	4.01	4.22	4.47	5.06
HPI91966	R0.3	**0.6**	4	0.45	4	45	0.55	9.52	4.34	4.56	4.81	5.09	5.77
HPI91967	R0.3	**0.6**	4	0.45	4.5	45	0.55	9.08	4.87	5.12	5.40	5.71	6.48
HPI91968	R0.3	**0.6**	4	0.45	5	45	0.55	8.68	5.39	5.67	5.99	6.34	7.19
HPI91969	R0.3	**0.6**	4	0.45	5.5	45	0.55	8.31	5.92	6.23	6.57	6.96	7.90
HPI91970	R0.3	**0.6**	4	0.45	6	45	0.55	7.97	6.45	6.78	7.16	7.58	8.61
HPI91971	R0.3	**0.6**	4	0.45	7	45	0.55	7.37	7.50	7.89	8.34	8.83	10.04

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	○		○	○											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

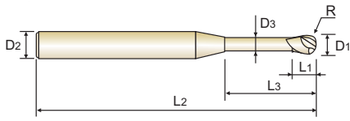
C-COATED SOLID CARBIDE END MILLS

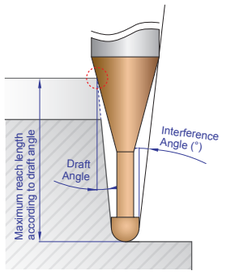
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI91**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91972	R0.3	**0.6**	4	0.45	8	45	0.55	6.86	8.55	9.00	9.51	10.08	11.36
HPI91973	R0.3	**0.6**	4	0.45	9	45	0.55	6.41	9.60	10.11	10.68	11.33	12.53
HPI91974	R0.3	**0.6**	4	0.45	10	45	0.55	6.01	10.65	11.22	11.86	12.57	13.70
HPI91975	R0.3	**0.6**	4	0.45	12	45	0.55	5.35	12.76	13.44	14.21	15.07	16.03
HPI91976	R0.3	**0.6**	4	0.6	1.5	35	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPI91977	R0.3	**0.6**	4	0.6	1.5	50	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPI91978	R0.3	**0.6**	6	0.45	2	50	0.55	12.81	2.24	2.34	2.46	2.60	2.92
HPI91979	R0.3	**0.6**	6	0.45	3	50	0.55	11.85	3.29	3.45	3.64	3.84	4.34
HPI91980	R0.3	**0.6**	6	0.45	4	50	0.55	11.02	4.34	4.56	4.81	5.09	5.77
HPI91981	R0.3	**0.6**	6	0.6	1.5	50	0.55	13.36	1.71	1.79	1.88	1.97	2.21
HPI91007	R0.35	**0.7**	4	0.5	2	45	0.65	11.80	2.24	2.34	2.45	2.58	2.90
HPI91982	R0.35	**0.7**	4	0.5	4	45	0.65	9.46	4.34	4.56	4.80	5.08	5.75
HPI91983	R0.35	**0.7**	4	0.5	6	45	0.65	7.89	6.44	6.78	7.15	7.57	8.59
HPI91984	R0.35	**0.7**	4	0.5	8	45	0.65	6.77	8.55	9.00	9.50	10.07	11.29
HPI91008	R0.4	**0.8**	4	0.6	2	45	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPI91985	R0.4	**0.8**	4	0.6	3	45	0.75	10.46	3.28	3.44	3.62	3.82	4.30
HPI91986	R0.4	**0.8**	4	0.6	4	45	0.75	9.40	4.34	4.55	4.79	5.07	5.72
HPI91987	R0.4	**0.8**	4	0.6	5	45	0.75	8.53	5.39	5.66	5.97	6.31	7.15
HPI91988	R0.4	**0.8**	4	0.6	6	45	0.75	7.81	6.44	6.77	7.14	7.56	8.57
HPI91989	R0.4	**0.8**	4	0.6	7	45	0.75	7.20	7.49	7.88	8.32	8.81	9.99
HPI91990	R0.4	**0.8**	4	0.6	8	45	0.75	6.68	8.54	8.99	9.49	10.05	11.23
HPI91991	R0.4	**0.8**	4	0.6	10	45	0.75	5.83	10.65	11.21	11.84	12.55	13.56
HPI91992	R0.4	**0.8**	4	0.6	12	45	0.75	5.18	12.75	13.43	14.19	15.04	15.90
HPI91993	R0.4	**0.8**	4	0.8	2	35	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPI91994	R0.4	**0.8**	4	0.8	2	50	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPI91995	R0.4	**0.8**	6	0.6	2	50	0.75	12.85	2.23	2.33	2.45	2.57	2.88

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	○		○	○											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

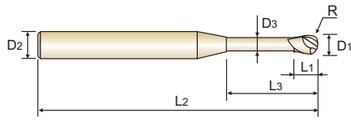
C-COATED SOLID CARBIDE END MILLS

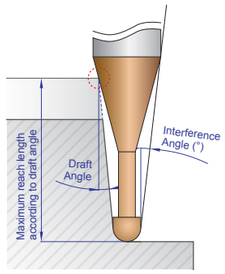
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK HPI91

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91996	R0.4	**0.8**	6	0.8	2	50	0.75	12.85	2.23	2.33	2.45	2.57	2.88
HPI91009	R0.45	**0.9**	4	0.65	2	45	0.85	11.79	2.23	2.33	2.44	2.56	2.86
HPI91997	R0.45	**0.9**	4	0.65	4	45	0.85	9.34	4.33	4.55	4.79	5.05	5.70
HPI91998	R0.45	**0.9**	4	0.65	6	45	0.85	7.72	6.44	6.77	7.13	7.55	8.55
HPI91999	R0.45	**0.9**	4	0.65	8	45	0.85	6.58	8.54	8.99	9.48	10.04	11.16
HPI91010	R0.5	**1.0**	4	0.75	2	45	0.95	11.78	2.23	2.32	2.43	2.55	2.84
HPI91801	R0.5	**1.0**	4	0.75	2.5	45	0.95	11.04	2.75	2.88	3.02	3.17	3.55
HPI91802	R0.5	**1.0**	4	0.75	3	45	0.95	10.38	3.28	3.43	3.60	3.79	4.26
HPI91803	R0.5	**1.0**	4	0.75	4	45	0.95	9.27	4.33	4.54	4.78	5.04	5.68
HPI91804	R0.5	**1.0**	4	0.75	5	45	0.95	8.37	5.38	5.65	5.95	6.29	7.10
HPI91805	R0.5	**1.0**	4	0.75	6	45	0.95	7.63	6.44	6.76	7.13	7.54	8.53
HPI91806	R0.5	**1.0**	4	0.75	7	45	0.95	7.01	7.49	7.87	8.30	8.78	9.93
HPI91807	R0.5	**1.0**	4	0.75	8	45	0.95	6.49	8.54	8.98	9.47	10.03	11.10
HPI91808	R0.5	**1.0**	4	0.75	9	45	0.95	6.03	9.59	10.09	10.65	11.28	12.26
HPI91809	R0.5	**1.0**	4	0.75	10	45	0.95	5.64	10.64	11.20	11.82	12.52	13.43
HPI91810	R0.5	**1.0**	4	0.75	12	45	0.95	4.99	12.75	13.42	14.17	14.96	15.77
HPI91811	R0.5	**1.0**	4	0.75	13	45	0.95	4.71	13.80	14.53	15.35	16.06	16.94
HPI91812	R0.5	**1.0**	4	0.75	14	50	0.95	4.47	14.85	15.64	16.52	17.17	18.10
HPI91813	R0.5	**1.0**	4	0.75	16	50	0.95	4.05	16.96	17.86	18.87	19.38	20.44
HPI91814	R0.5	**1.0**	4	0.75	18	55	0.95	3.70	19.06	20.08	21.05	21.59	22.78
HPI91815	R0.5	**1.0**	4	0.75	20	55	0.95	3.41	21.16	22.30	23.20	23.81	25.11
HPI91816	R0.5	**1.0**	4	1	2.5	40	0.95	11.04	2.75	2.88	3.02	3.17	3.55
HPI91817	R0.5	**1.0**	4	1	2.5	50	0.95	11.04	2.75	2.88	3.02	3.17	3.55
HPI91818	R0.5	**1.0**	6	0.75	3	50	0.95	11.84	3.28	3.43	3.60	3.79	4.26
HPI91819	R0.5	**1.0**	6	0.75	4	50	0.95	10.95	4.33	4.54	4.78	5.04	5.68
HPI91820	R0.5	**1.0**	6	0.75	5	50	0.95	10.18	5.38	5.65	5.95	6.29	7.10

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	○		○	○											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI91**

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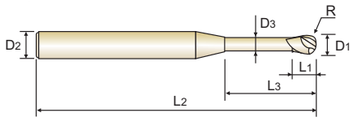
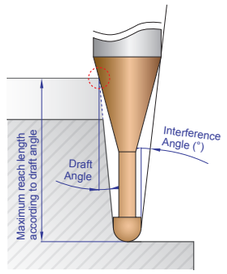




CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91821	R0.5	**1.0**	6	0.75	6	50	0.95	9.51	6.44	6.76	7.13	7.54	8.53
HPI91822	R0.5	**1.0**	6	0.75	7	50	0.95	8.92	7.49	7.87	8.30	8.78	9.95
HPI91823	R0.5	**1.0**	6	0.75	8	50	0.95	8.40	8.54	8.98	9.47	10.03	11.37
HPI91824	R0.5	**1.0**	6	0.75	10	50	0.95	7.53	10.64	11.20	11.82	12.52	14.22
HPI91825	R0.5	**1.0**	6	0.75	22	60	0.95	4.62	23.27	24.52	25.92	27.11	28.60
HPI91826	R0.5	**1.0**	6	1	2.5	50	0.95	12.34	2.75	2.88	3.02	3.17	3.55
HPI91012	R0.6	**1.2**	4	0.9	2.4	45	1.15	11.13	2.56	2.63	2.70	2.78	2.95
HPI91827	R0.6	**1.2**	4	0.9	4	45	1.15	9.12	4.21	4.34	4.47	4.62	4.94
HPI91828	R0.6	**1.2**	4	0.9	6	45	1.15	7.44	6.28	6.48	6.69	6.92	7.43
HPI91829	R0.6	**1.2**	4	0.9	8	45	1.15	6.28	8.35	8.62	8.90	9.22	9.92
HPI91830	R0.6	**1.2**	4	0.9	10	45	1.15	5.43	10.41	10.75	11.12	11.52	12.40
HPI91831	R0.6	**1.2**	4	0.9	12	45	1.15	4.79	12.48	12.89	13.34	13.82	14.89
HPI91832	R0.6	**1.2**	4	0.9	14	50	1.15	4.28	14.55	15.03	15.55	16.12	17.37
HPI91833	R0.6	**1.2**	4	0.9	16	50	1.15	3.87	16.61	17.17	17.77	18.42	19.86
HPI91834	R0.6	**1.2**	4	1.2	3	40	1.15	10.28	3.18	3.27	3.36	3.47	3.70
HPI91014	R0.7	**1.4**	4	1	8	45	1.35	6.06	8.34	8.61	8.89	9.20	9.89
HPI91835	R0.7	**1.4**	4	1	12	50	1.35	4.58	12.48	12.89	13.33	13.80	14.86
HPI91836	R0.7	**1.4**	4	1	16	50	1.35	3.67	16.61	17.17	17.76	18.40	19.84
HPI91015	R0.75	**1.5**	4	1.1	3	45	1.45	10.11	3.17	3.26	3.35	3.44	3.66
HPI91837	R0.75	**1.5**	4	1.1	4	45	1.45	8.87	4.21	4.33	4.46	4.59	4.91
HPI91838	R0.75	**1.5**	4	1.1	6	45	1.45	7.12	6.27	6.47	6.67	6.89	7.39
HPI91839	R0.75	**1.5**	4	1.1	8	45	1.45	5.94	8.34	8.61	8.89	9.19	9.88
HPI91840	R0.75	**1.5**	4	1.1	10	45	1.45	5.10	10.41	10.74	11.11	11.49	12.37
HPI91841	R0.75	**1.5**	4	1.1	12	45	1.45	4.46	12.48	12.88	13.32	13.79	14.85
HPI91842	R0.75	**1.5**	4	1.1	14	50	1.45	3.97	14.54	15.02	15.54	16.09	17.34
HPI91843	R0.75	**1.5**	4	1.1	16	50	1.45	3.57	16.61	17.16	17.76	18.39	19.82

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○										

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

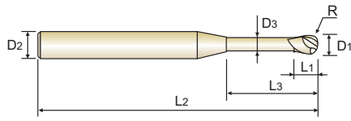
C-COATED SOLID CARBIDE END MILLS

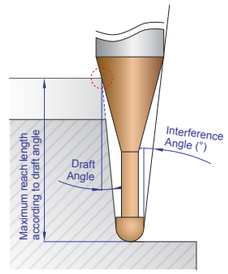
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK HPI91

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91844	R0.75	**1.5**	4	1.1	18	55	1.45	3.25	18.68	19.30	19.97	20.69	22.31
HPI91845	R0.75	**1.5**	4	1.1	20	55	1.45	2.98	20.74	21.44	22.19	22.99	-
HPI91846	R0.75	**1.5**	4	1.1	22	60	1.45	2.75	22.81	23.58	24.41	25.29	-
HPI91847	R0.75	**1.5**	4	1.1	30	70	1.45	2.10	31.08	32.14	33.27	34.49	-
HPI91848	R0.75	**1.5**	4	1.5	3.8	40	1.45	9.10	4.00	4.11	4.23	4.36	4.66
HPI91849	R0.75	**1.5**	4	1.5	3.8	50	1.45	9.10	4.00	4.11	4.23	4.36	4.66
HPI91850	R0.75	**1.5**	6	1.1	6	50	1.45	9.30	6.27	6.47	6.67	6.89	7.39
HPI91851	R0.75	**1.5**	6	1.1	8	50	1.45	8.13	8.34	8.61	8.89	9.19	9.88
HPI91852	R0.75	**1.5**	6	1.5	3.8	50	1.45	11.03	4.00	4.11	4.23	4.36	4.66
HPI91016	R0.8	**1.6**	4	1.2	8	45	1.55	5.82	8.34	8.60	8.88	9.19	9.87
HPI91853	R0.8	**1.6**	4	1.2	12	45	1.55	4.35	12.47	12.88	13.32	13.79	14.84
HPI91854	R0.8	**1.6**	4	1.2	16	50	1.55	3.47	16.61	17.16	17.75	18.39	19.81
HPI91855	R0.8	**1.6**	4	1.2	20	55	1.55	2.89	20.74	21.44	22.18	22.98	-
HPI91020	R1.0	**2.0**	4	1.5	3	45	1.95	9.74	3.16	3.24	3.32	3.41	3.60
HPI91856	R1.0	**2.0**	4	1.5	4	45	1.95	8.34	4.20	4.31	4.43	4.56	4.85
HPI91857	R1.0	**2.0**	4	1.5	6	45	1.95	6.46	6.26	6.45	6.64	6.86	7.33
HPI91858	R1.0	**2.0**	4	1.5	8	45	1.95	5.28	8.33	8.59	8.86	9.16	9.82
HPI91859	R1.0	**2.0**	4	1.5	10	45	1.95	4.46	10.40	10.73	11.08	11.46	12.30
HPI91860	R1.0	**2.0**	4	1.5	12	45	1.95	3.86	12.47	12.87	13.29	13.76	14.79
HPI91861	R1.0	**2.0**	4	1.5	13	45	1.95	3.62	13.50	13.94	14.40	14.91	16.03
HPI91862	R1.0	**2.0**	4	1.5	14	50	1.95	3.40	14.53	15.01	15.51	16.06	17.28
HPI91863	R1.0	**2.0**	4	1.5	16	50	1.95	3.04	16.60	17.15	17.73	18.36	19.76
HPI91864	R1.0	**2.0**	4	1.5	18	55	1.95	2.75	18.67	19.28	19.94	20.65	-
HPI91865	R1.0	**2.0**	4	1.5	20	55	1.95	2.51	20.74	21.42	22.16	22.95	-
HPI91866	R1.0	**2.0**	4	1.5	22	60	1.95	2.31	22.80	23.56	24.38	25.25	-
HPI91867	R1.0	**2.0**	4	1.5	25	65	1.95	2.06	25.90	26.77	27.70	28.70	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○										

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

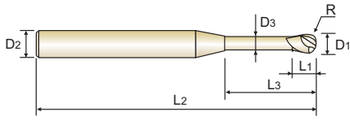
C-COATED SOLID CARBIDE END MILLS

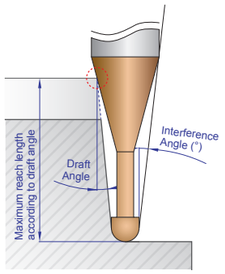
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI91**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91868	R1.0	**2.0**	4	1.5	30	70	1.95	1.74	31.07	32.12	33.24	-	-
HPI91869	R1.0	**2.0**	4	1.5	35	70	1.95	1.51	36.24	37.47	38.79	-	-
HPI91870	R1.0	**2.0**	4	1.5	40	90	1.95	1.34	41.41	42.82	-	-	-
HPI91871	R1.0	**2.0**	4	2	5	40	1.95	7.28	5.23	5.38	5.54	5.71	6.09
HPI91872	R1.0	**2.0**	4	2	5	50	1.95	7.28	5.23	5.38	5.54	5.71	6.09
HPI91873	R1.0	**2.0**	6	1.5	4	50	1.95	10.73	4.20	4.31	4.43	4.56	4.85
HPI91874	R1.0	**2.0**	6	1.5	6	50	1.95	9.05	6.26	6.45	6.64	6.86	7.33
HPI91875	R1.0	**2.0**	6	1.5	8	50	1.95	7.82	8.33	8.59	8.86	9.16	9.82
HPI91876	R1.0	**2.0**	6	1.5	10	50	1.95	6.89	10.40	10.73	11.08	11.46	12.30
HPI91877	R1.0	**2.0**	6	1.5	16	60	1.95	5.07	16.60	17.15	17.73	18.36	19.76
HPI91878	R1.0	**2.0**	6	1.5	25	65	1.95	3.63	25.90	26.77	27.70	28.70	30.95
HPI91879	R1.0	**2.0**	6	2	5	50	1.95	9.82	5.23	5.38	5.54	5.71	6.09
HPI91025	R1.25	**2.5**	4	2.3	6	45	2.4	5.54	6.35	6.53	6.72	6.93	7.39
HPI91880	R1.25	**2.5**	4	2.3	8	45	2.4	4.41	8.42	8.67	8.94	9.23	9.87
HPI91881	R1.25	**2.5**	4	2.3	10	45	2.4	3.66	10.49	10.81	11.15	11.53	12.36
HPI91882	R1.25	**2.5**	4	2.3	15	50	2.4	2.57	15.66	16.16	16.70	17.28	-
HPI91883	R1.25	**2.5**	4	2.3	20	55	2.4	1.98	20.82	21.51	22.24	-	-
HPI91884	R1.25	**2.5**	4	2.3	25	65	2.4	1.61	25.99	26.85	27.78	-	-
HPI91885	R1.25	**2.5**	4	2.3	30	70	2.4	1.35	31.16	32.20	-	-	-
HPI91886	R1.25	**2.5**	4	2.3	35	70	2.4	1.17	36.33	37.55	-	-	-
HPI91030	R1.5	**3.0**	4	3	8	40	2.85	3.31	8.51	8.75	9.01	9.30	9.93
HPI91887	R1.5	**3.0**	6	2.5	6	60	2.85	8.22	6.44	6.61	6.80	7.00	7.44
HPI91888	R1.5	**3.0**	6	2.5	8	60	2.85	6.91	8.51	8.75	9.01	9.30	9.93
HPI91889	R1.5	**3.0**	6	2.5	10	60	2.85	5.96	10.58	10.89	11.23	11.60	12.41
HPI91890	R1.5	**3.0**	6	2.5	12	60	2.85	5.23	12.64	13.03	13.45	13.90	14.90
HPI91891	R1.5	**3.0**	6	2.5	14	60	2.85	4.67	14.71	15.17	15.66	16.20	17.39

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	○		○	○											

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK HPI91

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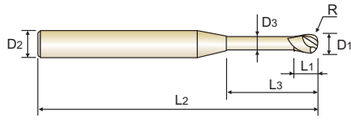
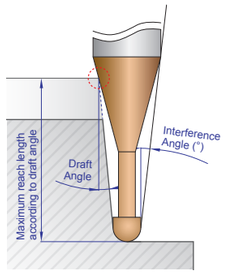




CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91892	R1.5	**3.0**	6	2.5	16	60	2.85	4.21	16.78	17.31	17.88	18.49	19.87
HPI91893	R1.5	**3.0**	6	2.5	20	65	2.85	3.52	20.91	21.59	22.31	23.09	24.85
HPI91894	R1.5	**3.0**	6	2.5	25	65	2.85	2.92	26.08	26.94	27.86	28.84	-
HPI91895	R1.5	**3.0**	6	2.5	30	70	2.85	2.50	31.25	32.29	33.40	34.59	-
HPI91896	R1.5	**3.0**	6	2.5	35	80	2.85	2.18	36.42	37.63	38.94	40.34	-
HPI91897	R1.5	**3.0**	6	2.5	40	90	2.85	1.94	41.59	42.98	44.48	-	-
HPI91898	R1.5	**3.0**	6	3	8	60	2.85	6.91	8.51	8.75	9.01	9.30	9.93
HPI91035	R1.75	**3.5**	6	2.8	15	60	1.25	3.24	19.79	20.41	21.09	21.81	23.44
HPI91899	R1.75	**3.5**	6	2.8	20	65	3.35	3.08	20.90	21.57	22.29	23.06	24.79
HPI91701	R1.75	**3.5**	6	2.8	25	65	3.35	2.54	26.07	26.92	27.83	28.81	-
HPI91702	R1.75	**3.5**	6	2.8	30	70	3.35	2.16	31.24	32.27	33.37	34.56	-
HPI91703	R1.75	**3.5**	6	2.8	35	80	3.35	1.87	36.41	37.62	38.91	-	-
HPI91704	R1.75	**3.5**	6	2.8	40	90	3.35	1.66	41.58	42.96	44.45	-	-
HPI91705	R1.75	**3.5**	6	2.8	45	90	3.35	1.49	46.75	48.31	-	-	-
HPI91040	R2.0	**4.0**	4	3	8	65	3.85	0.00	-	-	-	-	-
HPI91706	R2.0	**4.0**	6	3	8	65	3.85	5.70	8.49	8.72	8.96	9.22	9.81
HPI91707	R2.0	**4.0**	6	3	10	65	3.85	4.76	10.56	10.86	11.18	11.52	12.29
HPI91708	R2.0	**4.0**	6	3	12	65	3.85	4.08	12.63	13.00	13.39	13.82	14.78
HPI91709	R2.0	**4.0**	6	3	14	65	3.85	3.57	14.69	15.14	15.61	16.12	17.27
HPI91710	R2.0	**4.0**	6	3	15	65	3.85	3.36	15.73	16.21	16.72	17.27	18.51
HPI91711	R2.0	**4.0**	6	3	20	65	3.85	2.60	20.90	21.55	22.26	23.02	-
HPI91712	R2.0	**4.0**	6	3	25	70	3.85	2.12	26.06	26.90	27.80	28.77	-
HPI91713	R2.0	**4.0**	6	3	30	70	3.85	1.79	31.23	32.25	33.34	-	-
HPI91714	R2.0	**4.0**	6	3	35	80	3.85	1.55	36.40	37.60	38.88	-	-
HPI91715	R2.0	**4.0**	6	3	40	85	3.85	1.36	41.57	42.95	-	-	-
HPI91716	R2.0	**4.0**	6	3	45	90	3.85	1.22	46.74	48.30	-	-	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	○		○	○											

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

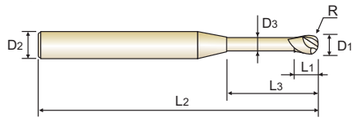
C-COATED SOLID CARBIDE END MILLS

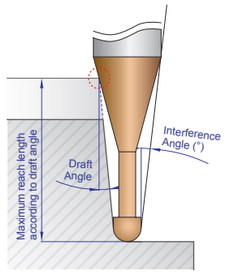
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI91**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 88 -99

R0.05~R3 R3.5~R6

✻ NEW SIZE Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI91717	R2.0	**4.0**	6	3	50	100	3.85	1.10	51.91	53.64	-	-	-
HPI91718	R2.0	**4.0**	6	4	10	40	3.85	4.76	10.56	10.86	11.18	11.52	12.29
HPI91719	R2.0	**4.0**	6	4	10	60	3.85	4.76	10.56	10.86	11.18	11.52	12.29
HPI91050	R2.5	**5.0**	6	3.5	10	70	4.85	2.97	10.54	10.82	11.12	11.45	-
HPI91720	R2.5	**5.0**	6	3.5	15	70	4.85	1.96	15.71	16.17	16.66	-	-
HPI91721	R2.5	**5.0**	6	3.5	20	70	4.85	1.46	20.88	21.52	-	-	-
HPI91722	R2.5	**5.0**	6	3.5	25	70	4.85	1.16	26.05	26.87	-	-	-
HPI91723	R2.5	**5.0**	6	3.5	30	80	4.85	0.97	31.22	-	-	-	-
HPI91724	R2.5	**5.0**	6	3.5	40	90	4.85	0.72	41.55	-	-	-	-
HPI91725	R2.5	**5.0**	6	5	12	45	4.85	2.46	12.61	12.96	13.34	13.75	-
HPI91726	R2.5	**5.0**	6	5	12	60	4.85	2.46	12.61	12.96	13.34	13.75	-
HPI91060	R3.0	**6.0**	6	6	10	70	5.85	0.00	-	-	-	-	-
HPI91727	R3.0	**6.0**	6	6	15	45	5.85	0.00	-	-	-	-	-
HPI91728	R3.0	**6.0**	6	6	15	60	5.85	0.00	-	-	-	-	-
HPI91729	R3.0	**6.0**	6	6	15	70	5.85	0.00	-	-	-	-	-
HPI91730	R3.0	**6.0**	6	6	20	70	5.85	0.00	-	-	-	-	-
HPI91731	R3.0	**6.0**	6	6	25	70	5.85	0.00	-	-	-	-	-
HPI91732	R3.0	**6.0**	6	6	30	80	5.85	0.00	-	-	-	-	-
HPI91733	R3.0	**6.0**	6	6	35	85	5.85	0.00	-	-	-	-	-
HPI91734	R3.0	**6.0**	6	6	40	90	5.85	0.00	-	-	-	-	-
HPI91735	R3.0	**6.0**	6	6	50	120	5.85	0.00	-	-	-	-	-
HPI91736	R3.0	**6.0**	6	6	60	120	5.85	0.00	-	-	-	-	-
✻ **HPI91080**	R4.0	**8.0**	8	12	24	100	7.7	0.00	-	-	-	-	-
✻ **HPI91100**	R5.0	**10.0**	10	15	30	100	9.7	0.00	-	-	-	-	-
✻ **HPI91120**	R6.0	**12.0**	12	18	36	110	11.7	0.00	-	-	-	-	-

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P															M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron			
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20			
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21			
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230			
Recommended					○			○	○		○	○												

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

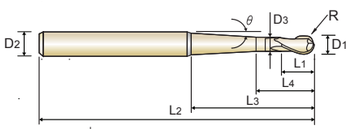
C-COATED SOLID CARBIDE END MILLS

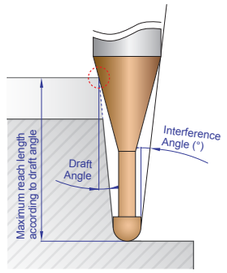
2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

SERIES

PLAIN SHANK **HPI92**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3	θ°	L_4		0.5°	1°	1.5°	2°	3°
HPI92001	R0.05	**0.1**	4	0.07	0.5	50	0.085	**3°**	0.17	14.23	0.37	0.44	0.51	0.53	0.56
HPI92901	R0.05	**0.1**	4	0.07	0.75	50	0.085	**3°**	0.17	13.88	0.37	0.44	0.58	0.76	0.81
HPI920015	R0.075	**0.15**	4	0.1	1	50	0.135	**3°**	0.25	13.55	0.46	0.55	0.71	1.00	1.08
HPI92902	R0.075	**0.15**	4	0.1	1.5	50	0.135	**3°**	0.25	12.92	0.46	0.55	0.71	1.03	1.58
HPI92002	R0.1	**0.2**	4	0.15	1.5	50	0.17	**0.5°**	0.35	12.59	1.57	1.62	1.67	1.73	1.86
HPI92903	R0.1	**0.2**	4	0.15	1.5	50	0.17	**1°**	0.35	12.64	1.53	1.58	1.63	1.69	1.82
HPI92904	R0.1	**0.2**	4	0.15	1.5	50	0.17	**1.5°**	0.35	12.69	1.33	1.54	1.59	1.64	1.77
HPI92905	R0.1	**0.2**	4	0.15	1.5	50	0.17	**2°**	0.35	12.75	1.01	1.46	1.55	1.60	1.72
HPI92906	R0.1	**0.2**	4	0.15	2	50	0.17	**0.5°**	0.35	11.93	2.07	2.13	2.21	2.29	2.46
HPI92907	R0.1	**0.2**	4	0.15	2	50	0.17	**1°**	0.35	12.00	2.01	2.08	2.15	2.23	2.40
HPI92908	R0.1	**0.2**	4	0.15	2	50	0.17	**1.5°**	0.35	12.07	1.33	2.02	2.09	2.16	2.33
HPI92909	R0.1	**0.2**	4	0.15	2	50	0.17	**2°**	0.35	12.14	1.01	1.46	2.03	2.10	2.26
HPI92910	R0.1	**0.2**	4	0.15	3	50	0.17	**3°**	0.35	11.28	0.74	0.90	1.17	1.71	3.13
HPI92911	R0.1	**0.2**	4	0.15	3	50	0.17	**5°**	0.35	11.69	0.57	0.63	0.70	0.80	1.15
HPI92912	R0.1	**0.2**	4	0.15	5	50	0.17	**3°**	0.35	9.68	0.74	0.90	1.17	1.71	5.13
HPI92913	R0.1	**0.2**	4	0.15	5	50	0.17	**5°**	0.35	10.23	0.57	0.63	0.70	0.80	1.15
HPI92003	R0.15	**0.3**	4	0.2	2	50	0.27	**0.5°**	0.5	11.92	2.07	2.14	2.21	2.29	2.46
HPI92914	R0.15	**0.3**	4	0.2	2	50	0.27	**1°**	0.5	11.99	2.02	2.08	2.15	2.23	2.40
HPI92915	R0.15	**0.3**	4	0.2	2	50	0.27	**1.5°**	0.5	12.05	1.53	2.03	2.10	2.17	2.34
HPI92916	R0.15	**0.3**	4	0.2	2	50	0.27	**2°**	0.5	12.12	1.19	1.71	2.05	2.12	2.28
HPI92917	R0.15	**0.3**	4	0.2	2	50	0.27	**3°**	0.5	12.26	0.91	1.10	1.42	2.00	2.15
HPI92918	R0.15	**0.3**	4	0.2	3	50	0.27	**0.5°**	0.5	10.77	3.07	3.17	3.28	3.40	3.66
HPI92919	R0.15	**0.3**	4	0.2	3	50	0.27	**1°**	0.5	10.86	2.57	3.08	3.19	3.30	3.56
HPI92920	R0.15	**0.3**	4	0.2	3	50	0.27	**1.5°**	0.5	10.95	1.53	2.92	3.10	3.21	3.46
HPI92921	R0.15	**0.3**	4	0.2	3	50	0.27	**2°**	0.5	11.04	1.19	1.71	3.01	3.12	3.36
HPI92922	R0.15	**0.3**	4	0.2	3	50	0.27	**3°**	0.5	11.23	0.91	1.10	1.42	2.06	3.15

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPI92**

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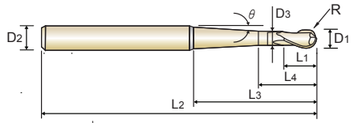
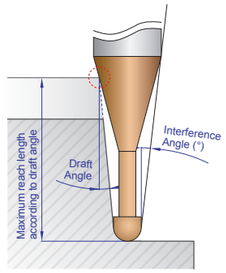




CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPI92923	R0.15	**0.3**	4	0.2	3	50	0.27	**5°**	0.5	11.62	0.73	0.80	0.89	1.02	1.45
HPI92924	R0.15	**0.3**	4	0.2	5	50	0.27	**3°**	0.5	9.61	0.91	1.10	1.42	2.06	5.15
HPI92925	R0.15	**0.3**	4	0.2	5	50	0.27	**5°**	0.5	10.14	0.73	0.80	0.89	1.02	1.45
HPI92926	R0.15	**0.3**	4	0.2	7	50	0.27	**3°**	0.5	8.39	0.91	1.10	1.42	2.06	7.15
HPI92927	R0.15	**0.3**	4	0.2	7	50	0.27	**5°**	0.5	8.99	0.73	0.80	0.89	1.02	1.45
HPI92004	R0.2	**0.4**	4	0.3	3	50	0.37	**0.5°**	0.7	10.73	3.07	3.17	3.28	3.40	3.66
HPI92928	R0.2	**0.4**	4	0.3	3	50	0.37	**1°**	0.7	10.81	2.92	3.09	3.20	3.31	3.56
HPI92929	R0.2	**0.4**	4	0.3	3	50	0.37	**1.5°**	0.7	10.90	1.81	3.01	3.12	3.23	3.47
HPI92930	R0.2	**0.4**	4	0.3	3	50	0.37	**2°**	0.7	10.98	1.44	2.06	3.03	3.14	3.38
HPI92931	R0.2	**0.4**	4	0.3	4	50	0.37	**0.5°**	0.7	9.76	4.07	4.21	4.35	4.51	4.86
HPI92932	R0.2	**0.4**	4	0.3	4	50	0.37	**1°**	0.7	9.86	2.92	4.09	4.24	4.39	4.73
HPI92933	R0.2	**0.4**	4	0.3	4	50	0.37	**1.5°**	0.7	9.96	1.81	3.42	4.12	4.26	4.59
HPI92934	R0.2	**0.4**	4	0.3	4	50	0.37	**2°**	0.7	10.06	1.44	2.06	3.92	4.14	4.46
HPI92935	R0.2	**0.4**	4	0.3	5	50	0.37	**3°**	0.7	9.52	1.14	1.38	1.77	2.56	5.19
HPI92936	R0.2	**0.4**	4	0.3	5	50	0.37	**5°**	0.7	10.04	0.95	1.04	1.16	1.32	1.87
HPI92937	R0.2	**0.4**	4	0.3	6	50	0.37	**0.5°**	0.7	8.26	6.07	6.28	6.50	6.74	7.27
HPI92938	R0.2	**0.4**	4	0.3	6	50	0.37	**1°**	0.7	8.37	2.92	6.09	6.31	6.54	7.05
HPI92939	R0.2	**0.4**	4	0.3	6	50	0.37	**1.5°**	0.7	8.49	1.81	3.42	6.12	6.34	6.84
HPI92940	R0.2	**0.4**	4	0.3	6	50	0.37	**2°**	0.7	8.61	1.44	2.06	3.92	6.14	6.62
HPI92941	R0.2	**0.4**	4	0.3	7	50	0.37	**3°**	0.7	8.30	1.14	1.38	1.77	2.56	7.19
HPI92942	R0.2	**0.4**	4	0.3	7	50	0.37	**5°**	0.7	8.88	0.95	1.04	1.16	1.32	1.87
HPI92005	R0.25	**0.5**	4	0.35	4	50	0.45	**0.5°**	0.85	9.67	4.12	4.25	4.40	4.55	4.90
HPI92943	R0.25	**0.5**	4	0.35	4	50	0.45	**1°**	0.85	9.76	4.01	4.14	4.28	4.43	4.77
HPI92944	R0.25	**0.5**	4	0.35	4	50	0.45	**1.5°**	0.85	9.86	2.58	4.03	4.17	4.32	4.65
HPI92945	R0.25	**0.5**	4	0.35	4	50	0.45	**2°**	0.85	9.96	2.00	2.88	4.05	4.20	4.52
HPI92946	R0.25	**0.5**	4	0.35	5	50	0.45	**0.5°**	0.85	8.85	5.12	5.29	5.47	5.66	6.10

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

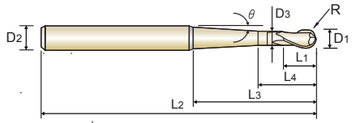
C-COATED SOLID CARBIDE END MILLS

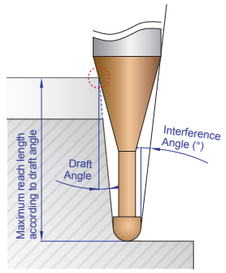
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK HPI92

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPI92947	R0.25	**0.5**	4	0.35	5	50	0.45	**1°**	0.85	8.96	4.31	5.14	5.32	5.51	5.93
HPI92948	R0.25	**0.5**	4	0.35	5	50	0.45	**1.5°**	0.85	9.06	2.58	4.91	5.17	5.35	5.77
HPI92949	R0.25	**0.5**	4	0.35	5	50	0.45	**2°**	0.85	9.18	2.00	2.88	5.02	5.20	5.60
HPI92006	R0.3	**0.6**	4	0.45	4	50	0.55	**0.5°**	1.05	9.61	4.12	4.25	4.40	4.55	4.90
HPI92950	R0.3	**0.6**	4	0.45	4	50	0.55	**1°**	1.05	9.70	4.02	4.15	4.29	4.44	4.78
HPI92951	R0.3	**0.6**	4	0.45	4	50	0.55	**1.5°**	1.05	9.79	2.86	4.05	4.18	4.33	4.66
HPI92952	R0.3	**0.6**	4	0.45	4	50	0.55	**3°**	1.05	10.08	1.77	2.14	2.75	3.98	4.30
HPI92953	R0.3	**0.6**	4	0.45	5	50	0.55	**0.5°**	1.05	8.78	5.12	5.29	5.47	5.66	6.10
HPI92954	R0.3	**0.6**	4	0.45	5	50	0.55	**1°**	1.05	8.88	4.66	5.15	5.33	5.52	5.94
HPI92955	R0.3	**0.6**	4	0.45	5	50	0.55	**1.5°**	1.05	8.98	2.86	5.01	5.18	5.37	5.78
HPI92956	R0.3	**0.6**	4	0.45	5	50	0.55	**2°**	1.05	9.09	2.25	3.23	5.04	5.22	5.62
HPI92957	R0.3	**0.6**	4	0.45	5	50	0.55	**3°**	1.05	9.31	1.77	2.14	2.75	3.98	5.30
HPI92958	R0.3	**0.6**	4	0.45	5	50	0.55	**5°**	1.05	9.79	1.45	1.59	1.78	2.02	2.88
HPI92959	R0.3	**0.6**	4	0.45	6	50	0.55	**0.5°**	1.05	8.08	6.12	6.32	6.54	6.78	7.30
HPI92960	R0.3	**0.6**	4	0.45	6	50	0.55	**1°**	1.05	8.19	4.66	6.15	6.36	6.59	7.10
HPI92961	R0.3	**0.6**	4	0.45	6	50	0.55	**1.5°**	1.05	8.30	2.86	5.41	6.18	6.41	6.90
HPI92962	R0.3	**0.6**	4	0.45	6	50	0.55	**2°**	1.05	8.41	2.25	3.23	6.01	6.22	6.70
HPI92963	R0.3	**0.6**	4	0.45	7	50	0.55	**3°**	1.05	8.08	1.77	2.14	2.75	3.98	7.30
HPI92964	R0.3	**0.6**	4	0.45	7	50	0.55	**5°**	1.05	8.63	1.45	1.59	1.78	2.02	2.88
HPI92965	R0.3	**0.6**	4	0.45	8	50	0.55	**0.5°**	1.05	6.97	8.12	8.39	8.69	9.00	9.71
HPI92966	R0.3	**0.6**	4	0.45	8	50	0.55	**1°**	1.05	7.08	4.66	8.15	8.44	8.74	9.43
HPI92967	R0.3	**0.6**	4	0.45	8	50	0.55	**1.5°**	1.05	7.20	2.86	5.41	8.18	8.48	9.14
HPI92968	R0.3	**0.6**	4	0.45	8	50	0.55	**2°**	1.05	7.32	2.25	3.23	6.16	8.22	8.86
HPI92008	R0.4	**0.8**	4	0.6	8	60	0.75	**0.5°**	1.4	6.78	8.13	8.40	8.69	9.00	9.70
HPI92969	R0.4	**0.8**	4	0.6	8	60	0.75	**1°**	1.4	6.89	5.26	8.17	8.45	8.75	9.43
HPI92970	R0.4	**0.8**	4	0.6	8	60	0.75	**1.5°**	1.4	7.01	3.33	6.26	8.21	8.50	9.16

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

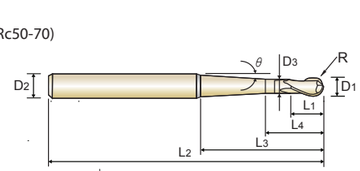
C-COATED SOLID CARBIDE END MILLS

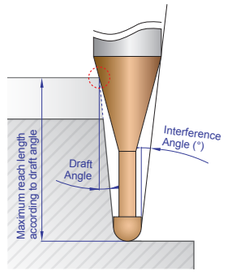
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPI92**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3	θ°	L_4		0.5°	1°	1.5°	2°	3°
HPI92971	R0.4	**0.8**	4	0.6	8	60	0.75	**2°**	1.4	7.12	2.69	3.83	7.26	8.26	8.89
HPI92972	R0.4	**0.8**	4	0.6	12	60	0.75	**0.5°**	1.4	5.28	12.13	12.54	12.98	13.45	14.51
HPI92973	R0.4	**0.8**	4	0.6	12	60	0.75	**1°**	1.4	5.38	5.26	12.17	12.59	13.05	14.08
HPI92974	R0.4	**0.8**	4	0.6	12	60	0.75	**1.5°**	1.4	5.50	3.33	6.26	12.21	12.65	13.65
HPI92975	R0.4	**0.8**	4	0.6	12	60	0.75	**2°**	1.4	5.61	2.69	3.83	7.26	12.26	13.22
HPI92010	R0.5	**1.0**	4	0.75	6	60	0.95	**0.5°**	2.75	7.71	6.17	6.37	6.58	6.81	7.32
HPI92976	R0.5	**1.0**	4	0.75	6	60	0.95	**1°**	2.75	7.78	6.06	6.26	6.46	6.69	7.19
HPI92977	R0.5	**1.0**	4	0.75	6	60	0.95	**1.5°**	2.75	7.85	5.31	6.14	6.35	6.57	7.06
HPI92978	R0.5	**1.0**	4	0.75	8	60	0.95	**0.5°**	2.75	6.57	8.17	8.44	8.73	9.03	9.73
HPI92979	R0.5	**1.0**	4	0.75	8	60	0.95	**1°**	2.75	6.66	7.86	8.26	8.54	8.84	9.51
HPI92980	R0.5	**1.0**	4	0.75	8	60	0.95	**1.5°**	2.75	6.75	5.31	8.07	8.35	8.64	9.30
HPI92981	R0.5	**1.0**	4	0.75	8	60	0.95	**2°**	2.75	6.84	4.45	6.43	8.16	8.44	9.09
HPI92982	R0.5	**1.0**	4	0.75	10	60	0.95	**0.5°**	2.75	5.73	10.17	10.51	10.87	11.26	12.13
HPI92983	R0.5	**1.0**	4	0.75	10	60	0.95	**1°**	2.75	5.82	7.86	10.26	10.61	10.99	11.84
HPI92984	R0.5	**1.0**	4	0.75	10	60	0.95	**1.5°**	2.75	5.91	5.31	10.00	10.35	10.72	11.55
HPI92985	R0.5	**1.0**	4	0.75	10	60	0.95	**2°**	2.75	6.01	4.45	6.43	10.09	10.44	11.25
HPI92986	R0.5	**1.0**	4	0.75	10	60	0.95	**3°**	2.75	6.22	3.77	4.59	5.95	8.67	10.66
HPI92987	R0.5	**1.0**	4	0.75	12	60	0.95	**0.5°**	2.75	5.08	12.17	12.58	13.02	13.48	14.54
HPI92988	R0.5	**1.0**	4	0.75	12	60	0.95	**1°**	2.75	5.17	7.86	12.26	12.68	13.14	14.16
HPI92989	R0.5	**1.0**	4	0.75	12	60	0.95	**1.5°**	2.75	5.26	5.31	10.11	12.35	12.79	13.79
HPI92990	R0.5	**1.0**	4	0.75	16	60	0.95	**0.5°**	2.75	4.13	16.17	16.72	17.30	17.93	19.35
HPI92991	R0.5	**1.0**	4	0.75	16	60	0.95	**1°**	2.75	4.22	7.86	16.26	16.83	17.44	18.81
HPI92992	R0.5	**1.0**	4	0.75	16	60	0.95	**1.5°**	2.75	4.31	5.31	10.11	16.35	16.94	18.28
HPI92993	R0.5	**1.0**	4	0.75	20	70	0.95	**0.5°**	2.75	3.49	20.17	20.86	21.59	22.38	24.16
HPI92994	R0.5	**1.0**	4	0.75	20	70	0.95	**1°**	2.75	3.57	7.86	20.26	20.97	21.74	23.46
HPI92995	R0.5	**1.0**	4	0.75	20	70	0.95	**1.5°**	2.75	3.65	5.31	10.11	20.35	21.09	22.76

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	○	○	◎

C-COATED SOLID CARBIDE END MILLS

SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK HPI92

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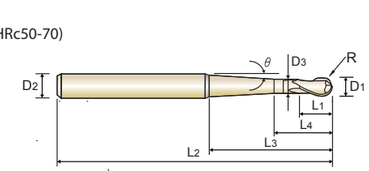
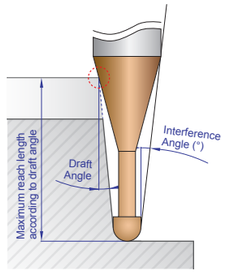
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3	θ°	L_4		0.5°	1°	1.5°	2°	3°
HPI92996	R0.5	**1.0**	4	0.75	20	70	0.95	**2°**	2.75	3.74	4.45	6.43	12.36	20.44	22.06
HPI92997	R0.5	**1.0**	4	0.75	20	70	0.95	**3°**	2.75	3.93	3.77	4.59	5.95	8.67	20.66
HPI92998	R0.5	**1.0**	4	0.75	25	70	0.95	**0.5°**	2.75	2.91	25.17	26.03	26.95	27.95	-
HPI92999	R0.5	**1.0**	4	0.75	25	70	0.95	**1°**	2.75	2.99	7.86	25.26	26.15	27.11	-
HPI92801	R0.5	**1.0**	4	0.75	25	70	0.95	**1.5°**	2.75	3.06	5.31	10.11	25.35	26.28	28.37
HPI92802	R0.5	**1.0**	4	0.75	30	70	0.95	**0.5°**	2.75	2.50	30.17	31.21	32.31	33.51	-
HPI92803	R0.5	**1.0**	4	0.75	30	70	0.95	**1°**	2.75	2.57	7.86	30.26	31.33	32.49	-
HPI92804	R0.5	**1.0**	4	0.75	30	70	0.95	**1.5°**	2.75	2.64	5.31	10.11	30.35	31.47	-
HPI92805	R0.5	**1.0**	4	0.75	30	70	0.95	**2°**	2.75	2.71	4.45	6.43	12.36	30.44	-
HPI92896	R0.5	**1.0**	6	0.75	30	70	0.95	**3°**	2.75	4.26	3.77	4.59	5.95	8.67	30.66
HPI92015	R0.75	**1.5**	4	1.1	10	60	1.45	**0.5°**	3.1	5.18	10.18	10.50	10.86	11.24	12.09
HPI92806	R0.75	**1.5**	4	1.1	10	60	1.45	**1°**	3.1	5.27	8.31	10.26	10.61	10.98	11.81
HPI92807	R0.75	**1.5**	4	1.1	10	60	1.45	**1.5°**	3.1	5.36	5.71	10.02	10.36	10.72	11.53
HPI92808	R0.75	**1.5**	4	1.1	10	60	1.45	**2°**	3.1	5.45	4.84	6.88	10.11	10.46	11.25
HPI92809	R0.75	**1.5**	4	1.1	15	60	1.45	**0.5°**	3.1	3.84	15.18	15.68	16.22	16.80	18.10
HPI92810	R0.75	**1.5**	4	1.1	15	60	1.45	**1°**	3.1	3.92	8.31	15.26	15.79	16.35	17.62
HPI92811	R0.75	**1.5**	4	1.1	15	60	1.45	**1.5°**	3.1	4.01	5.71	10.66	15.36	15.91	17.14
HPI92812	R0.75	**1.5**	4	1.1	15	60	1.45	**2°**	3.1	4.10	4.84	6.88	13.01	15.46	16.65
HPI92813	R0.75	**1.5**	4	1.1	20	70	1.45	**0.5°**	3.1	3.05	20.18	20.85	21.58	22.36	24.11
HPI92814	R0.75	**1.5**	4	1.1	20	70	1.45	**1°**	3.1	3.12	8.31	20.26	20.97	21.73	23.43
HPI92815	R0.75	**1.5**	4	1.1	20	70	1.45	**1.5°**	3.1	3.20	5.71	10.66	20.36	21.09	22.74
HPI92816	R0.75	**1.5**	4	1.1	20	70	1.45	**2°**	3.1	3.28	4.84	6.88	13.01	20.46	22.06
HPI92817	R0.75	**1.5**	4	1.1	25	70	1.45	**0.5°**	3.1	2.53	25.18	26.03	26.94	27.92	-
HPI92818	R0.75	**1.5**	4	1.1	25	70	1.45	**1°**	3.1	2.59	8.31	25.26	26.15	27.10	-
HPI92819	R0.75	**1.5**	4	1.1	30	70	1.45	**0.5°**	3.1	2.16	30.18	31.20	32.30	33.48	-
HPI92820	R0.75	**1.5**	4	1.1	30	70	1.45	**1°**	3.1	2.22	8.31	30.26	31.33	32.48	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	○	○	◎

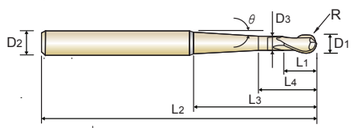
C-COATED SOLID CARBIDE END MILLS

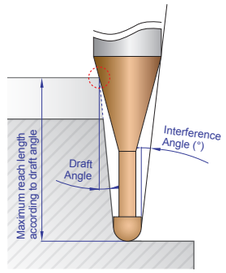
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPI92**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPI92020	R1.0	**2.0**	4	1.5	12	60	1.95	**0.5°**	3.5	3.93	12.18	12.57	12.99	13.44	14.45
HPI92821	R1.0	**2.0**	4	1.5	12	60	1.95	**1°**	3.5	4.01	8.86	12.27	12.68	13.12	14.10
HPI92822	R1.0	**2.0**	4	1.5	12	60	1.95	**1.5°**	3.5	4.09	6.18	11.36	12.37	12.80	13.76
HPI92823	R1.0	**2.0**	4	1.5	12	60	1.95	**2°**	3.5	4.17	5.29	7.43	12.07	12.48	13.41
HPI92824	R1.0	**2.0**	4	1.5	16	60	1.95	**0.5°**	3.5	3.11	16.18	16.71	17.28	17.89	19.26
HPI92825	R1.0	**2.0**	4	1.5	16	60	1.95	**1°**	3.5	3.18	8.86	16.27	16.83	17.42	18.75
HPI92826	R1.0	**2.0**	4	1.5	16	60	1.95	**1.5°**	3.5	3.25	6.18	11.36	16.37	16.95	18.24
HPI92827	R1.0	**2.0**	4	1.5	16	60	1.95	**2°**	3.5	3.33	5.29	7.43	13.86	16.48	17.74
HPI92828	R1.0	**2.0**	4	1.5	20	70	1.95	**0.5°**	3.5	2.57	20.18	20.85	21.57	22.34	-
HPI92829	R1.0	**2.0**	4	1.5	20	70	1.95	**1°**	3.5	2.63	8.86	20.27	20.97	21.72	-
HPI92830	R1.0	**2.0**	4	1.5	20	70	1.95	**1.5°**	3.5	2.70	6.18	11.36	20.37	21.10	-
HPI92831	R1.0	**2.0**	4	1.5	20	70	1.95	**2°**	3.5	2.77	5.29	7.43	13.86	20.48	-
HPI92832	R1.0	**2.0**	4	1.5	25	70	1.95	**0.5°**	3.5	2.11	25.18	26.02	26.93	27.90	-
HPI92833	R1.0	**2.0**	4	1.5	25	70	1.95	**1°**	3.5	2.17	8.86	25.27	26.15	27.09	-
HPI92834	R1.0	**2.0**	4	1.5	25	70	1.95	**1.5°**	3.5	2.23	6.18	11.36	25.37	26.29	-
HPI92835	R1.0	**2.0**	4	1.5	30	70	1.95	**0.5°**	3.5	1.79	30.18	31.20	32.29	-	-
HPI92836	R1.0	**2.0**	4	1.5	30	70	1.95	**1°**	3.5	1.84	8.86	30.27	31.33	-	-
HPI92837	R1.0	**2.0**	4	1.5	35	80	1.95	**0.5°**	3.5	1.56	35.18	36.37	37.65	-	-
HPI92838	R1.0	**2.0**	4	1.5	40	80	1.95	**0.5°**	3.5	1.38	40.18	41.55	-	-	-
HPI92839	R1.0	**2.0**	4	1.5	50	90	1.95	**0.5°**	3.5	1.12	50.18	51.89	-	-	-
HPI92840	R1.0	**2.0**	6	1.5	25	70	1.95	**2°**	3.5	3.98	5.29	7.43	13.86	25.48	27.47
HPI92841	R1.0	**2.0**	6	1.5	30	70	1.95	**1.5°**	3.5	3.37	6.18	11.36	30.37	31.48	33.95
HPI92842	R1.0	**2.0**	6	1.5	30	70	1.95	**2°**	3.5	3.46	5.29	7.43	13.86	30.48	32.87
HPI92843	R1.0	**2.0**	6	1.5	35	80	1.95	**1°**	3.5	2.90	8.86	35.27	36.51	37.84	-
HPI92844	R1.0	**2.0**	6	1.5	35	80	1.95	**1.5°**	3.5	2.98	6.18	11.36	35.37	36.66	-
HPI92845	R1.0	**2.0**	6	1.5	40	80	1.95	**1°**	3.5	2.59	8.86	40.27	41.69	43.22	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

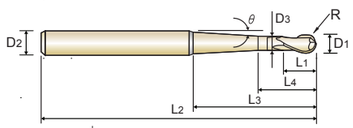
C-COATED SOLID CARBIDE END MILLS

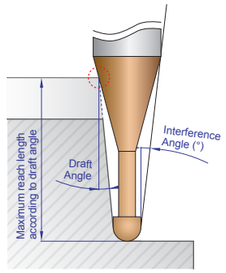
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPI92**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPI92846	R1.0	**2.0**	6	1.5	40	80	1.95	**1.5°**	3.5	2.66	6.18	11.36	40.37	41.85	-
HPI92847	R1.0	**2.0**	6	1.5	40	80	1.95	**2°**	3.5	2.74	5.29	7.43	13.86	40.48	-
HPI92848	R1.0	**2.0**	6	1.5	50	90	1.95	**1°**	3.5	2.14	8.86	50.27	52.05	53.97	-
HPI92849	R1.0	**2.0**	6	1.5	50	90	1.95	**1.5°**	3.5	2.20	6.18	11.36	50.37	52.22	-
HPI92850	R1.0	**2.0**	6	1.5	50	90	1.95	**2°**	3.5	2.27	5.29	7.43	13.86	50.48	-
HPI92030	R1.5	**3.0**	6	2.5	15	70	2.85	**0.5°**	4.5	4.51	15.39	15.87	16.39	16.95	18.21
HPI92851	R1.5	**3.0**	6	2.5	15	70	2.85	**1°**	4.5	4.59	15.04	15.51	16.01	16.56	17.78
HPI92852	R1.5	**3.0**	6	2.5	15	70	2.85	**1.5°**	4.5	4.67	10.30	15.14	15.64	16.17	17.35
HPI92853	R1.5	**3.0**	6	2.5	15	70	2.85	**2°**	4.5	4.76	8.36	11.79	15.26	15.77	16.93
HPI92854	R1.5	**3.0**	6	2.5	20	70	2.85	**0.5°**	4.5	3.60	20.39	21.05	21.75	22.51	24.22
HPI92855	R1.5	**3.0**	6	2.5	20	70	2.85	**1°**	4.5	3.67	16.09	20.51	21.19	21.93	23.59
HPI92856	R1.5	**3.0**	6	2.5	20	70	2.85	**1.5°**	4.5	3.75	10.30	19.09	20.64	21.35	22.96
HPI92857	R1.5	**3.0**	6	2.5	20	70	2.85	**2°**	4.5	3.84	8.36	11.79	20.08	20.77	22.33
HPI92858	R1.5	**3.0**	6	2.5	25	70	2.85	**0.5°**	4.5	2.99	25.39	26.22	27.12	28.08	-
HPI92859	R1.5	**3.0**	6	2.5	25	70	2.85	**1°**	4.5	3.06	16.09	25.51	26.38	27.31	29.40
HPI92860	R1.5	**3.0**	6	2.5	25	70	2.85	**1.5°**	4.5	3.14	10.30	19.09	25.64	26.54	28.57
HPI92861	R1.5	**3.0**	6	2.5	30	70	2.85	**0.5°**	4.5	2.56	30.39	31.40	32.48	33.64	-
HPI92862	R1.5	**3.0**	6	2.5	30	70	2.85	**1°**	4.5	2.63	16.09	30.51	31.56	32.68	-
HPI92863	R1.5	**3.0**	6	2.5	30	70	2.85	**1.5°**	4.5	2.69	10.30	19.09	30.64	31.73	-
HPI92864	R1.5	**3.0**	6	2.5	30	70	2.85	**2°**	4.5	2.77	8.36	11.79	22.08	30.77	-
HPI92865	R1.5	**3.0**	6	2.5	40	80	2.85	**0.5°**	4.5	1.99	40.39	41.75	43.20	-	-
HPI92866	R1.5	**3.0**	6	2.5	40	80	2.85	**1°**	4.5	2.04	16.09	40.51	41.92	43.43	-
HPI92867	R1.5	**3.0**	6	2.5	40	80	2.85	**1.5°**	4.5	2.10	10.30	19.09	40.64	42.10	-
HPI92868	R1.5	**3.0**	6	2.5	50	90	2.85	**0.5°**	4.5	1.62	50.39	52.09	53.92	-	-
HPI92869	R1.5	**3.0**	6	2.5	50	90	2.85	**1°**	4.5	1.67	16.09	50.51	52.28	-	-
HPI92870	R1.5	**3.0**	6	2.5	50	90	2.85	**1.5°**	4.5	1.72	10.30	19.09	50.64	-	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPI92**

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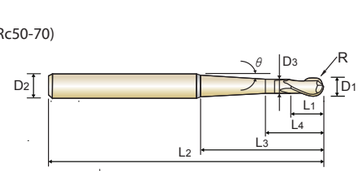
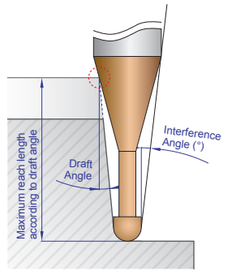
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPI92040	R2.0	**4.0**	6	3	20	80	3.85	**1°**	5	2.72	16.59	20.51	21.18	21.90	-
HPI92871	R2.0	**4.0**	6	3	30	80	3.85	**1°**	5	1.89	16.59	30.51	31.54	-	-
HPI92872	R2.0	**4.0**	6	3	40	80	3.85	**1°**	5	1.44	16.59	40.51	-	-	-
HPI92873	R2.0	**4.0**	6	3	50	90	3.85	**1°**	5	1.17	16.59	50.51	-	-	-
HPI92874	R2.0	**4.0**	6	3	61.1	110	3.85	**1°**	5	0.96	16.59	-	-	-	-
HPI92897	R2.5	**5.0**	8	10	30	80	4.85	**1°**	13	2.66	30.07	31.03	32.06	33.17	-
HPI92898	R2.5	**5.0**	8	10	40	90	4.85	**1°**	13	2.06	32.09	41.03	42.42	43.92	-
HPI92899	R2.5	**5.0**	8	10	60	110	4.85	**1°**	13	1.42	32.09	61.03	-	-	-
HPI92702	R2.5	**5.0**	8	10	74	150	4.75	**1.5°**	13	1.20	25.41	48.31	-	-	-
HPI92701	R2.5	**5.0**	8	10	90	140	4.85	**1°**	13	0.97	32.09	-	-	-	-
HPI92703	R2.5	**5.0**	8	10	100	150	4.85	**0.5°**	13	0.85	100.64	-	-	-	-
HPI92704	R3.0	**6.0**	8	12	30	80	5.85	**1°**	15	1.91	30.19	31.14	32.15	-	-
HPI92705	R3.0	**6.0**	8	12	40	90	5.85	**1°**	15	1.45	35.59	41.14	-	-	-
HPI92706	R3.0	**6.0**	8	12	45	95	5.85	**1°**	15	1.30	35.59	46.14	-	-	-
HPI92707	R3.0	**6.0**	8	12	50	100	5.85	**1°**	15	1.18	35.59	51.14	-	-	-
HPI92708	R3.0	**6.0**	8	12	120	200	5.85	**0.5°**	15	0.49	-	-	-	-	-
HPI92709	R3.0	**6.0**	10	12	30	80	5.85	**3°**	15	3.60	19.11	23.14	29.84	30.99	33.27
HPI92710	R3.0	**6.0**	10	12	50	100	5.85	**1.5°**	15	2.23	25.29	47.58	51.61	53.43	-
HPI92711	R3.0	**6.0**	10	12	60	110	5.85	**1°**	15	1.85	35.59	61.14	63.24	-	-
HPI92712	R3.0	**6.0**	10	12	70	120	5.85	**1°**	15	1.61	35.59	71.14	73.60	-	-
HPI92713	R3.0	**6.0**	10	12	80	130	5.85	**1°**	15	1.42	35.59	81.14	-	-	-
HPI92714	R3.0	**6.0**	10	12	96	200	5.75	**1.5°**	15	1.23	28.16	53.31	-	-	-
HPI92715	R3.0	**6.0**	10	12	120	200	5.85	**1°**	15	0.97	35.59	-	-	-	-
HPI92070	R3.5	**7.0**	10	14	40	90	6.70	**3°**	17	2.25	23.13	28.03	36.20	40.94	-
HPI92875	R3.5	**7.0**	10	14	45	95	6.70	**1°**	17	1.87	45.09	46.54	48.09	-	-
HPI92876	R3.5	**7.0**	10	14	60	110	6.70	**1.5°**	17	1.47	32.34	60.04	-	-	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

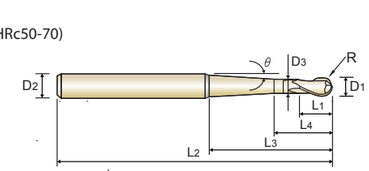
C-COATED SOLID CARBIDE END MILLS

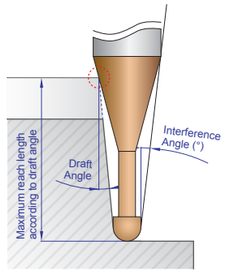
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPI92**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 88 -99

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPI92080	R4.0	**8.0**	10	14	35	95	7.70	**3°**	17	1.80	23.03	27.78	35.08	-	-
HPI92877	R4.0	**8.0**	10	14	50	110	7.70	**1°**	17	1.19	47.18	51.50	-	-	-
HPI92878	R4.0	**8.0**	10	14	50	110	7.70	**1.5°**	17	1.22	32.09	50.35	-	-	-
HPI92879	R4.0	**8.0**	10	14	55	115	7.70	**1°**	17	1.08	47.18	56.50	-	-	-
HPI92880	R4.0	**8.0**	10	14	60	120	7.70	**1°**	17	1.00	47.18	-	-	-	-
HPI92881	R4.0	**8.0**	10	14	70	130	7.70	**1°**	17	0.86	47.18	-	-	-	-
HPI92882	R4.0	**8.0**	10	14	120	200	7.70	**0.5°**	17	0.49	-	-	-	-	-
HPI92883	R4.0	**8.0**	12	14	80	140	7.70	**1°**	17	1.43	47.18	81.50	-	-	-
HPI92884	R4.0	**8.0**	12	14	98	200	7.70	**1.5°**	17	1.22	32.09	60.17	-	-	-
HPI92885	R4.0	**8.0**	12	14	120	200	7.70	**1°**	17	0.98	47.18	-	-	-	-
HPI92100	R5.0	**10.0**	12	18	35	105	9.70	**3°**	21	1.82	27.63	33.28	35.83	-	-
HPI92886	R5.0	**10.0**	12	18	55	125	9.70	**1.5°**	21	1.12	37.59	55.53	-	-	-
HPI92887	R5.0	**10.0**	12	18	60	130	9.70	**1°**	21	1.01	54.18	61.71	-	-	-
HPI92888	R5.0	**10.0**	12	18	65	135	9.70	**1°**	21	0.93	54.18	-	-	-	-
HPI92889	R5.0	**10.0**	12	18	75	140	9.70	**1°**	21	0.81	54.18	-	-	-	-
HPI92890	R5.0	**10.0**	12	18	86	200	9.70	**1°**	21	0.71	54.18	-	-	-	-
HPI92891	R5.0	**10.0**	12	18	120	200	9.70	**0.5°**	21	0.49	-	-	-	-	-
HPI92892	R5.0	**10.0**	16	18	120	200	9.70	**1.5°**	21	1.47	37.59	70.17	-	-	-
HPI92120	R6.0	**12.0**	16	22	60	140	11.70	**3°**	25	2.08	32.23	38.78	49.69	60.86	-
HPI92893	R6.0	**12.0**	16	22	80	160	11.70	**1.5°**	25	1.49	43.09	80.01	-	-	-
HPI92894	R6.0	**12.0**	16	22	106	200	11.70	**1.5°**	25	1.14	43.09	80.17	-	-	-
HPI92895	R6.0	**12.0**	16	22	120	200	11.70	**1°**	25	0.99	61.18	-	-	-	-

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

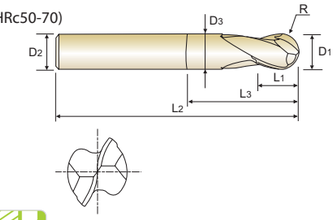
C-COATED SOLID CARBIDE END MILLS

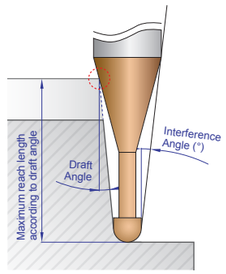
2 FLUTE BALL NOSE with NECK

SERIES

PLAIN SHANK **HPK10**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 88 -99

R0.5~R3 R3.5~R12.5

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK10010	R0.5	**1.0**	4	1	2.5	45	0.95	10.38	2.78	2.93	3.10	3.29	3.76
HPK10015	R0.75	**1.5**	4	1.5	3.75	45	1.45	8.36	3.97	4.11	4.26	4.42	4.78
HPK10020	R1.0	**2.0**	6	2	5	45	1.95	9.05	5.26	5.45	5.64	5.86	6.33
HPK10025	R1.25	**2.5**	6	2.5	6.25	45	2.4	7.69	6.65	6.89	7.13	7.40	8.00
HPK10030	R1.5	**3.0**	6	3	7.5	45	2.85	6.40	8.04	8.32	8.62	8.95	9.67
HPK10035	R1.75	**3.5**	6	3.5	8.75	45	3.35	5.22	9.33	9.66	10.01	10.38	11.23
HPK10040	R2.0	**4.0**	6	4	10	45	3.85	4.08	10.63	11.00	11.39	11.82	12.78
HPK10050	R2.5	**5.0**	6	5	12.5	50	4.85	1.96	13.21	13.67	14.16	-	-
HPK10060	R3.0	**6.0**	6	6	15	50	5.85	0.00	-	-	-	-	-
HPK10080	R4.0	**8.0**	8	8	20	60	7.7	0.00	-	-	-	-	-
HPK10100	R5.0	**10.0**	10	10	25	70	9.7	0.00	-	-	-	-	-
HPK10120	R6.0	**12.0**	12	12	30	75	11.7	0.00	-	-	-	-	-
HPK10140	R7.0	**14.0**	14	14	28	110	13.7	0.00	-	-	-	-	-
HPK10160	R8.0	**16.0**	16	16	32	140	15.7	0.00	-	-	-	-	-
HPK10180	R9.0	**18.0**	18	18	36	140	17.7	0.00	-	-	-	-	-
HPK10200	R10.0	**20.0**	20	20	40	160	19.7	0.00	-	-	-	-	-
HPK10250	R12.5	**25.0**	25	25	50	180	24.7	0.00	-	-	-	-	-

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

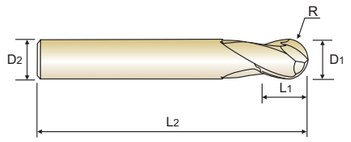
C-COATED SOLID CARBIDE END MILLS

2 FLUTE BALL NOSE

SERIES

PLAIN SHANK **HPI90**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 100-101

R0.05~R3 R3.5~R10.0

* NEW SIZE Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D_1	D_2	L_1	L_2
HPI90001	R0.05	**0.1**	4	0.1	50
HPI900015	R0.075	**0.15**	4	0.15	50
HPI90002	R0.1	**0.2**	4	0.2	50
HPI90003	R0.15	**0.3**	4	0.3	50
HPI90004	R0.2	**0.4**	4	0.6	50
* **HPI90902**	R0.2	**0.4**	6	0.4	50
HPI90005	R0.25	**0.5**	4	0.8	50
* **HPI90903**	R0.25	**0.5**	6	0.5	50
HPI90006	R0.3	**0.6**	4	0.9	50
* **HPI90904**	R0.3	**0.6**	6	0.6	50
HPI90008	R0.4	**0.8**	4	1.2	50
* **HPI90905**	R0.4	**0.8**	6	0.8	50
HPI90010	R0.5	**1.0**	4	1.5	50
* **HPI90906**	R0.5	**1.0**	6	1	50
* **HPI90012**	R0.6	**1.2**	6	1.2	50
HPI90015	R0.75	**1.5**	4	2.3	50
* **HPI90907**	R0.75	**1.5**	6	1.5	50
HPI90020	R1.0	**2.0**	4	3	60
* **HPI90908**	R1.0	**2.0**	6	2	50
HPI90025	R1.25	**2.5**	6	3.8	60
HPI90030	R1.5	**3.0**	6	5	60
HPI90040	R2.0	**4.0**	4	6	70
HPI90901	R2.0	**4.0**	6	6	70
HPI90050	R2.5	**5.0**	6	8	70
HPI90060	R3.0	**6.0**	6	10	80
HPI90080	R4.0	**8.0**	8	12	100
HPI90100	R5.0	**10.0**	10	15	100
HPI90120	R6.0	**12.0**	12	18	110
HPI90160	R8.0	**16.0**	16	24	140
HPI90200	R10.0	**20.0**	20	30	160

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

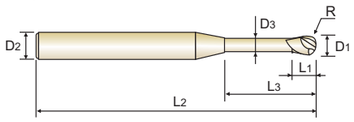
C-COATED SOLID CARBIDE END MILLS

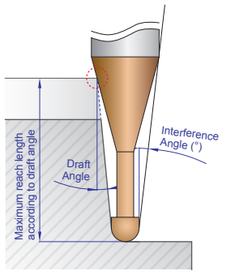
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45001	R0.05	**0.1**	4	0.07	0.2	45	0.085	14.66	0.25	0.26	0.28	0.29	0.32
HPK45901	R0.05	**0.1**	4	0.07	0.3	45	0.085	14.47	0.36	0.37	0.39	0.41	0.47
HPK45902	R0.05	**0.1**	4	0.07	0.5	45	0.085	14.11	0.57	0.60	0.63	0.66	0.75
HPK450015	R0.075	**0.15**	4	0.1	0.3	45	0.135	14.51	0.36	0.37	0.39	0.41	0.46
HPK45903	R0.075	**0.15**	4	0.1	0.5	45	0.135	14.15	0.57	0.59	0.62	0.66	0.74
HPK45904	R0.075	**0.15**	4	0.1	1	45	0.135	13.31	1.09	1.15	1.21	1.28	1.45
HPK45002	R0.1	**0.2**	4	0.15	0.3	45	0.17	14.50	0.40	0.42	0.43	0.46	0.51
HPK45905	R0.1	**0.2**	4	0.15	0.5	45	0.17	14.13	0.61	0.64	0.67	0.70	0.79
HPK45906	R0.1	**0.2**	4	0.15	0.75	45	0.17	13.70	0.87	0.92	0.96	1.02	1.15
HPK45907	R0.1	**0.2**	4	0.15	1	45	0.17	13.29	1.14	1.19	1.26	1.33	1.50
HPK45908	R0.1	**0.2**	4	0.15	1	50	0.17	13.29	1.14	1.19	1.26	1.33	1.50
HPK45909	R0.1	**0.2**	4	0.15	1.25	45	0.17	12.90	1.40	1.47	1.55	1.64	1.86
HPK45910	R0.1	**0.2**	4	0.15	1.5	45	0.17	12.53	1.66	1.75	1.84	1.95	2.21
HPK45911	R0.1	**0.2**	4	0.15	1.75	45	0.17	12.19	1.93	2.03	2.14	2.26	2.57
HPK45912	R0.1	**0.2**	4	0.15	2	45	0.17	11.86	2.19	2.30	2.43	2.58	2.92
HPK45913	R0.1	**0.2**	4	0.15	2.5	45	0.17	11.26	2.71	2.86	3.02	3.20	3.64
HPK45914	R0.1	**0.2**	4	0.15	3	45	0.17	10.71	3.24	3.41	3.61	3.82	4.35
HPK45915	R0.1	**0.2**	4	0.2	0.5	35	0.17	14.13	0.61	0.64	0.67	0.70	0.79
HPK45916	R0.1	**0.2**	4	0.2	0.5	50	0.17	14.13	0.61	0.64	0.67	0.70	0.79
HPK45917	R0.1	**0.2**	6	0.2	0.5	50	0.17	14.42	0.61	0.64	0.67	0.70	0.79
HPK45003	R0.15	**0.3**	4	0.2	0.5	45	0.27	14.20	0.61	0.63	0.66	0.69	0.77
HPK45918	R0.15	**0.3**	4	0.2	0.6	45	0.27	14.02	0.71	0.74	0.78	0.82	0.91
HPK45919	R0.15	**0.3**	4	0.2	0.75	45	0.27	13.75	0.87	0.91	0.95	1.00	1.12
HPK45920	R0.15	**0.3**	4	0.2	1	45	0.27	13.33	1.13	1.19	1.25	1.32	1.48
HPK45921	R0.15	**0.3**	4	0.2	1.25	45	0.27	12.93	1.40	1.47	1.54	1.63	1.84
HPK45922	R0.15	**0.3**	4	0.2	1.5	45	0.27	12.55	1.66	1.74	1.84	1.94	2.19

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

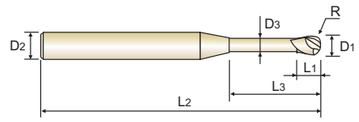
C-COATED SOLID CARBIDE END MILLS

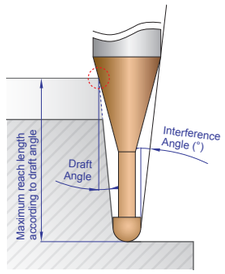
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45923	R0.15	**0.3**	4	0.2	1.75	45	0.27	12.19	1.92	2.02	2.13	2.25	2.55
HPK45924	R0.15	**0.3**	4	0.2	2	45	0.27	11.86	2.19	2.30	2.42	2.56	2.90
HPK45925	R0.15	**0.3**	4	0.2	2.25	45	0.27	11.54	2.45	2.58	2.72	2.87	3.26
HPK45926	R0.15	**0.3**	4	0.2	2.5	45	0.27	11.24	2.71	2.85	3.01	3.19	3.61
HPK45927	R0.15	**0.3**	4	0.2	3	45	0.27	10.68	3.24	3.41	3.60	3.81	4.33
HPK45928	R0.15	**0.3**	4	0.2	3.5	45	0.27	10.17	3.76	3.96	4.18	4.43	5.04
HPK45929	R0.15	**0.3**	4	0.2	4	45	0.27	9.71	4.29	4.52	4.77	5.06	5.75
HPK45930	R0.15	**0.3**	6	0.2	1.5	50	0.27	13.31	1.66	1.74	1.84	1.94	2.19
HPK45004	R0.2	**0.4**	4	0.3	0.5	45	0.37	14.28	0.61	0.63	0.65	0.68	0.75
HPK45931	R0.2	**0.4**	4	0.3	0.8	45	0.37	13.72	0.92	0.96	1.00	1.05	1.17
HPK45932	R0.2	**0.4**	4	0.3	1	45	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPK45933	R0.2	**0.4**	4	0.3	1.5	45	0.37	12.57	1.66	1.74	1.83	1.93	2.17
HPK45934	R0.2	**0.4**	4	0.3	2	45	0.37	11.86	2.18	2.29	2.41	2.55	2.88
HPK45935	R0.2	**0.4**	4	0.3	2.5	45	0.37	11.22	2.71	2.85	3.00	3.17	3.59
HPK45936	R0.2	**0.4**	4	0.3	3	45	0.37	10.65	3.24	3.40	3.59	3.80	4.31
HPK45937	R0.2	**0.4**	4	0.3	3.5	45	0.37	10.13	3.76	3.96	4.18	4.42	5.02
HPK45938	R0.2	**0.4**	4	0.3	4	45	0.37	9.66	4.29	4.51	4.76	5.04	5.73
HPK45939	R0.2	**0.4**	4	0.3	4.5	45	0.37	9.23	4.81	5.07	5.35	5.67	6.44
HPK45940	R0.2	**0.4**	4	0.3	5	45	0.37	8.84	5.34	5.62	5.94	6.29	7.15
HPK45941	R0.2	**0.4**	4	0.3	6	45	0.37	8.15	6.39	6.73	7.11	7.54	8.57
HPK45942	R0.2	**0.4**	4	0.4	1	35	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPK45943	R0.2	**0.4**	4	0.4	1	50	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPK45944	R0.2	**0.4**	6	0.3	1	50	0.37	13.91	1.13	1.18	1.24	1.30	1.46
HPK45945	R0.2	**0.4**	6	0.3	2	50	0.37	12.82	2.18	2.29	2.41	2.55	2.88
HPK45946	R0.2	**0.4**	6	0.4	1	50	0.37	13.91	1.13	1.18	1.24	1.30	1.46
HPK45005	R0.25	**0.5**	4	0.35	1	45	0.45	13.35	1.19	1.24	1.30	1.36	1.52

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

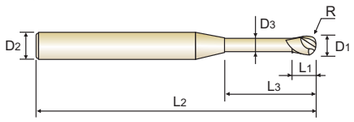
C-COATED SOLID CARBIDE END MILLS

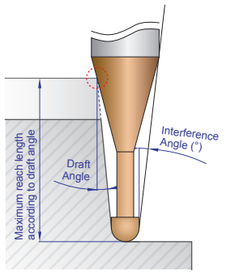
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45947	R0.25	**0.5**	4	0.35	1.5	45	0.45	12.53	1.71	1.79	1.88	1.99	2.23
HPK45948	R0.25	**0.5**	4	0.35	2	45	0.45	11.80	2.24	2.35	2.47	2.61	2.94
HPK45949	R0.25	**0.5**	4	0.35	2.5	45	0.45	11.16	2.77	2.90	3.06	3.23	3.65
HPK45950	R0.25	**0.5**	4	0.35	3	45	0.45	10.57	3.29	3.46	3.65	3.86	4.36
HPK45951	R0.25	**0.5**	4	0.35	3.5	45	0.45	10.05	3.82	4.01	4.23	4.48	5.08
HPK45952	R0.25	**0.5**	4	0.35	4	45	0.45	9.57	4.34	4.57	4.82	5.10	5.79
HPK45953	R0.25	**0.5**	4	0.35	4.5	45	0.45	9.14	4.87	5.12	5.41	5.73	6.50
HPK45954	R0.25	**0.5**	4	0.35	5	45	0.45	8.75	5.40	5.68	5.99	6.35	7.21
HPK45955	R0.25	**0.5**	4	0.35	5.5	45	0.45	8.38	5.92	6.23	6.58	6.97	7.92
HPK45956	R0.25	**0.5**	4	0.35	6	45	0.45	8.05	6.45	6.79	7.17	7.60	8.63
HPK45957	R0.25	**0.5**	4	0.35	8	45	0.45	6.94	8.55	9.01	9.52	10.09	11.43
HPK45958	R0.25	**0.5**	4	0.35	10	45	0.45	6.10	10.66	11.23	11.87	12.58	13.76
HPK45959	R0.25	**0.5**	4	0.5	1.25	50	0.45	12.93	1.45	1.52	1.59	1.67	1.87
HPK45960	R0.25	**0.5**	6	0.5	1.25	50	0.45	13.61	1.45	1.52	1.59	1.67	1.87
HPK45006	R0.3	**0.6**	4	0.45	1	45	0.55	13.40	1.19	1.23	1.29	1.35	1.50
HPK45961	R0.3	**0.6**	4	0.45	1.5	45	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPK45962	R0.3	**0.6**	4	0.45	2	45	0.55	11.80	2.24	2.34	2.46	2.60	2.92
HPK45963	R0.3	**0.6**	4	0.45	2.5	45	0.55	11.13	2.76	2.90	3.05	3.22	3.63
HPK45964	R0.3	**0.6**	4	0.45	3	45	0.55	10.54	3.29	3.45	3.64	3.84	4.34
HPK45965	R0.3	**0.6**	4	0.45	3.5	45	0.55	10.00	3.82	4.01	4.22	4.47	5.06
HPK45966	R0.3	**0.6**	4	0.45	4	45	0.55	9.52	4.34	4.56	4.81	5.09	5.77
HPK45967	R0.3	**0.6**	4	0.45	4.5	45	0.55	9.08	4.87	5.12	5.40	5.71	6.48
HPK45968	R0.3	**0.6**	4	0.45	5	45	0.55	8.68	5.39	5.67	5.99	6.34	7.19
HPK45969	R0.3	**0.6**	4	0.45	5.5	45	0.55	8.31	5.92	6.23	6.57	6.96	7.90
HPK45970	R0.3	**0.6**	4	0.45	6	45	0.55	7.97	6.45	6.78	7.16	7.58	8.61
HPK45971	R0.3	**0.6**	4	0.45	7	45	0.55	7.37	7.50	7.89	8.34	8.83	10.04

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	◎		○	◎											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

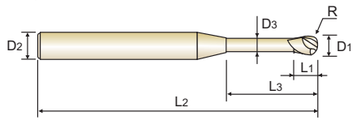
C-COATED SOLID CARBIDE END MILLS

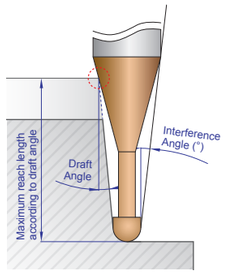
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45972	R0.3	**0.6**	4	0.45	8	45	0.55	6.86	8.55	9.00	9.51	10.08	11.36
HPK45973	R0.3	**0.6**	4	0.45	9	45	0.55	6.41	9.60	10.11	10.68	11.33	12.53
HPK45974	R0.3	**0.6**	4	0.45	10	45	0.55	6.01	10.65	11.22	11.86	12.57	13.70
HPK45975	R0.3	**0.6**	4	0.45	12	45	0.55	5.35	12.76	13.44	14.21	15.07	16.03
HPK45976	R0.3	**0.6**	4	0.6	1.5	35	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPK45977	R0.3	**0.6**	4	0.6	1.5	50	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPK45978	R0.3	**0.6**	6	0.45	2	50	0.55	12.81	2.24	2.34	2.46	2.60	2.92
HPK45979	R0.3	**0.6**	6	0.45	3	50	0.55	11.85	3.29	3.45	3.64	3.84	4.34
HPK45980	R0.3	**0.6**	6	0.45	4	50	0.55	11.02	4.34	4.56	4.81	5.09	5.77
HPK45981	R0.3	**0.6**	6	0.6	1.5	50	0.55	13.36	1.71	1.79	1.88	1.97	2.21
HPK45007	R0.35	**0.7**	4	0.5	2	45	0.65	11.80	2.24	2.34	2.45	2.58	2.90
HPK45982	R0.35	**0.7**	4	0.5	4	45	0.65	9.46	4.34	4.56	4.80	5.08	5.75
HPK45983	R0.35	**0.7**	4	0.5	6	45	0.65	7.89	6.44	6.78	7.15	7.57	8.59
HPK45984	R0.35	**0.7**	4	0.5	8	45	0.65	6.77	8.55	9.00	9.50	10.07	11.29
HPK45008	R0.4	**0.8**	4	0.6	2	45	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPK45985	R0.4	**0.8**	4	0.6	3	45	0.75	10.46	3.28	3.44	3.62	3.82	4.30
HPK45986	R0.4	**0.8**	4	0.6	4	45	0.75	9.40	4.34	4.55	4.79	5.07	5.72
HPK45987	R0.4	**0.8**	4	0.6	5	45	0.75	8.53	5.39	5.66	5.97	6.31	7.15
HPK45988	R0.4	**0.8**	4	0.6	6	45	0.75	7.81	6.44	6.77	7.14	7.56	8.57
HPK45989	R0.4	**0.8**	4	0.6	7	45	0.75	7.20	7.49	7.88	8.32	8.81	9.99
HPK45990	R0.4	**0.8**	4	0.6	8	45	0.75	6.68	8.54	8.99	9.49	10.05	11.23
HPK45991	R0.4	**0.8**	4	0.6	10	45	0.75	5.83	10.65	11.21	11.84	12.55	13.56
HPK45992	R0.4	**0.8**	4	0.6	12	45	0.75	5.18	12.75	13.43	14.19	15.04	15.90
HPK45993	R0.4	**0.8**	4	0.8	2	35	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPK45994	R0.4	**0.8**	4	0.8	2	50	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPK45995	R0.4	**0.8**	6	0.6	2	50	0.75	12.85	2.23	2.33	2.45	2.57	2.88

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2		12	13	14.1	15	16	17	18	19	20	
HRc		13	25	28	32	10	29	32	38	15	35	44		15	23	10	10	26	3	25		21	
HB	125	190	250	270	300	180	275	300	350	200	325	409		200	240	180	180	260	160	250	130	230	
Recommended					○			○	◎		○	◎											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

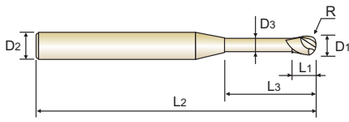
C-COATED SOLID CARBIDE END MILLS

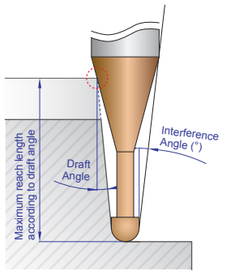
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45996	R0.4	**0.8**	6	0.8	2	50	0.75	12.85	2.23	2.33	2.45	2.57	2.88
HPK45009	R0.45	**0.9**	4	0.65	2	45	0.85	11.79	2.23	2.33	2.44	2.56	2.86
HPK45997	R0.45	**0.9**	4	0.65	4	45	0.85	9.34	4.33	4.55	4.79	5.05	5.70
HPK45998	R0.45	**0.9**	4	0.65	6	45	0.85	7.72	6.44	6.77	7.13	7.55	8.55
HPK45999	R0.45	**0.9**	4	0.65	8	45	0.85	6.58	8.54	8.99	9.48	10.04	11.16
HPK45010	R0.5	**1.0**	4	0.75	2	45	0.95	11.78	2.23	2.32	2.43	2.55	2.84
HPK45801	R0.5	**1.0**	4	0.75	2.5	45	0.95	11.04	2.75	2.88	3.02	3.17	3.55
HPK45802	R0.5	**1.0**	4	0.75	3	45	0.95	10.38	3.28	3.43	3.60	3.79	4.26
HPK45803	R0.5	**1.0**	4	0.75	4	45	0.95	9.27	4.33	4.54	4.78	5.04	5.68
HPK45804	R0.5	**1.0**	4	0.75	5	45	0.95	8.37	5.38	5.65	5.95	6.29	7.10
HPK45805	R0.5	**1.0**	4	0.75	6	45	0.95	7.63	6.44	6.76	7.13	7.54	8.53
HPK45806	R0.5	**1.0**	4	0.75	7	45	0.95	7.01	7.49	7.87	8.30	8.78	9.93
HPK45807	R0.5	**1.0**	4	0.75	8	45	0.95	6.49	8.54	8.98	9.47	10.03	11.10
HPK45808	R0.5	**1.0**	4	0.75	9	45	0.95	6.03	9.59	10.09	10.65	11.28	12.26
HPK45809	R0.5	**1.0**	4	0.75	10	45	0.95	5.64	10.64	11.20	11.82	12.52	13.43
HPK45810	R0.5	**1.0**	4	0.75	12	45	0.95	4.99	12.75	13.42	14.17	14.96	15.77
HPK45811	R0.5	**1.0**	4	0.75	13	45	0.95	4.71	13.80	14.53	15.35	16.06	16.94
HPK45812	R0.5	**1.0**	4	0.75	14	50	0.95	4.47	14.85	15.64	16.52	17.17	18.10
HPK45813	R0.5	**1.0**	4	0.75	16	50	0.95	4.05	16.96	17.86	18.87	19.38	20.44
HPK45814	R0.5	**1.0**	4	0.75	18	55	0.95	3.70	19.06	20.08	21.05	21.59	22.78
HPK45815	R0.5	**1.0**	4	0.75	20	55	0.95	3.41	21.16	22.30	23.20	23.81	25.11
HPK45816	R0.5	**1.0**	4	1	2.5	40	0.95	11.04	2.75	2.88	3.02	3.17	3.55
HPK45817	R0.5	**1.0**	4	1	2.5	50	0.95	11.04	2.75	2.88	3.02	3.17	3.55
HPK45818	R0.5	**1.0**	6	0.75	3	50	0.95	11.84	3.28	3.43	3.60	3.79	4.26
HPK45819	R0.5	**1.0**	6	0.75	4	50	0.95	10.95	4.33	4.54	4.78	5.04	5.68
HPK45820	R0.5	**1.0**	6	0.75	5	50	0.95	10.18	5.38	5.65	5.95	6.29	7.10

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P															M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel						Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

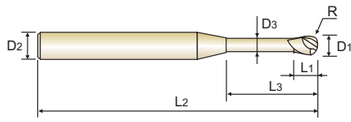
C-COATED SOLID CARBIDE END MILLS

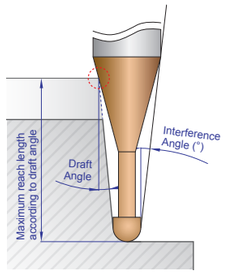
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45821	R0.5	**1.0**	6	0.75	6	50	0.95	9.51	6.44	6.76	7.13	7.54	8.53
HPK45822	R0.5	**1.0**	6	0.75	7	50	0.95	8.92	7.49	7.87	8.30	8.78	9.95
HPK45823	R0.5	**1.0**	6	0.75	8	50	0.95	8.40	8.54	8.98	9.47	10.03	11.37
HPK45824	R0.5	**1.0**	6	0.75	10	50	0.95	7.53	10.64	11.20	11.82	12.52	14.22
HPK45825	R0.5	**1.0**	6	0.75	22	60	0.95	4.62	23.27	24.52	25.92	27.11	28.60
HPK45826	R0.5	**1.0**	6	1	2.5	50	0.95	12.34	2.75	2.88	3.02	3.17	3.55
HPK45012	R0.6	**1.2**	4	0.9	2.4	45	1.15	11.13	2.56	2.63	2.70	2.78	2.95
HPK45827	R0.6	**1.2**	4	0.9	4	45	1.15	9.12	4.21	4.34	4.47	4.62	4.94
HPK45828	R0.6	**1.2**	4	0.9	6	45	1.15	7.44	6.28	6.48	6.69	6.92	7.43
HPK45829	R0.6	**1.2**	4	0.9	8	45	1.15	6.28	8.35	8.62	8.90	9.22	9.92
HPK45830	R0.6	**1.2**	4	0.9	10	45	1.15	5.43	10.41	10.75	11.12	11.52	12.40
HPK45831	R0.6	**1.2**	4	0.9	12	45	1.15	4.79	12.48	12.89	13.34	13.82	14.89
HPK45832	R0.6	**1.2**	4	0.9	14	50	1.15	4.28	14.55	15.03	15.55	16.12	17.37
HPK45833	R0.6	**1.2**	4	0.9	16	50	1.15	3.87	16.61	17.17	17.77	18.42	19.86
HPK45834	R0.6	**1.2**	4	1.2	3	40	1.15	10.28	3.18	3.27	3.36	3.47	3.70
HPK45014	R0.7	**1.4**	4	1	8	45	1.35	6.06	8.34	8.61	8.89	9.20	9.89
HPK45835	R0.7	**1.4**	4	1	12	50	1.35	4.58	12.48	12.89	13.33	13.80	14.86
HPK45836	R0.7	**1.4**	4	1	16	50	1.35	3.67	16.61	17.17	17.76	18.40	19.84
HPK45015	R0.75	**1.5**	4	1.1	3	45	1.45	10.11	3.17	3.26	3.35	3.44	3.66
HPK45837	R0.75	**1.5**	4	1.1	4	45	1.45	8.87	4.21	4.33	4.46	4.59	4.91
HPK45838	R0.75	**1.5**	4	1.1	6	45	1.45	7.12	6.27	6.47	6.67	6.89	7.39
HPK45839	R0.75	**1.5**	4	1.1	8	45	1.45	5.94	8.34	8.61	8.89	9.19	9.88
HPK45840	R0.75	**1.5**	4	1.1	10	45	1.45	5.10	10.41	10.74	11.11	11.49	12.37
HPK45841	R0.75	**1.5**	4	1.1	12	45	1.45	4.46	12.48	12.88	13.32	13.79	14.85
HPK45842	R0.75	**1.5**	4	1.1	14	50	1.45	3.97	14.54	15.02	15.54	16.09	17.34
HPK45843	R0.75	**1.5**	4	1.1	16	50	1.45	3.57	16.61	17.16	17.76	18.39	19.82

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

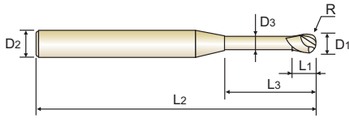
C-COATED SOLID CARBIDE END MILLS

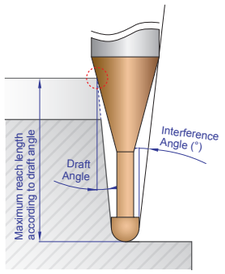
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45844	R0.75	**1.5**	4	1.1	18	55	1.45	3.25	18.68	19.30	19.97	20.69	22.31
HPK45845	R0.75	**1.5**	4	1.1	20	55	1.45	2.98	20.74	21.44	22.19	22.99	-
HPK45846	R0.75	**1.5**	4	1.1	22	60	1.45	2.75	22.81	23.58	24.41	25.29	-
HPK45847	R0.75	**1.5**	4	1.1	30	70	1.45	2.10	31.08	32.14	33.27	34.49	-
HPK45848	R0.75	**1.5**	4	1.5	3.8	40	1.45	9.10	4.00	4.11	4.23	4.36	4.66
HPK45849	R0.75	**1.5**	4	1.5	3.8	50	1.45	9.10	4.00	4.11	4.23	4.36	4.66
HPK45850	R0.75	**1.5**	6	1.1	6	50	1.45	9.30	6.27	6.47	6.67	6.89	7.39
HPK45851	R0.75	**1.5**	6	1.1	8	50	1.45	8.13	8.34	8.61	8.89	9.19	9.88
HPK45852	R0.75	**1.5**	6	1.5	3.8	50	1.45	11.03	4.00	4.11	4.23	4.36	4.66
HPK45016	R0.8	**1.6**	4	1.2	8	45	1.55	5.82	8.34	8.60	8.88	9.19	9.87
HPK45853	R0.8	**1.6**	4	1.2	12	45	1.55	4.35	12.47	12.88	13.32	13.79	14.84
HPK45854	R0.8	**1.6**	4	1.2	16	50	1.55	3.47	16.61	17.16	17.75	18.39	19.81
HPK45855	R0.8	**1.6**	4	1.2	20	55	1.55	2.89	20.74	21.44	22.18	22.98	-
HPK45020	R1.0	**2.0**	4	1.5	3	45	1.95	9.74	3.16	3.24	3.32	3.41	3.60
HPK45856	R1.0	**2.0**	4	1.5	4	45	1.95	8.34	4.20	4.31	4.43	4.56	4.85
HPK45857	R1.0	**2.0**	4	1.5	6	45	1.95	6.46	6.26	6.45	6.64	6.86	7.33
HPK45858	R1.0	**2.0**	4	1.5	8	45	1.95	5.28	8.33	8.59	8.86	9.16	9.82
HPK45859	R1.0	**2.0**	4	1.5	10	45	1.95	4.46	10.40	10.73	11.08	11.46	12.30
HPK45860	R1.0	**2.0**	4	1.5	12	45	1.95	3.86	12.47	12.87	13.29	13.76	14.79
HPK45861	R1.0	**2.0**	4	1.5	13	45	1.95	3.62	13.50	13.94	14.40	14.91	16.03
HPK45862	R1.0	**2.0**	4	1.5	14	50	1.95	3.40	14.53	15.01	15.51	16.06	17.28
HPK45863	R1.0	**2.0**	4	1.5	16	50	1.95	3.04	16.60	17.15	17.73	18.36	19.76
HPK45864	R1.0	**2.0**	4	1.5	18	55	1.95	2.75	18.67	19.28	19.94	20.65	-
HPK45865	R1.0	**2.0**	4	1.5	20	55	1.95	2.51	20.74	21.42	22.16	22.95	-
HPK45866	R1.0	**2.0**	4	1.5	22	60	1.95	2.31	22.80	23.56	24.38	25.25	-
HPK45867	R1.0	**2.0**	4	1.5	25	65	1.95	2.06	25.90	26.77	27.70	28.70	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M		K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

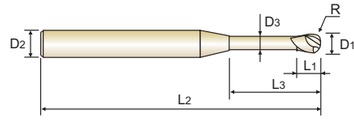
C-COATED SOLID CARBIDE END MILLS

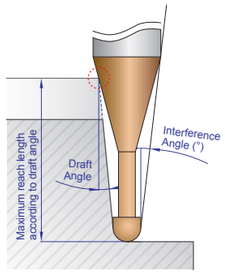
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45868	R1.0	**2.0**	4	1.5	30	70	1.95	1.74	31.07	32.12	33.24	-	-
HPK45869	R1.0	**2.0**	4	1.5	35	70	1.95	1.51	36.24	37.47	38.79	-	-
HPK45870	R1.0	**2.0**	4	1.5	40	90	1.95	1.34	41.41	42.82	-	-	-
HPK45871	R1.0	**2.0**	4	2	5	40	1.95	7.28	5.23	5.38	5.54	5.71	6.09
HPK45872	R1.0	**2.0**	4	2	5	50	1.95	7.28	5.23	5.38	5.54	5.71	6.09
HPK45873	R1.0	**2.0**	6	1.5	4	50	1.95	10.73	4.20	4.31	4.43	4.56	4.85
HPK45874	R1.0	**2.0**	6	1.5	6	50	1.95	9.05	6.26	6.45	6.64	6.86	7.33
HPK45875	R1.0	**2.0**	6	1.5	8	50	1.95	7.82	8.33	8.59	8.86	9.16	9.82
HPK45876	R1.0	**2.0**	6	1.5	10	50	1.95	6.89	10.40	10.73	11.08	11.46	12.30
HPK45877	R1.0	**2.0**	6	1.5	16	60	1.95	5.07	16.60	17.15	17.73	18.36	19.76
HPK45878	R1.0	**2.0**	6	1.5	25	65	1.95	3.63	25.90	26.77	27.70	28.70	30.95
HPK45879	R1.0	**2.0**	6	2	5	50	1.95	9.82	5.23	5.38	5.54	5.71	6.09
HPK45025	R1.25	**2.5**	4	2.3	6	45	2.4	5.54	6.35	6.53	6.72	6.93	7.39
HPK45880	R1.25	**2.5**	4	2.3	8	45	2.4	4.41	8.42	8.67	8.94	9.23	9.87
HPK45881	R1.25	**2.5**	4	2.3	10	45	2.4	3.66	10.49	10.81	11.15	11.53	12.36
HPK45882	R1.25	**2.5**	4	2.3	15	50	2.4	2.57	15.66	16.16	16.70	17.28	-
HPK45883	R1.25	**2.5**	4	2.3	20	55	2.4	1.98	20.82	21.51	22.24	-	-
HPK45884	R1.25	**2.5**	4	2.3	25	65	2.4	1.61	25.99	26.85	27.78	-	-
HPK45885	R1.25	**2.5**	4	2.3	30	70	2.4	1.35	31.16	32.20	-	-	-
HPK45886	R1.25	**2.5**	4	2.3	35	70	2.4	1.17	36.33	37.55	-	-	-
HPK45030	R1.5	**3.0**	4	3	8	40	2.85	3.31	8.51	8.75	9.01	9.30	9.93
HPK45887	R1.5	**3.0**	6	2.5	6	60	2.85	8.22	6.44	6.61	6.80	7.00	7.44
HPK45888	R1.5	**3.0**	6	2.5	8	60	2.85	6.91	8.51	8.75	9.01	9.30	9.93
HPK45889	R1.5	**3.0**	6	2.5	10	60	2.85	5.96	10.58	10.89	11.23	11.60	12.41
HPK45890	R1.5	**3.0**	6	2.5	12	60	2.85	5.23	12.64	13.03	13.45	13.90	14.90
HPK45891	R1.5	**3.0**	6	2.5	14	60	2.85	4.67	14.71	15.17	15.66	16.20	17.39

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M		K						
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

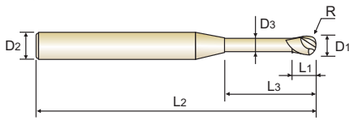
C-COATED SOLID CARBIDE END MILLS

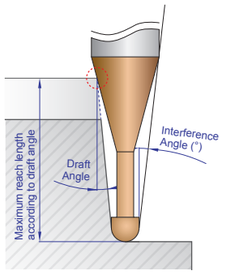
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45892	R1.5	**3.0**	6	2.5	16	60	2.85	4.21	16.78	17.31	17.88	18.49	19.87
HPK45893	R1.5	**3.0**	6	2.5	20	65	2.85	3.52	20.91	21.59	22.31	23.09	24.85
HPK45894	R1.5	**3.0**	6	2.5	25	65	2.85	2.92	26.08	26.94	27.86	28.84	-
HPK45895	R1.5	**3.0**	6	2.5	30	70	2.85	2.50	31.25	32.29	33.40	34.59	-
HPK45896	R1.5	**3.0**	6	2.5	35	80	2.85	2.18	36.42	37.63	38.94	40.34	-
HPK45897	R1.5	**3.0**	6	2.5	40	90	2.85	1.94	41.59	42.98	44.48	-	-
HPK45898	R1.5	**3.0**	6	3	8	60	2.85	6.91	8.51	8.75	9.01	9.30	9.93
HPK45035	R1.75	**3.5**	6	2.8	15	60	1.25	3.24	19.79	20.41	21.09	21.81	23.44
HPK45899	R1.75	**3.5**	6	2.8	20	65	3.35	3.08	20.90	21.57	22.29	23.06	24.79
HPK45701	R1.75	**3.5**	6	2.8	25	65	3.35	2.54	26.07	26.92	27.83	28.81	-
HPK45702	R1.75	**3.5**	6	2.8	30	70	3.35	2.16	31.24	32.27	33.37	34.56	-
HPK45703	R1.75	**3.5**	6	2.8	35	80	3.35	1.87	36.41	37.62	38.91	-	-
HPK45704	R1.75	**3.5**	6	2.8	40	90	3.35	1.66	41.58	42.96	44.45	-	-
HPK45705	R1.75	**3.5**	6	2.8	45	90	3.35	1.49	46.75	48.31	-	-	-
HPK45040	R2.0	**4.0**	4	3	8	65	3.85	0.00	-	-	-	-	-
HPK45706	R2.0	**4.0**	6	3	8	65	3.85	5.70	8.49	8.72	8.96	9.22	9.81
HPK45707	R2.0	**4.0**	6	3	10	65	3.85	4.76	10.56	10.86	11.18	11.52	12.29
HPK45708	R2.0	**4.0**	6	3	12	65	3.85	4.08	12.63	13.00	13.39	13.82	14.78
HPK45709	R2.0	**4.0**	6	3	14	65	3.85	3.57	14.69	15.14	15.61	16.12	17.27
HPK45710	R2.0	**4.0**	6	3	15	65	3.85	3.36	15.73	16.21	16.72	17.27	18.51
HPK45711	R2.0	**4.0**	6	3	20	65	3.85	2.60	20.90	21.55	22.26	23.02	-
HPK45712	R2.0	**4.0**	6	3	25	70	3.85	2.12	26.06	26.90	27.80	28.77	-
HPK45713	R2.0	**4.0**	6	3	30	70	3.85	1.79	31.23	32.25	33.34	-	-
HPK45714	R2.0	**4.0**	6	3	35	80	3.85	1.55	36.40	37.60	38.88	-	-
HPK45715	R2.0	**4.0**	6	3	40	85	3.85	1.36	41.57	42.95	-	-	-
HPK45716	R2.0	**4.0**	6	3	45	90	3.85	1.22	46.74	48.30	-	-	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

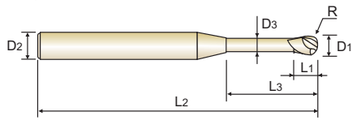
C-COATED SOLID CARBIDE END MILLS

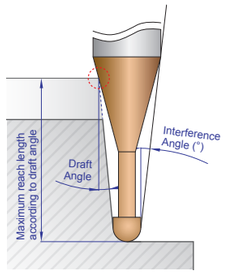
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPK45**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK45717	R2.0	**4.0**	6	3	50	100	3.85	1.10	51.91	53.64	-	-	-
HPK45718	R2.0	**4.0**	6	4	10	40	3.85	4.76	10.56	10.86	11.18	11.52	12.29
HPK45719	R2.0	**4.0**	6	4	10	60	3.85	4.76	10.56	10.86	11.18	11.52	12.29
HPK45050	R2.5	**5.0**	6	3.5	10	70	4.85	2.97	10.54	10.82	11.12	11.45	-
HPK45720	R2.5	**5.0**	6	3.5	15	70	4.85	1.96	15.71	16.17	16.66	-	-
HPK45721	R2.5	**5.0**	6	3.5	20	70	4.85	1.46	20.88	21.52	-	-	-
HPK45722	R2.5	**5.0**	6	3.5	25	70	4.85	1.16	26.05	26.87	-	-	-
HPK45723	R2.5	**5.0**	6	3.5	30	80	4.85	0.97	31.22	-	-	-	-
HPK45724	R2.5	**5.0**	6	3.5	40	90	4.85	0.72	41.55	-	-	-	-
HPK45725	R2.5	**5.0**	6	5	12	45	4.85	2.46	12.61	12.96	13.34	13.75	-
HPK45726	R2.5	**5.0**	6	5	12	60	4.85	2.46	12.61	12.96	13.34	13.75	-
HPK45060	R3.0	**6.0**	6	6	10	70	5.85	0.00	-	-	-	-	-
HPK45727	R3.0	**6.0**	6	6	15	45	5.85	0.00	-	-	-	-	-
HPK45728	R3.0	**6.0**	6	6	15	60	5.85	0.00	-	-	-	-	-
HPK45729	R3.0	**6.0**	6	6	15	70	5.85	0.00	-	-	-	-	-
HPK45730	R3.0	**6.0**	6	6	20	70	5.85	0.00	-	-	-	-	-
HPK45731	R3.0	**6.0**	6	6	25	70	5.85	0.00	-	-	-	-	-
HPK45732	R3.0	**6.0**	6	6	30	80	5.85	0.00	-	-	-	-	-
HPK45733	R3.0	**6.0**	6	6	35	85	5.85	0.00	-	-	-	-	-
HPK45734	R3.0	**6.0**	6	6	40	90	5.85	0.00	-	-	-	-	-
HPK45735	R3.0	**6.0**	6	6	50	120	5.85	0.00	-	-	-	-	-
HPK45736	R3.0	**6.0**	6	6	60	120	5.85	0.00	-	-	-	-	-
HPK45080	R4.0	**8.0**	8	12	24	100	7.7	0.00	-	-	-	-	-
HPK45100	R5.0	**10.0**	10	15	30	100	9.7	0.00	-	-	-	-	-
HPK45120	R6.0	**12.0**	12	18	36	110	11.7	0.00	-	-	-	-	-

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

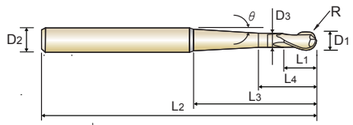
C-COATED SOLID CARBIDE END MILLS

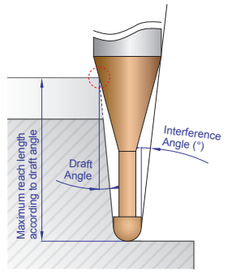
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPK47001	R0.05	**0.1**	4	0.07	0.5	50	0.085	**3°**	0.17	14.23	0.37	0.44	0.51	0.53	0.56
HPK47901	R0.05	**0.1**	4	0.07	0.75	50	0.085	**3°**	0.17	13.88	0.37	0.44	0.58	0.76	0.81
HPK470015	R0.075	**0.15**	4	0.1	1	50	0.135	**3°**	0.25	13.55	0.46	0.55	0.71	1.00	1.08
HPK47902	R0.075	**0.15**	4	0.1	1.5	50	0.135	**3°**	0.25	12.92	0.46	0.55	0.71	1.03	1.58
HPK47002	R0.1	**0.2**	4	0.15	1.5	50	0.17	**0.5°**	0.35	12.59	1.57	1.62	1.67	1.73	1.86
HPK47903	R0.1	**0.2**	4	0.15	1.5	50	0.17	**1°**	0.35	12.64	1.53	1.58	1.63	1.69	1.82
HPK47904	R0.1	**0.2**	4	0.15	1.5	50	0.17	**1.5°**	0.35	12.69	1.33	1.54	1.59	1.64	1.77
HPK47905	R0.1	**0.2**	4	0.15	1.5	50	0.17	**2°**	0.35	12.75	1.01	1.46	1.55	1.60	1.72
HPK47906	R0.1	**0.2**	4	0.15	2	50	0.17	**0.5°**	0.35	11.93	2.07	2.13	2.21	2.29	2.46
HPK47907	R0.1	**0.2**	4	0.15	2	50	0.17	**1°**	0.35	12.00	2.01	2.08	2.15	2.23	2.40
HPK47908	R0.1	**0.2**	4	0.15	2	50	0.17	**1.5°**	0.35	12.07	1.33	2.02	2.09	2.16	2.33
HPK47909	R0.1	**0.2**	4	0.15	2	50	0.17	**2°**	0.35	12.14	1.01	1.46	2.03	2.10	2.26
HPK47910	R0.1	**0.2**	4	0.15	3	50	0.17	**3°**	0.35	11.28	0.74	0.90	1.17	1.71	3.13
HPK47911	R0.1	**0.2**	4	0.15	3	50	0.17	**5°**	0.35	11.69	0.57	0.63	0.70	0.80	1.15
HPK47912	R0.1	**0.2**	4	0.15	5	50	0.17	**3°**	0.35	9.68	0.74	0.90	1.17	1.71	5.13
HPK47913	R0.1	**0.2**	4	0.15	5	50	0.17	**5°**	0.35	10.23	0.57	0.63	0.70	0.80	1.15
HPK47003	R0.15	**0.3**	4	0.2	2	50	0.27	**0.5°**	0.5	11.92	2.07	2.14	2.21	2.29	2.46
HPK47914	R0.15	**0.3**	4	0.2	2	50	0.27	**1°**	0.5	11.99	2.02	2.08	2.15	2.23	2.40
HPK47915	R0.15	**0.3**	4	0.2	2	50	0.27	**1.5°**	0.5	12.05	1.53	2.03	2.10	2.17	2.34
HPK47916	R0.15	**0.3**	4	0.2	2	50	0.27	**2°**	0.5	12.12	1.19	1.71	2.05	2.12	2.28
HPK47917	R0.15	**0.3**	4	0.2	2	50	0.27	**3°**	0.5	12.26	0.91	1.10	1.42	2.00	2.15
HPK47918	R0.15	**0.3**	4	0.2	3	50	0.27	**0.5°**	0.5	10.77	3.07	3.17	3.28	3.40	3.66
HPK47919	R0.15	**0.3**	4	0.2	3	50	0.27	**1°**	0.5	10.86	2.57	3.08	3.19	3.30	3.56
HPK47920	R0.15	**0.3**	4	0.2	3	50	0.27	**1.5°**	0.5	10.95	1.53	2.92	3.10	3.21	3.46
HPK47921	R0.15	**0.3**	4	0.2	3	50	0.27	**2°**	0.5	11.04	1.19	1.71	3.01	3.12	3.36
HPK47922	R0.15	**0.3**	4	0.2	3	50	0.27	**3°**	0.5	11.23	0.91	1.10	1.42	2.06	3.15

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel				Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

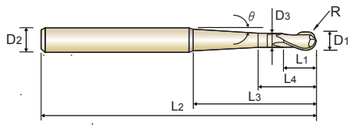
C-COATED SOLID CARBIDE END MILLS

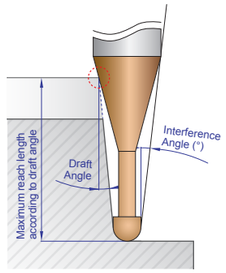
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPK47923	R0.15	**0.3**	4	0.2	3	50	0.27	**5°**	0.5	11.62	0.73	0.80	0.89	1.02	1.45
HPK47924	R0.15	**0.3**	4	0.2	5	50	0.27	**3°**	0.5	9.61	0.91	1.10	1.42	2.06	5.15
HPK47925	R0.15	**0.3**	4	0.2	5	50	0.27	**5°**	0.5	10.14	0.73	0.80	0.89	1.02	1.45
HPK47926	R0.15	**0.3**	4	0.2	7	50	0.27	**3°**	0.5	8.39	0.91	1.10	1.42	2.06	7.15
HPK47927	R0.15	**0.3**	4	0.2	7	50	0.27	**5°**	0.5	8.99	0.73	0.80	0.89	1.02	1.45
HPK47004	R0.2	**0.4**	4	0.3	3	50	0.37	**0.5°**	0.7	10.73	3.07	3.17	3.28	3.40	3.66
HPK47928	R0.2	**0.4**	4	0.3	3	50	0.37	**1°**	0.7	10.81	2.92	3.09	3.20	3.31	3.56
HPK47929	R0.2	**0.4**	4	0.3	3	50	0.37	**1.5°**	0.7	10.90	1.81	3.01	3.12	3.23	3.47
HPK47930	R0.2	**0.4**	4	0.3	3	50	0.37	**2°**	0.7	10.98	1.44	2.06	3.03	3.14	3.38
HPK47931	R0.2	**0.4**	4	0.3	4	50	0.37	**0.5°**	0.7	9.76	4.07	4.21	4.35	4.51	4.86
HPK47932	R0.2	**0.4**	4	0.3	4	50	0.37	**1°**	0.7	9.86	2.92	4.09	4.24	4.39	4.73
HPK47933	R0.2	**0.4**	4	0.3	4	50	0.37	**1.5°**	0.7	9.96	1.81	3.42	4.12	4.26	4.59
HPK47934	R0.2	**0.4**	4	0.3	4	50	0.37	**2°**	0.7	10.06	1.44	2.06	3.92	4.14	4.46
HPK47935	R0.2	**0.4**	4	0.3	5	50	0.37	**3°**	0.7	9.52	1.14	1.38	1.77	2.56	5.19
HPK47936	R0.2	**0.4**	4	0.3	5	50	0.37	**5°**	0.7	10.04	0.95	1.04	1.16	1.32	1.87
HPK47937	R0.2	**0.4**	4	0.3	6	50	0.37	**0.5°**	0.7	8.26	6.07	6.28	6.50	6.74	7.27
HPK47938	R0.2	**0.4**	4	0.3	6	50	0.37	**1°**	0.7	8.37	2.92	6.09	6.31	6.54	7.05
HPK47939	R0.2	**0.4**	4	0.3	6	50	0.37	**1.5°**	0.7	8.49	1.81	3.42	6.12	6.34	6.84
HPK47940	R0.2	**0.4**	4	0.3	6	50	0.37	**2°**	0.7	8.61	1.44	2.06	3.92	6.14	6.62
HPK47941	R0.2	**0.4**	4	0.3	7	50	0.37	**3°**	0.7	8.30	1.14	1.38	1.77	2.56	7.19
HPK47942	R0.2	**0.4**	4	0.3	7	50	0.37	**5°**	0.7	8.88	0.95	1.04	1.16	1.32	1.87
HPK47005	R0.25	**0.5**	4	0.35	4	50	0.45	**0.5°**	0.85	9.67	4.12	4.25	4.40	4.55	4.90
HPK47943	R0.25	**0.5**	4	0.35	4	50	0.45	**1°**	0.85	9.76	4.01	4.14	4.28	4.43	4.77
HPK47944	R0.25	**0.5**	4	0.35	4	50	0.45	**1.5°**	0.85	9.86	2.58	4.03	4.17	4.32	4.65
HPK47945	R0.25	**0.5**	4	0.35	4	50	0.45	**2°**	0.85	9.96	2.00	2.88	4.05	4.20	4.52
HPK47946	R0.25	**0.5**	4	0.35	5	50	0.45	**0.5°**	0.85	8.85	5.12	5.29	5.47	5.66	6.10

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
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HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel				Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

C-COATED SOLID CARBIDE END MILLS

SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
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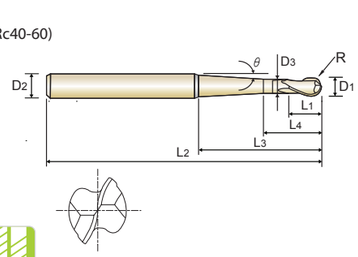
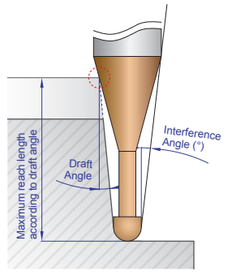
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPK47947	R0.25	**0.5**	4	0.35	5	50	0.45	**1°**	0.85	8.96	4.31	5.14	5.32	5.51	5.93
HPK47948	R0.25	**0.5**	4	0.35	5	50	0.45	**1.5°**	0.85	9.06	2.58	4.91	5.17	5.35	5.77
HPK47949	R0.25	**0.5**	4	0.35	5	50	0.45	**2°**	0.85	9.18	2.00	2.88	5.02	5.20	5.60
HPK47006	R0.3	**0.6**	4	0.45	4	50	0.55	**0.5°**	1.05	9.61	4.12	4.25	4.40	4.55	4.90
HPK47950	R0.3	**0.6**	4	0.45	4	50	0.55	**1°**	1.05	9.70	4.02	4.15	4.29	4.44	4.78
HPK47951	R0.3	**0.6**	4	0.45	4	50	0.55	**1.5°**	1.05	9.79	2.86	4.05	4.18	4.33	4.66
HPK47952	R0.3	**0.6**	4	0.45	4	50	0.55	**3°**	1.05	10.08	1.77	2.14	2.75	3.98	4.30
HPK47953	R0.3	**0.6**	4	0.45	5	50	0.55	**0.5°**	1.05	8.78	5.12	5.29	5.47	5.66	6.10
HPK47954	R0.3	**0.6**	4	0.45	5	50	0.55	**1°**	1.05	8.88	4.66	5.15	5.33	5.52	5.94
HPK47955	R0.3	**0.6**	4	0.45	5	50	0.55	**1.5°**	1.05	8.98	2.86	5.01	5.18	5.37	5.78
HPK47956	R0.3	**0.6**	4	0.45	5	50	0.55	**2°**	1.05	9.09	2.25	3.23	5.04	5.22	5.62
HPK47957	R0.3	**0.6**	4	0.45	5	50	0.55	**3°**	1.05	9.31	1.77	2.14	2.75	3.98	5.30
HPK47958	R0.3	**0.6**	4	0.45	5	50	0.55	**5°**	1.05	9.79	1.45	1.59	1.78	2.02	2.88
HPK47959	R0.3	**0.6**	4	0.45	6	50	0.55	**0.5°**	1.05	8.08	6.12	6.32	6.54	6.78	7.30
HPK47960	R0.3	**0.6**	4	0.45	6	50	0.55	**1°**	1.05	8.19	4.66	6.15	6.36	6.59	7.10
HPK47961	R0.3	**0.6**	4	0.45	6	50	0.55	**1.5°**	1.05	8.30	2.86	5.41	6.18	6.41	6.90
HPK47962	R0.3	**0.6**	4	0.45	6	50	0.55	**2°**	1.05	8.41	2.25	3.23	6.01	6.22	6.70
HPK47963	R0.3	**0.6**	4	0.45	7	50	0.55	**3°**	1.05	8.08	1.77	2.14	2.75	3.98	7.30
HPK47964	R0.3	**0.6**	4	0.45	7	50	0.55	**5°**	1.05	8.63	1.45	1.59	1.78	2.02	2.88
HPK47965	R0.3	**0.6**	4	0.45	8	50	0.55	**0.5°**	1.05	6.97	8.12	8.39	8.69	9.00	9.71
HPK47966	R0.3	**0.6**	4	0.45	8	50	0.55	**1°**	1.05	7.08	4.66	8.15	8.44	8.74	9.43
HPK47967	R0.3	**0.6**	4	0.45	8	50	0.55	**1.5°**	1.05	7.20	2.86	5.41	8.18	8.48	9.14
HPK47968	R0.3	**0.6**	4	0.45	8	50	0.55	**2°**	1.05	7.32	2.25	3.23	6.16	8.22	8.86
HPK47008	R0.4	**0.8**	4	0.6	8	60	0.75	**0.5°**	1.4	6.78	8.13	8.40	8.69	9.00	9.70
HPK47969	R0.4	**0.8**	4	0.6	8	60	0.75	**1°**	1.4	6.89	5.26	8.17	8.45	8.75	9.43
HPK47970	R0.4	**0.8**	4	0.6	8	60	0.75	**1.5°**	1.4	7.01	3.33	6.26	8.21	8.50	9.16

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

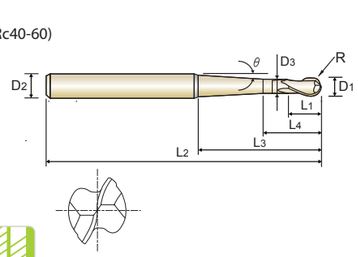
C-COATED SOLID CARBIDE END MILLS

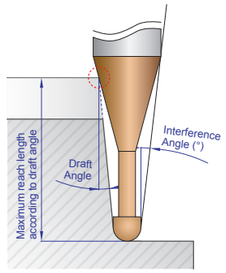
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPK47971	R0.4	**0.8**	4	0.6	8	60	0.75	**2°**	1.4	7.12	2.69	3.83	7.26	8.26	8.89
HPK47972	R0.4	**0.8**	4	0.6	12	60	0.75	**0.5°**	1.4	5.28	12.13	12.54	12.98	13.45	14.51
HPK47973	R0.4	**0.8**	4	0.6	12	60	0.75	**1°**	1.4	5.38	5.26	12.17	12.59	13.05	14.08
HPK47974	R0.4	**0.8**	4	0.6	12	60	0.75	**1.5°**	1.4	5.50	3.33	6.26	12.21	12.65	13.65
HPK47975	R0.4	**0.8**	4	0.6	12	60	0.75	**2°**	1.4	5.61	2.69	3.83	7.26	12.26	13.22
HPK47010	R0.5	**1.0**	4	0.75	6	60	0.95	**0.5°**	2.75	7.71	6.17	6.37	6.58	6.81	7.32
HPK47976	R0.5	**1.0**	4	0.75	6	60	0.95	**1°**	2.75	7.78	6.06	6.26	6.46	6.69	7.19
HPK47977	R0.5	**1.0**	4	0.75	6	60	0.95	**1.5°**	2.75	7.85	5.31	6.14	6.35	6.57	7.06
HPK47978	R0.5	**1.0**	4	0.75	8	60	0.95	**0.5°**	2.75	6.57	8.17	8.44	8.73	9.03	9.73
HPK47979	R0.5	**1.0**	4	0.75	8	60	0.95	**1°**	2.75	6.66	7.86	8.26	8.54	8.84	9.51
HPK47980	R0.5	**1.0**	4	0.75	8	60	0.95	**1.5°**	2.75	6.75	5.31	8.07	8.35	8.64	9.30
HPK47981	R0.5	**1.0**	4	0.75	8	60	0.95	**2°**	2.75	6.84	4.45	6.43	8.16	8.44	9.09
HPK47982	R0.5	**1.0**	4	0.75	10	60	0.95	**0.5°**	2.75	5.73	10.17	10.51	10.87	11.26	12.13
HPK47983	R0.5	**1.0**	4	0.75	10	60	0.95	**1°**	2.75	5.82	7.86	10.26	10.61	10.99	11.84
HPK47984	R0.5	**1.0**	4	0.75	10	60	0.95	**1.5°**	2.75	5.91	5.31	10.00	10.35	10.72	11.55
HPK47985	R0.5	**1.0**	4	0.75	10	60	0.95	**2°**	2.75	6.01	4.45	6.43	10.09	10.44	11.25
HPK47986	R0.5	**1.0**	4	0.75	10	60	0.95	**3°**	2.75	6.22	3.77	4.59	5.95	8.67	10.66
HPK47987	R0.5	**1.0**	4	0.75	12	60	0.95	**0.5°**	2.75	5.08	12.17	12.58	13.02	13.48	14.54
HPK47988	R0.5	**1.0**	4	0.75	12	60	0.95	**1°**	2.75	5.17	7.86	12.26	12.68	13.14	14.16
HPK47989	R0.5	**1.0**	4	0.75	12	60	0.95	**1.5°**	2.75	5.26	5.31	10.11	12.35	12.79	13.79
HPK47990	R0.5	**1.0**	4	0.75	16	60	0.95	**0.5°**	2.75	4.13	16.17	16.72	17.30	17.93	19.35
HPK47991	R0.5	**1.0**	4	0.75	16	60	0.95	**1°**	2.75	4.22	7.86	16.26	16.83	17.44	18.81
HPK47992	R0.5	**1.0**	4	0.75	16	60	0.95	**1.5°**	2.75	4.31	5.31	10.11	16.35	16.94	18.28
HPK47993	R0.5	**1.0**	4	0.75	20	70	0.95	**0.5°**	2.75	3.49	20.17	20.86	21.59	22.38	24.16
HPK47994	R0.5	**1.0**	4	0.75	20	70	0.95	**1°**	2.75	3.57	7.86	20.26	20.97	21.74	23.46
HPK47995	R0.5	**1.0**	4	0.75	20	70	0.95	**1.5°**	2.75	3.65	5.31	10.11	20.35	21.09	22.76

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

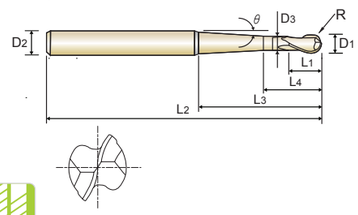
C-COATED SOLID CARBIDE END MILLS

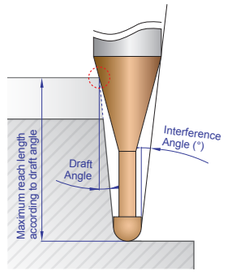
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3	θ°	L_4		0.5°	1°	1.5°	2°	3°
HPK47996	R0.5	**1.0**	4	0.75	20	70	0.95	**2°**	2.75	3.74	4.45	6.43	12.36	20.44	22.06
HPK47997	R0.5	**1.0**	4	0.75	20	70	0.95	**3°**	2.75	3.93	3.77	4.59	5.95	8.67	20.66
HPK47998	R0.5	**1.0**	4	0.75	25	70	0.95	**0.5°**	2.75	2.91	25.17	26.03	26.95	27.95	-
HPK47999	R0.5	**1.0**	4	0.75	25	70	0.95	**1°**	2.75	2.99	7.86	25.26	26.15	27.11	-
HPK47801	R0.5	**1.0**	4	0.75	25	70	0.95	**1.5°**	2.75	3.06	5.31	10.11	25.35	26.28	28.37
HPK47802	R0.5	**1.0**	4	0.75	30	70	0.95	**0.5°**	2.75	2.50	30.17	31.21	32.31	33.51	-
HPK47803	R0.5	**1.0**	4	0.75	30	70	0.95	**1°**	2.75	2.57	7.86	30.26	31.33	32.49	-
HPK47804	R0.5	**1.0**	4	0.75	30	70	0.95	**1.5°**	2.75	2.64	5.31	10.11	30.35	31.47	-
HPK47805	R0.5	**1.0**	4	0.75	30	70	0.95	**2°**	2.75	2.71	4.45	6.43	12.36	30.44	-
HPK47896	R0.5	**1.0**	6	0.75	30	70	0.95	**3°**	2.75	4.26	3.77	4.59	5.95	8.67	30.66
HPK47015	R0.75	**1.5**	4	1.1	10	60	1.45	**0.5°**	3.1	5.18	10.18	10.50	10.86	11.24	12.09
HPK47806	R0.75	**1.5**	4	1.1	10	60	1.45	**1°**	3.1	5.27	8.31	10.26	10.61	10.98	11.81
HPK47807	R0.75	**1.5**	4	1.1	10	60	1.45	**1.5°**	3.1	5.36	5.71	10.02	10.36	10.72	11.53
HPK47808	R0.75	**1.5**	4	1.1	10	60	1.45	**2°**	3.1	5.45	4.84	6.88	10.11	10.46	11.25
HPK47809	R0.75	**1.5**	4	1.1	15	60	1.45	**0.5°**	3.1	3.84	15.18	15.68	16.22	16.80	18.10
HPK47810	R0.75	**1.5**	4	1.1	15	60	1.45	**1°**	3.1	3.92	8.31	15.26	15.79	16.35	17.62
HPK47811	R0.75	**1.5**	4	1.1	15	60	1.45	**1.5°**	3.1	4.01	5.71	10.66	15.36	15.91	17.14
HPK47812	R0.75	**1.5**	4	1.1	15	60	1.45	**2°**	3.1	4.10	4.84	6.88	13.01	15.46	16.65
HPK47813	R0.75	**1.5**	4	1.1	20	70	1.45	**0.5°**	3.1	3.05	20.18	20.85	21.58	22.36	24.11
HPK47814	R0.75	**1.5**	4	1.1	20	70	1.45	**1°**	3.1	3.12	8.31	20.26	20.97	21.73	23.43
HPK47815	R0.75	**1.5**	4	1.1	20	70	1.45	**1.5°**	3.1	3.20	5.71	10.66	20.36	21.09	22.74
HPK47816	R0.75	**1.5**	4	1.1	20	70	1.45	**2°**	3.1	3.28	4.84	6.88	13.01	20.46	22.06
HPK47817	R0.75	**1.5**	4	1.1	25	70	1.45	**0.5°**	3.1	2.53	25.18	26.03	26.94	27.92	-
HPK47818	R0.75	**1.5**	4	1.1	25	70	1.45	**1°**	3.1	2.59	8.31	25.26	26.15	27.10	-
HPK47819	R0.75	**1.5**	4	1.1	30	70	1.45	**0.5°**	3.1	2.16	30.18	31.20	32.30	33.48	-
HPK47820	R0.75	**1.5**	4	1.1	30	70	1.45	**1°**	3.1	2.22	8.31	30.26	31.33	32.48	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
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HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

C-COATED SOLID CARBIDE END MILLS

SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK HPK47

- Improvement of tool life by applying new coating
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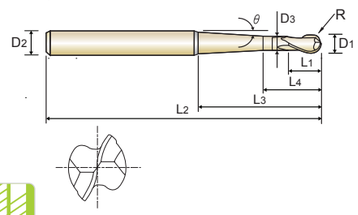
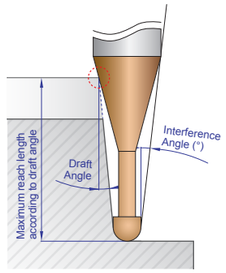
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating | P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3	θ°	L_4		0.5°	1°	1.5°	2°	3°
HPK47020	R1.0	**2.0**	4	1.5	12	60	1.95	**0.5°**	3.5	3.93	12.18	12.57	12.99	13.44	14.45
HPK47821	R1.0	**2.0**	4	1.5	12	60	1.95	**1°**	3.5	4.01	8.86	12.27	12.68	13.12	14.10
HPK47822	R1.0	**2.0**	4	1.5	12	60	1.95	**1.5°**	3.5	4.09	6.18	11.36	12.37	12.80	13.76
HPK47823	R1.0	**2.0**	4	1.5	12	60	1.95	**2°**	3.5	4.17	5.29	7.43	12.07	12.48	13.41
HPK47824	R1.0	**2.0**	4	1.5	16	60	1.95	**0.5°**	3.5	3.11	16.18	16.71	17.28	17.89	19.26
HPK47825	R1.0	**2.0**	4	1.5	16	60	1.95	**1°**	3.5	3.18	8.86	16.27	16.83	17.42	18.75
HPK47826	R1.0	**2.0**	4	1.5	16	60	1.95	**1.5°**	3.5	3.25	6.18	11.36	16.37	16.95	18.24
HPK47827	R1.0	**2.0**	4	1.5	16	60	1.95	**2°**	3.5	3.33	5.29	7.43	13.86	16.48	17.74
HPK47828	R1.0	**2.0**	4	1.5	20	70	1.95	**0.5°**	3.5	2.57	20.18	20.85	21.57	22.34	-
HPK47829	R1.0	**2.0**	4	1.5	20	70	1.95	**1°**	3.5	2.63	8.86	20.27	20.97	21.72	-
HPK47830	R1.0	**2.0**	4	1.5	20	70	1.95	**1.5°**	3.5	2.70	6.18	11.36	20.37	21.10	-
HPK47831	R1.0	**2.0**	4	1.5	20	70	1.95	**2°**	3.5	2.77	5.29	7.43	13.86	20.48	-
HPK47832	R1.0	**2.0**	4	1.5	25	70	1.95	**0.5°**	3.5	2.11	25.18	26.02	26.93	27.90	-
HPK47833	R1.0	**2.0**	4	1.5	25	70	1.95	**1°**	3.5	2.17	8.86	25.27	26.15	27.09	-
HPK47834	R1.0	**2.0**	4	1.5	25	70	1.95	**1.5°**	3.5	2.23	6.18	11.36	25.37	26.29	-
HPK47835	R1.0	**2.0**	4	1.5	30	70	1.95	**0.5°**	3.5	1.79	30.18	31.20	32.29	-	-
HPK47836	R1.0	**2.0**	4	1.5	30	70	1.95	**1°**	3.5	1.84	8.86	30.27	31.33	-	-
HPK47837	R1.0	**2.0**	4	1.5	35	80	1.95	**0.5°**	3.5	1.56	35.18	36.37	37.65	-	-
HPK47838	R1.0	**2.0**	4	1.5	40	80	1.95	**0.5°**	3.5	1.38	40.18	41.55	-	-	-
HPK47839	R1.0	**2.0**	4	1.5	50	90	1.95	**0.5°**	3.5	1.12	50.18	51.89	-	-	-
HPK47840	R1.0	**2.0**	6	1.5	25	70	1.95	**2°**	3.5	3.98	5.29	7.43	13.86	25.48	27.47
HPK47841	R1.0	**2.0**	6	1.5	30	70	1.95	**1.5°**	3.5	3.37	6.18	11.36	30.37	31.48	33.95
HPK47842	R1.0	**2.0**	6	1.5	30	70	1.95	**2°**	3.5	3.46	5.29	7.43	13.86	30.48	32.87
HPK47843	R1.0	**2.0**	6	1.5	35	80	1.95	**1°**	3.5	2.90	8.86	35.27	36.51	37.84	-
HPK47844	R1.0	**2.0**	6	1.5	35	80	1.95	**1.5°**	3.5	2.98	6.18	11.36	35.37	36.66	-
HPK47845	R1.0	**2.0**	6	1.5	40	80	1.95	**1°**	3.5	2.59	8.86	40.27	41.69	43.22	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

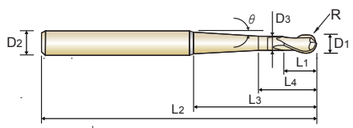
C-COATED SOLID CARBIDE END MILLS

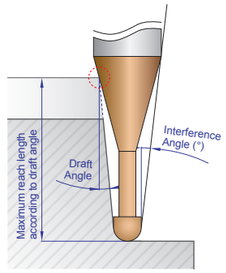
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPK47846	R1.0	**2.0**	6	1.5	40	80	1.95	**1.5°**	3.5	2.66	6.18	11.36	40.37	41.85	-
HPK47847	R1.0	**2.0**	6	1.5	40	80	1.95	**2°**	3.5	2.74	5.29	7.43	13.86	40.48	-
HPK47848	R1.0	**2.0**	6	1.5	50	90	1.95	**1°**	3.5	2.14	8.86	50.27	52.05	53.97	-
HPK47849	R1.0	**2.0**	6	1.5	50	90	1.95	**1.5°**	3.5	2.20	6.18	11.36	50.37	52.22	-
HPK47850	R1.0	**2.0**	6	1.5	50	90	1.95	**2°**	3.5	2.27	5.29	7.43	13.86	50.48	-
HPK47030	R1.5	**3.0**	6	2.5	15	70	2.85	**0.5°**	4.5	4.51	15.39	15.87	16.39	16.95	18.21
HPK47851	R1.5	**3.0**	6	2.5	15	70	2.85	**1°**	4.5	4.59	15.04	15.51	16.01	16.56	17.78
HPK47852	R1.5	**3.0**	6	2.5	15	70	2.85	**1.5°**	4.5	4.67	10.30	15.14	15.64	16.17	17.35
HPK47853	R1.5	**3.0**	6	2.5	15	70	2.85	**2°**	4.5	4.76	8.36	11.79	15.26	15.77	16.93
HPK47854	R1.5	**3.0**	6	2.5	20	70	2.85	**0.5°**	4.5	3.60	20.39	21.05	21.75	22.51	24.22
HPK47855	R1.5	**3.0**	6	2.5	20	70	2.85	**1°**	4.5	3.67	16.09	20.51	21.19	21.93	23.59
HPK47856	R1.5	**3.0**	6	2.5	20	70	2.85	**1.5°**	4.5	3.75	10.30	19.09	20.64	21.35	22.96
HPK47857	R1.5	**3.0**	6	2.5	20	70	2.85	**2°**	4.5	3.84	8.36	11.79	20.08	20.77	22.33
HPK47858	R1.5	**3.0**	6	2.5	25	70	2.85	**0.5°**	4.5	2.99	25.39	26.22	27.12	28.08	-
HPK47859	R1.5	**3.0**	6	2.5	25	70	2.85	**1°**	4.5	3.06	16.09	25.51	26.38	27.31	29.40
HPK47860	R1.5	**3.0**	6	2.5	25	70	2.85	**1.5°**	4.5	3.14	10.30	19.09	25.64	26.54	28.57
HPK47861	R1.5	**3.0**	6	2.5	30	70	2.85	**0.5°**	4.5	2.56	30.39	31.40	32.48	33.64	-
HPK47862	R1.5	**3.0**	6	2.5	30	70	2.85	**1°**	4.5	2.63	16.09	30.51	31.56	32.68	-
HPK47863	R1.5	**3.0**	6	2.5	30	70	2.85	**1.5°**	4.5	2.69	10.30	19.09	30.64	31.73	-
HPK47864	R1.5	**3.0**	6	2.5	30	70	2.85	**2°**	4.5	2.77	8.36	11.79	22.08	30.77	-
HPK47865	R1.5	**3.0**	6	2.5	40	80	2.85	**0.5°**	4.5	1.99	40.39	41.75	43.20	-	-
HPK47866	R1.5	**3.0**	6	2.5	40	80	2.85	**1°**	4.5	2.04	16.09	40.51	41.92	43.43	-
HPK47867	R1.5	**3.0**	6	2.5	40	80	2.85	**1.5°**	4.5	2.10	10.30	19.09	40.64	42.10	-
HPK47868	R1.5	**3.0**	6	2.5	50	90	2.85	**0.5°**	4.5	1.62	50.39	52.09	53.92	-	-
HPK47869	R1.5	**3.0**	6	2.5	50	90	2.85	**1°**	4.5	1.67	16.09	50.51	52.28	-	-
HPK47870	R1.5	**3.0**	6	2.5	50	90	2.85	**1.5°**	4.5	1.72	10.30	19.09	50.64	-	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

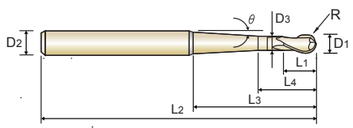
C-COATED SOLID CARBIDE END MILLS

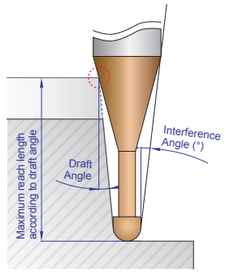
SERIES

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3	θ°	L4		0.5°	1°	1.5°	2°	3°
HPK47040	R2.0	**4.0**	6	3	20	80	3.85	**1°**	5	2.72	16.59	20.51	21.18	21.90	-
HPK47871	R2.0	**4.0**	6	3	30	80	3.85	**1°**	5	1.89	16.59	30.51	31.54	-	-
HPK47872	R2.0	**4.0**	6	3	40	80	3.85	**1°**	5	1.44	16.59	40.51	-	-	-
HPK47873	R2.0	**4.0**	6	3	50	90	3.85	**1°**	5	1.17	16.59	50.51	-	-	-
HPK47874	R2.0	**4.0**	6	3	61.1	110	3.85	**1°**	5	0.96	16.59	-	-	-	-
HPK47897	R2.5	**5.0**	8	10	30	80	4.85	**1°**	13	2.66	30.07	31.03	32.06	33.17	-
HPK47898	R2.5	**5.0**	8	10	40	90	4.85	**1°**	13	2.06	32.09	41.03	42.42	43.92	-
HPK47899	R2.5	**5.0**	8	10	60	110	4.85	**1°**	13	1.42	32.09	61.03	-	-	-
HPK47702	R2.5	**5.0**	8	10	74	150	4.75	**1.5°**	13	1.20	25.41	48.31	-	-	-
HPK47701	R2.5	**5.0**	8	10	90	140	4.85	**1°**	13	0.97	32.09	-	-	-	-
HPK47703	R2.5	**5.0**	8	10	100	150	4.85	**0.5°**	13	0.85	100.64	-	-	-	-
HPK47704	R3.0	**6.0**	8	12	30	80	5.85	**1°**	15	1.91	30.19	31.14	32.15	-	-
HPK47705	R3.0	**6.0**	8	12	40	90	5.85	**1°**	15	1.45	35.59	41.14	-	-	-
HPK47706	R3.0	**6.0**	8	12	45	95	5.85	**1°**	15	1.30	35.59	46.14	-	-	-
HPK47707	R3.0	**6.0**	8	12	50	100	5.85	**1°**	15	1.18	35.59	51.14	-	-	-
HPK47708	R3.0	**6.0**	8	12	120	200	5.85	**0.5°**	15	0.49	-	-	-	-	-
HPK47709	R3.0	**6.0**	10	12	30	80	5.85	**3°**	15	3.60	19.11	23.14	29.84	30.99	33.27
HPK47710	R3.0	**6.0**	10	12	50	100	5.85	**1.5°**	15	2.23	25.29	47.58	51.61	53.43	-
HPK47711	R3.0	**6.0**	10	12	60	110	5.85	**1°**	15	1.85	35.59	61.14	63.24	-	-
HPK47712	R3.0	**6.0**	10	12	70	120	5.85	**1°**	15	1.61	35.59	71.14	73.60	-	-
HPK47713	R3.0	**6.0**	10	12	80	130	5.85	**1°**	15	1.42	35.59	81.14	-	-	-
HPK47714	R3.0	**6.0**	10	12	96	200	5.75	**1.5°**	15	1.23	28.16	53.31	-	-	-
HPK47715	R3.0	**6.0**	10	12	120	200	5.85	**1°**	15	0.97	35.59	-	-	-	-
HPK47070	R3.5	**7.0**	10	14	40	90	6.70	**3°**	17	2.25	23.13	28.03	36.20	40.94	-
HPK47875	R3.5	**7.0**	10	14	45	95	6.70	**1°**	17	1.87	45.09	46.54	48.09	-	-
HPK47876	R3.5	**7.0**	10	14	60	110	6.70	**1.5°**	17	1.47	32.34	60.04	-	-	-

NEXT PAGE ▶

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

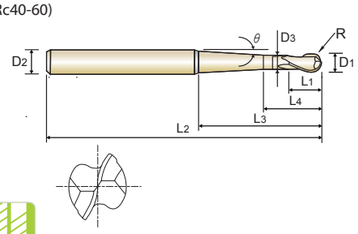
ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

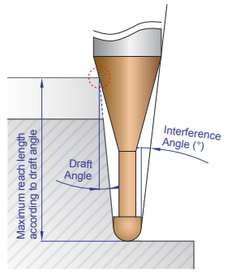
C-COATED SOLID CARBIDE END MILLS

2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

SERIES PLAIN SHANK **HPK47**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.05~R3 R3.5~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3	θ°	L_4		0.5°	1°	1.5°	2°	3°
HPK47080	R4.0	**8.0**	10	14	35	95	7.70	**3°**	17	1.80	23.03	27.78	35.08	-	-
HPK47877	R4.0	**8.0**	10	14	50	110	7.70	**1°**	17	1.19	47.18	51.50	-	-	-
HPK47878	R4.0	**8.0**	10	14	50	110	7.70	**1.5°**	17	1.22	32.09	50.35	-	-	-
HPK47879	R4.0	**8.0**	10	14	55	115	7.70	**1°**	17	1.08	47.18	56.50	-	-	-
HPK47880	R4.0	**8.0**	10	14	60	120	7.70	**1°**	17	1.00	47.18	-	-	-	-
HPK47881	R4.0	**8.0**	10	14	70	130	7.70	**1°**	17	0.86	47.18	-	-	-	-
HPK47882	R4.0	**8.0**	10	14	120	200	7.70	**0.5°**	17	0.49	-	-	-	-	-
HPK47883	R4.0	**8.0**	12	14	80	140	7.70	**1°**	17	1.43	47.18	81.50	-	-	-
HPK47884	R4.0	**8.0**	12	14	98	200	7.70	**1.5°**	17	1.22	32.09	60.17	-	-	-
HPK47885	R4.0	**8.0**	12	14	120	200	7.70	**1°**	17	0.98	47.18	-	-	-	-
HPK47100	R5.0	**10.0**	12	18	35	105	9.70	**3°**	21	1.82	27.63	33.28	35.83	-	-
HPK47886	R5.0	**10.0**	12	18	55	125	9.70	**1.5°**	21	1.12	37.59	55.53	-	-	-
HPK47887	R5.0	**10.0**	12	18	60	130	9.70	**1°**	21	1.01	54.18	61.71	-	-	-
HPK47888	R5.0	**10.0**	12	18	65	135	9.70	**1°**	21	0.93	54.18	-	-	-	-
HPK47889	R5.0	**10.0**	12	18	75	140	9.70	**1°**	21	0.81	54.18	-	-	-	-
HPK47890	R5.0	**10.0**	12	18	86	200	9.70	**1°**	21	0.71	54.18	-	-	-	-
HPK47891	R5.0	**10.0**	12	18	120	200	9.70	**0.5°**	21	0.49	-	-	-	-	-
HPK47892	R5.0	**10.0**	16	18	120	200	9.70	**1.5°**	21	1.47	37.59	70.17	-	-	-
HPK47120	R6.0	**12.0**	16	22	60	140	11.70	**3°**	25	2.08	32.23	38.78	49.69	60.86	-
HPK47893	R6.0	**12.0**	16	22	80	160	11.70	**1.5°**	25	1.49	43.09	80.01	-	-	-
HPK47894	R6.0	**12.0**	16	22	106	200	11.70	**1.5°**	25	1.14	43.09	80.17	-	-	-
HPK47895	R6.0	**12.0**	16	22	120	200	11.70	**1°**	25	0.99	61.18	-	-	-	-

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

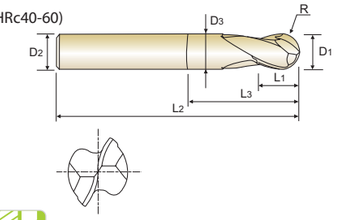
ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

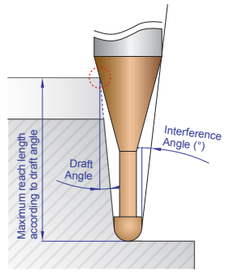
C-COATED SOLID CARBIDE END MILLS

2 FLUTE BALL NOSE with NECK

SERIES PLAIN SHANK **HPK46**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)





CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 104-115

R0.5~R3 R3.5~R12.5

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK46010	R0.5	**1.0**	4	1	2.5	45	0.95	10.38	2.78	2.93	3.10	3.29	3.76
HPK46015	R0.75	**1.5**	4	1.5	3.75	45	1.45	8.36	3.97	4.11	4.26	4.42	4.78
HPK46020	R1.0	**2.0**	6	2	5	45	1.95	9.05	5.26	5.45	5.64	5.86	6.33
HPK46025	R1.25	**2.5**	6	2.5	6.25	45	2.4	7.69	6.65	6.89	7.13	7.40	8.00
HPK46030	R1.5	**3.0**	6	3	7.5	45	2.85	6.40	8.04	8.32	8.62	8.95	9.67
HPK46035	R1.75	**3.5**	6	3.5	8.75	45	3.35	5.22	9.33	9.66	10.01	10.38	11.23
HPK46040	R2.0	**4.0**	6	4	10	45	3.85	4.08	10.63	11.00	11.39	11.82	12.78
HPK46050	R2.5	**5.0**	6	5	12.5	50	4.85	1.96	13.21	13.67	14.16	-	-
HPK46060	R3.0	**6.0**	6	6	15	50	5.85	0.00	-	-	-	-	-
HPK46080	R4.0	**8.0**	8	8	20	60	7.7	0.00	-	-	-	-	-
HPK46100	R5.0	**10.0**	10	10	25	70	9.7	0.00	-	-	-	-	-
HPK46120	R6.0	**12.0**	12	12	30	75	11.7	0.00	-	-	-	-	-
HPK46140	R7.0	**14.0**	14	14	28	110	13.7	0.00	-	-	-	-	-
HPK46160	R8.0	**16.0**	16	16	32	140	15.7	0.00	-	-	-	-	-
HPK46180	R9.0	**18.0**	18	18	36	140	17.7	0.00	-	-	-	-	-
HPK46200	R10.0	**20.0**	20	20	40	160	19.7	0.00	-	-	-	-	-
HPK46250	R12.5	**25.0**	25	25	50	180	24.7	0.00	-	-	-	-	-

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

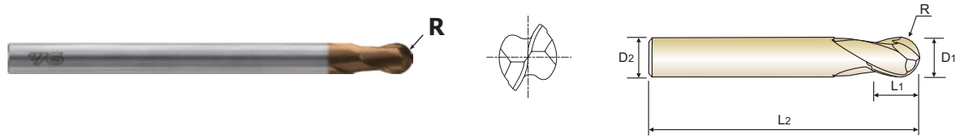
C-COATED SOLID CARBIDE END MILLS

2 FLUTE BALL NOSE

SERIES

PLAIN SHANK **HPK44**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc40-60)



CARBIDE | 2 | 30° | R +0.001 ~-0.005 | R +0.003 ~-0.007 | PLAIN | C Coating

P. 102-103

R0.05~R3 R3.5~R10.0

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D1	D2	L1	L2
HPK44001	R0.05	**0.1**	4	0.1	50
HPK440015	R0.075	**0.15**	4	0.15	50
HPK44002	R0.1	**0.2**	4	0.2	50
HPK44003	R0.15	**0.3**	4	0.3	50
HPK44004	R0.2	**0.4**	4	0.6	50
HPK44902	R0.2	**0.4**	6	0.4	50
HPK44005	R0.25	**0.5**	4	0.8	50
HPK44903	R0.25	**0.5**	6	0.5	50
HPK44006	R0.3	**0.6**	4	0.9	50
HPK44904	R0.3	**0.6**	6	0.6	50
HPK44008	R0.4	**0.8**	4	1.2	50
HPK44905	R0.4	**0.8**	6	0.8	50
HPK44010	R0.5	**1.0**	4	1.5	50
HPK44906	R0.5	**1.0**	6	1	50
HPK44012	R0.6	**1.2**	6	1.2	50
HPK44015	R0.75	**1.5**	4	2.3	50
HPK44907	R0.75	**1.5**	6	1.5	50
HPK44020	R1.0	**2.0**	4	3	60
HPK44908	R1.0	**2.0**	6	2	50
HPK44025	R1.25	**2.5**	6	3.8	60
HPK44030	R1.5	**3.0**	6	5	60
HPK44040	R2.0	**4.0**	4	6	70
HPK44901	R2.0	**4.0**	6	6	70
HPK44050	R2.5	**5.0**	6	8	70
HPK44060	R3.0	**6.0**	6	10	80
HPK44080	R4.0	**8.0**	8	12	100
HPK44100	R5.0	**10.0**	10	15	100
HPK44120	R6.0	**12.0**	12	18	110
HPK44160	R8.0	**16.0**	16	24	140
HPK44200	R10.0	**20.0**	20	30	160

Size	Radius Tolerance (mm)
up to R3	+0.001~-0.005
over R3	+0.003~-0.007

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	◎		○	◎									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎				◎	◎

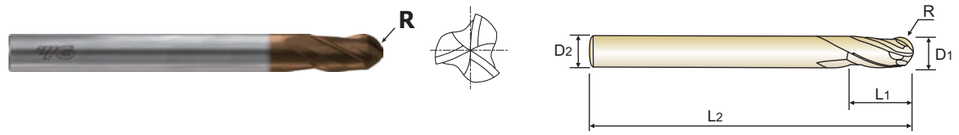
C-COATED SOLID CARBIDE END MILLS

3 FLUTE BALL NOSE

SERIES

PLAIN SHANK **HPK11**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



CARBIDE | 3 | 30° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 116

R1.5~R6 R8~R10

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D1	D2	L1	L2
HPK11030	R1.5	**3.0**	6	5	60
HPK11040	R2.0	**4.0**	6	6	70
HPK11050	R2.5	**5.0**	6	8	70
HPK11060	R3.0	**6.0**	6	10	80
HPK11080	R4.0	**8.0**	8	14	100
HPK11100	R5.0	**10.0**	10	18	100
HPK11120	R6.0	**12.0**	12	22	110
HPK11160	R8.0	**16.0**	16	30	140
HPK11200	R10.0	**20.0**	20	38	160

Size	Radius Tolerance (mm)
up to R3	±0.005
over R3	±0.008

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

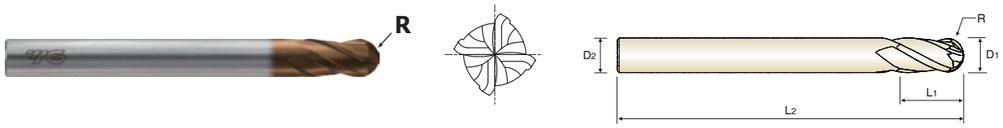
C-COATED SOLID CARBIDE END MILLS

4 FLUTE BALL NOSE - Center Match

SERIES

PLAIN SHANK **HPK12**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



CARBIDE | 4 | 30° | R ±0.005 | R ±0.008 | PLAIN | C Coating | P. 117

R1.5~R6 R8~R10

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D1	D2	L1	L2
HPK12030	R1.5	**3.0**	6	8	60
HPK12040	R2.0	**4.0**	6	8	70
HPK12050	R2.5	**5.0**	6	10	80
HPK12060	R3.0	**6.0**	6	12	90
HPK12080	R4.0	**8.0**	8	14	100
HPK12100	R5.0	**10.0**	10	18	100
HPK12120	R6.0	**12.0**	12	22	110
HPK12160	R8.0	**16.0**	16	30	140
HPK12200	R10.0	**20.0**	20	38	160

Size	Radius Tolerance (mm)
up to R3	±0.005
over R3	±0.008

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R6	0~-0.010	h4
over R6	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

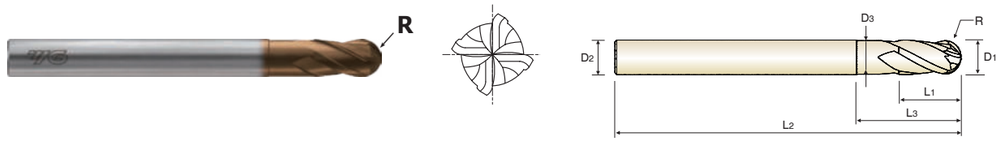
C-COATED SOLID CARBIDE END MILLS

4 FLUTE BALL NOSE with NECK

SERIES

PLAIN SHANK **HPK13**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



CARBIDE | 4 | 30° | R ±0.005 | R ±0.008 | PLAIN | C Coating | P. 117

R0.5~R3 R4~R6

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPK13010	R0.5	**1.0**	6	1.5	3	50	0.95	11.38	3.31	3.49	3.69	3.92	4.47
HPK13015	R0.75	**1.5**	6	2.5	4.5	50	1.45	9.83	4.75	4.91	5.09	5.28	5.71
HPK13020	R1.0	**2.0**	6	3	6	50	1.95	8.39	6.30	6.52	6.75	7.01	7.57
HPK13025	R1.25	**2.5**	6	4	7.5	50	2.40	7.02	7.95	8.22	8.52	8.84	9.56
HPK13030	R1.5	**3.0**	6	4.5	9	70	2.85	5.76	9.59	9.93	10.29	10.67	11.54
HPK13040	R2.0	**4.0**	6	6	12	70	3.85	3.57	12.69	13.14	13.61	14.12	15.27
HPK13050	R2.5	**5.0**	6	7.5	15	80	4.85	1.67	15.79	16.34	16.93	-	-
HPK13060	R3.0	**6.0**	6	9	18	90	5.85	0.00	-	-	-	-	-
HPK13080	R4.0	**8.0**	8	12	24	100	7.70	0.00	-	-	-	-	-
HPK13100	R5.0	**10.0**	10	15	30	100	9.70	0.00	-	-	-	-	-
HPK13120	R6.0	**12.0**	12	18	36	110	11.70	0.00	-	-	-	-	-

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	±0.005	0~-0.010	h4
over R3	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

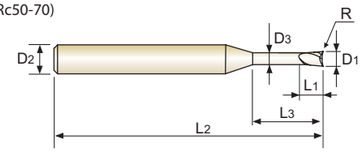
C-COATED SOLID CARBIDE END MILLS

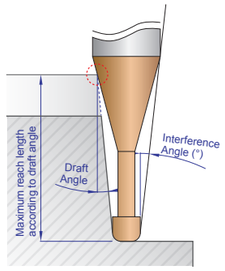
2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK **HPI89**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPI89002	R0.02	**0.2**	4	0.15	0.5	45	0.17	13.99	0.61	0.65	0.68	0.72	0.82
HPI89901	R0.05	**0.2**	4	0.15	0.5	45	0.17	14.04	0.61	0.64	0.68	0.72	0.81
HPI89902	R0.02	**0.2**	4	0.15	1	45	0.17	13.16	1.14	1.20	1.27	1.35	1.54
HPI89903	R0.05	**0.2**	4	0.15	1	45	0.17	13.21	1.14	1.20	1.27	1.34	1.52
HPI89904	R0.02	**0.2**	4	0.15	1.5	45	0.17	12.42	1.67	1.76	1.86	1.97	2.25
HPI89905	R0.05	**0.2**	4	0.15	1.5	45	0.17	12.46	1.66	1.75	1.85	1.96	2.23
HPI89906	R0.02	**0.2**	4	0.15	2	45	0.17	11.76	2.19	2.31	2.45	2.60	2.96
HPI89907	R0.05	**0.2**	4	0.15	2	45	0.17	11.80	2.19	2.31	2.44	2.59	2.95
HPI89003	R0.02	**0.3**	4	0.25	1	45	0.27	13.12	1.14	1.20	1.27	1.35	1.54
HPI89908	R0.05	**0.3**	4	0.25	1	45	0.27	13.16	1.14	1.20	1.27	1.34	1.52
HPI89909	R0.02	**0.3**	4	0.25	1.5	45	0.27	12.36	1.67	1.76	1.86	1.97	2.25
HPI89910	R0.05	**0.3**	4	0.25	1.5	45	0.27	12.41	1.66	1.75	1.85	1.96	2.23
HPI89911	R0.02	**0.3**	4	0.25	2	45	0.27	11.69	2.19	2.31	2.45	2.60	2.96
HPI89912	R0.05	**0.3**	4	0.25	2	45	0.27	11.73	2.19	2.31	2.44	2.59	2.95
HPI89913	R0.02	**0.3**	4	0.25	2.5	45	0.27	11.09	2.72	2.87	3.03	3.22	3.67
HPI89914	R0.05	**0.3**	4	0.25	2.5	45	0.27	11.12	2.72	2.86	3.03	3.21	3.66
HPI89915	R0.02	**0.3**	4	0.25	3	45	0.27	10.54	3.24	3.42	3.62	3.84	4.38
HPI89916	R0.05	**0.3**	4	0.25	3	45	0.27	10.57	3.24	3.42	3.61	3.83	4.37
HPI89004	R0.02	**0.4**	4	0.3	1	45	0.37	13.07	1.14	1.20	1.27	1.35	1.54
HPI89917	R0.05	**0.4**	4	0.3	1	45	0.37	13.12	1.14	1.20	1.27	1.34	1.52
HPI89918	R0.1	**0.4**	4	0.3	1	45	0.37	13.20	1.14	1.19	1.26	1.33	1.50
HPI89919	R0.02	**0.4**	4	0.3	1.5	45	0.37	12.30	1.67	1.76	1.86	1.97	2.25
HPI89920	R0.05	**0.4**	4	0.3	1.5	45	0.37	12.35	1.66	1.75	1.85	1.96	2.23
HPI89921	R0.02	**0.4**	4	0.3	2	45	0.37	11.62	2.19	2.31	2.45	2.60	2.96
HPI89922	R0.05	**0.4**	4	0.3	2	45	0.37	11.66	2.19	2.31	2.44	2.59	2.95
HPI89923	R0.1	**0.4**	4	0.3	2	45	0.37	11.72	2.19	2.30	2.43	2.58	2.92

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
over Ø6	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

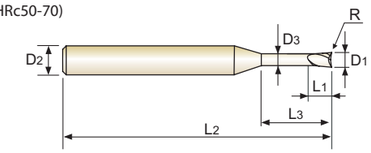
C-COATED SOLID CARBIDE END MILLS

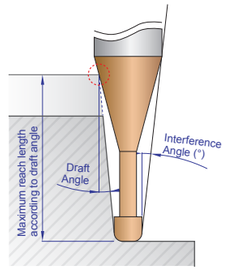
2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK HPI89

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPI89924	R0.02	**0.4**	4	0.3	2.5	45	0.37	11.01	2.72	2.87	3.03	3.22	3.67
HPI89925	R0.05	**0.4**	4	0.3	2.5	45	0.37	11.04	2.72	2.86	3.03	3.21	3.66
HPI89926	R0.02	**0.4**	4	0.3	3	45	0.37	10.46	3.24	3.42	3.62	3.84	4.38
HPI89927	R0.05	**0.4**	4	0.3	3	45	0.37	10.49	3.24	3.42	3.61	3.83	4.37
HPI89928	R0.1	**0.4**	4	0.3	3	45	0.37	10.54	3.24	3.41	3.61	3.82	4.35
HPI89929	R0.02	**0.4**	4	0.3	4	45	0.37	9.50	4.30	4.53	4.79	5.09	5.80
HPI89930	R0.05	**0.4**	4	0.3	4	45	0.37	9.53	4.30	4.53	4.79	5.08	5.79
HPI89931	R0.1	**0.4**	4	0.3	4	45	0.37	9.57	4.29	4.52	4.78	5.07	5.77
HPI89005	R0.02	**0.5**	4	0.4	1	45	0.45	12.96	1.20	1.27	1.34	1.42	1.62
HPI89932	R0.05	**0.5**	4	0.4	1	45	0.45	13.01	1.20	1.26	1.33	1.41	1.60
HPI89933	R0.1	**0.5**	4	0.4	1	45	0.45	13.09	1.20	1.26	1.32	1.40	1.58
HPI89934	R0.02	**0.5**	4	0.4	2	45	0.45	11.50	2.25	2.37	2.51	2.67	3.04
HPI89935	R0.05	**0.5**	4	0.4	2	45	0.45	11.54	2.25	2.37	2.51	2.66	3.03
HPI89936	R0.1	**0.5**	4	0.4	2	45	0.45	11.60	2.25	2.37	2.50	2.65	3.01
HPI89937	R0.02	**0.5**	4	0.4	3	45	0.45	10.33	3.30	3.48	3.69	3.91	4.46
HPI89938	R0.05	**0.5**	4	0.4	3	45	0.45	10.36	3.30	3.48	3.68	3.91	4.45
HPI89939	R0.1	**0.5**	4	0.4	3	45	0.45	10.41	3.30	3.48	3.67	3.89	4.43
HPI89940	R0.02	**0.5**	4	0.4	4	45	0.45	9.37	4.36	4.59	4.86	5.16	5.88
HPI89941	R0.05	**0.5**	4	0.4	4	45	0.45	9.40	4.35	4.59	4.86	5.15	5.87
HPI89942	R0.1	**0.5**	4	0.4	4	45	0.45	9.44	4.35	4.59	4.85	5.14	5.85
HPI89943	R0.02	**0.5**	4	0.4	5	45	0.45	8.58	5.41	5.70	6.04	6.41	7.31
HPI89944	R0.05	**0.5**	4	0.4	5	45	0.45	8.60	5.41	5.70	6.03	6.40	7.30
HPI89945	R0.1	**0.5**	4	0.4	5	45	0.45	8.63	5.40	5.70	6.02	6.39	7.27
HPI89946	R0.02	**0.5**	4	0.4	6	45	0.45	7.90	6.46	6.81	7.21	7.65	8.73
HPI89947	R0.05	**0.5**	4	0.4	6	45	0.45	7.92	6.46	6.81	7.20	7.65	8.72
HPI89948	R0.1	**0.5**	4	0.4	6	45	0.45	7.95	6.46	6.81	7.20	7.63	8.70

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
over Ø6	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK **HPI89**

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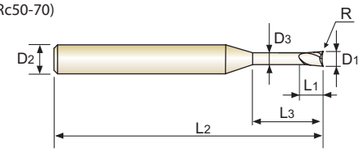
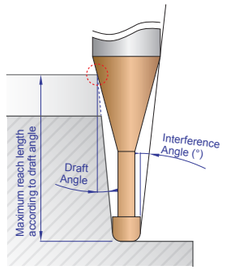




CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI89006	R0.02	**0.6**	4	0.5	2	45	0.55	11.42	2.25	2.37	2.51	2.67	3.04
HPI89949	R0.05	**0.6**	4	0.5	2	45	0.55	11.46	2.25	2.37	2.51	2.66	3.03
HPI89950	R0.1	**0.6**	4	0.5	2	45	0.55	11.52	2.25	2.37	2.50	2.65	3.01
HPI89951	R0.02	**0.6**	4	0.5	4	45	0.55	9.27	4.36	4.59	4.86	5.16	5.88
HPI89952	R0.05	**0.6**	4	0.5	4	45	0.55	9.29	4.35	4.59	4.86	5.15	5.87
HPI89953	R0.1	**0.6**	4	0.5	4	45	0.55	9.34	4.35	4.59	4.85	5.14	5.85
HPI89954	R0.02	**0.6**	4	0.5	6	45	0.55	7.80	6.46	6.81	7.21	7.65	8.73
HPI89955	R0.05	**0.6**	4	0.5	6	45	0.55	7.81	6.46	6.81	7.20	7.65	8.72
HPI89956	R0.1	**0.6**	4	0.5	6	45	0.55	7.85	6.46	6.81	7.20	7.63	8.70
HPI89957	R0.02	**0.6**	4	0.5	8	50	0.55	6.72	8.56	9.03	9.56	10.15	11.41
HPI89958	R0.05	**0.6**	4	0.5	8	50	0.55	6.74	8.56	9.03	9.55	10.14	11.40
HPI89959	R0.1	**0.6**	4	0.5	8	50	0.55	6.76	8.56	9.03	9.54	10.13	11.39
HPI89960	R0.02	**0.6**	4	0.5	10	50	0.55	5.91	10.67	11.25	11.91	12.64	13.74
HPI89961	R0.05	**0.6**	4	0.5	10	50	0.55	5.92	10.67	11.25	11.90	12.63	13.74
HPI89962	R0.1	**0.6**	4	0.5	10	50	0.55	5.94	10.66	11.25	11.89	12.62	13.73
HPI89007	R0.02	**0.7**	4	0.55	2	45	0.65	11.34	2.25	2.37	2.51	2.67	3.04
HPI89963	R0.05	**0.7**	4	0.55	2	45	0.65	11.38	2.25	2.37	2.51	2.66	3.03
HPI89964	R0.1	**0.7**	4	0.55	2	45	0.65	11.44	2.25	2.37	2.50	2.65	3.01
HPI89965	R0.02	**0.7**	4	0.55	4	45	0.65	9.16	4.36	4.59	4.86	5.16	5.88
HPI89966	R0.05	**0.7**	4	0.55	4	45	0.65	9.19	4.35	4.59	4.86	5.15	5.87
HPI89967	R0.1	**0.7**	4	0.55	4	45	0.65	9.23	4.35	4.59	4.85	5.14	5.85
HPI89968	R0.02	**0.7**	4	0.55	6	45	0.65	7.68	6.46	6.81	7.21	7.65	8.73
HPI89969	R0.05	**0.7**	4	0.55	6	45	0.65	7.70	6.46	6.81	7.20	7.65	8.72
HPI89970	R0.1	**0.7**	4	0.55	6	45	0.65	7.73	6.46	6.81	7.20	7.63	8.70
HPI89008	R0.02	**0.8**	4	0.65	2	45	0.75	11.25	2.25	2.37	2.51	2.67	3.04
HPI89971	R0.05	**0.8**	4	0.65	2	45	0.75	11.29	2.25	2.37	2.51	2.66	3.03

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
over Ø6	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P															M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel						Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

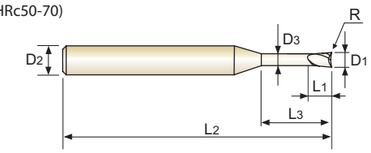
C-COATED SOLID CARBIDE END MILLS

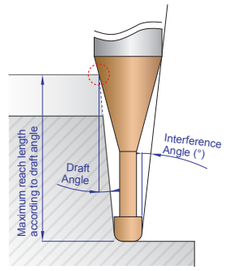
2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK HPI89

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI89972	R0.1	**0.8**	4	0.65	2	45	0.75	11.36	2.25	2.37	2.50	2.65	3.01
HPI89973	R0.2	**0.8**	4	0.65	2	45	0.75	11.50	2.24	2.36	2.48	2.62	2.96
HPI89974	R0.02	**0.8**	4	0.65	4	45	0.75	9.05	4.36	4.59	4.86	5.16	5.88
HPI89975	R0.05	**0.8**	4	0.65	4	45	0.75	9.08	4.35	4.59	4.86	5.15	5.87
HPI89976	R0.1	**0.8**	4	0.65	4	45	0.75	9.12	4.35	4.59	4.85	5.14	5.85
HPI89977	R0.2	**0.8**	4	0.65	4	45	0.75	9.21	4.35	4.57	4.83	5.12	5.81
HPI89978	R0.02	**0.8**	4	0.65	6	45	0.75	7.57	6.46	6.81	7.21	7.65	8.73
HPI89979	R0.05	**0.8**	4	0.65	6	45	0.75	7.59	6.46	6.81	7.20	7.65	8.72
HPI89980	R0.1	**0.8**	4	0.65	6	45	0.75	7.62	6.46	6.81	7.20	7.63	8.70
HPI89981	R0.2	**0.8**	4	0.65	6	45	0.75	7.68	6.45	6.79	7.18	7.61	8.65
HPI89982	R0.02	**0.8**	4	0.65	8	50	0.75	6.50	8.56	9.03	9.56	10.15	11.29
HPI89983	R0.05	**0.8**	4	0.65	8	50	0.75	6.51	8.56	9.03	9.55	10.14	11.29
HPI89984	R0.1	**0.8**	4	0.65	8	50	0.75	6.54	8.56	9.03	9.54	10.13	11.28
HPI89985	R0.2	**0.8**	4	0.65	8	50	0.75	6.58	8.56	9.01	9.53	10.10	11.26
HPI89986	R0.05	**0.8**	4	0.65	12	50	0.75	5.08	12.77	13.47	14.25	15.11	15.96
HPI89987	R0.1	**0.8**	4	0.65	12	50	0.75	5.09	12.77	13.46	14.24	15.11	15.95
HPI89988	R0.2	**0.8**	4	0.65	12	50	0.75	5.12	12.76	13.45	14.22	15.09	15.93
HPI89009	R0.1	**0.9**	4	0.7	4	45	0.85	9.01	4.35	4.59	4.85	5.14	5.85
HPI89989	R0.1	**0.9**	4	0.7	8	50	0.85	6.42	8.56	9.03	9.54	10.13	11.22
HPI89010	R0.1	**1.0**	4	0.8	4	50	0.95	8.89	4.35	4.59	4.85	5.14	5.85
HPI89990	R0.2	**1.0**	4	0.8	4	50	0.95	8.98	4.35	4.57	4.83	5.12	5.81
HPI89991	R0.1	**1.0**	4	0.8	6	50	0.95	7.37	6.46	6.81	7.20	7.63	8.70
HPI89992	R0.2	**1.0**	4	0.8	6	50	0.95	7.44	6.45	6.79	7.18	7.61	8.65
HPI89993	R0.3	**1.0**	4	0.8	6	50	0.95	7.50	6.45	6.78	7.16	7.58	8.61
HPI89994	R0.1	**1.0**	4	0.8	8	50	0.95	6.30	8.56	9.03	9.54	10.13	11.16
HPI89995	R0.2	**1.0**	4	0.8	8	50	0.95	6.34	8.56	9.01	9.53	10.10	11.15

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
over Ø6	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P															M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel						Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

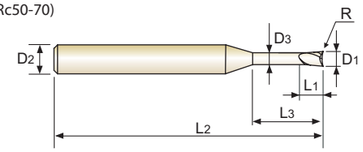
C-COATED SOLID CARBIDE END MILLS

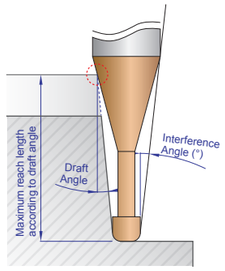
2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK **HPI89**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI89996	R0.1	**1.0**	4	0.8	10	50	0.95	5.50	10.66	11.25	11.89	12.62	13.50
HPI89997	R0.2	**1.0**	4	0.8	10	50	0.95	5.53	10.66	11.23	11.88	12.60	13.48
HPI89998	R0.3	**1.0**	4	0.8	10	50	0.95	5.57	10.65	11.22	11.86	12.57	13.47
HPI89999	R0.1	**1.0**	4	0.8	12	55	0.95	4.87	12.77	13.46	14.24	15.00	15.84
HPI89801	R0.2	**1.0**	4	0.8	12	55	0.95	4.90	12.76	13.45	14.22	14.99	15.82
HPI89802	R0.1	**1.0**	4	0.8	16	60	0.95	3.97	16.98	17.90	18.92	19.42	20.51
HPI89803	R0.2	**1.0**	4	0.8	16	60	0.95	3.99	16.97	17.89	18.92	19.41	20.49
HPI89804	R0.3	**1.0**	4	0.8	16	60	0.95	4.01	16.97	17.88	18.90	19.40	20.47
HPI89805	R0.1	**1.0**	4	0.8	20	60	0.95	3.35	21.19	22.34	23.23	23.85	25.18
HPI89806	R0.2	**1.0**	4	0.8	20	60	0.95	3.37	21.18	22.33	23.23	23.84	25.16
HPI89807	R0.3	**1.0**	4	0.8	20	60	0.95	3.38	21.17	22.32	23.22	23.83	25.15
HPI89015	R0.1	**1.5**	4	1.35	4	50	1.45	8.21	4.23	4.37	4.53	4.69	5.06
HPI89808	R0.2	**1.5**	4	1.35	4	50	1.45	8.31	4.22	4.36	4.51	4.68	5.04
HPI89809	R0.1	**1.5**	4	1.35	8	50	1.45	5.64	8.36	8.65	8.96	9.29	10.04
HPI89810	R0.2	**1.5**	4	1.35	8	50	1.45	5.68	8.36	8.64	8.95	9.28	10.01
HPI89811	R0.3	**1.5**	4	1.35	8	50	1.45	5.73	8.36	8.64	8.94	9.26	9.99
HPI89812	R0.2	**1.5**	4	1.35	12	55	1.45	4.32	12.49	12.92	13.38	13.88	14.99
HPI89813	R0.1	**1.5**	4	1.35	15	55	1.45	3.64	15.60	16.14	16.72	17.34	18.74
HPI89814	R0.2	**1.5**	4	1.35	15	55	1.45	3.66	15.59	16.13	16.71	17.33	18.71
HPI89815	R0.3	**1.5**	4	1.35	15	55	1.45	3.68	15.59	16.12	16.70	17.31	18.69
HPI89816	R0.1	**1.5**	4	1.35	20	60	1.45	2.90	20.77	21.49	22.26	23.09	-
HPI89817	R0.2	**1.5**	4	1.35	20	60	1.45	2.91	20.76	21.48	22.25	23.07	-
HPI89818	R0.3	**1.5**	4	1.35	20	60	1.45	2.93	20.76	21.47	22.24	23.06	-
HPI89020	R0.2	**2.0**	4	1.7	6	50	1.95	5.93	6.29	6.50	6.73	6.98	7.53
HPI89819	R0.5	**2.0**	4	1.7	6	50	1.95	6.12	6.28	6.48	6.70	6.93	7.45
HPI89820	R0.2	**2.0**	4	1.7	8	50	1.95	4.92	8.36	8.64	8.95	9.28	10.01

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
over Ø6	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	○	○	◎

C-COATED SOLID CARBIDE END MILLS

2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK HPI89

- Improvement of tool life by applying new coating
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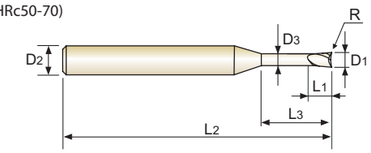

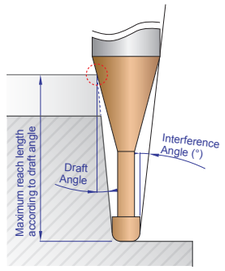

CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI89821	R0.3	**2.0**	4	1.7	8	50	1.95	4.96	8.36	8.64	8.94	9.26	9.99
HPI89822	R0.5	**2.0**	4	1.7	8	50	1.95	5.05	8.35	8.62	8.92	9.23	9.94
HPI89823	R0.8	**2.0**	4	1.7	8	50	1.95	5.18	8.34	8.60	8.88	9.19	9.87
HPI89824	R0.2	**2.0**	4	1.7	12	55	1.95	3.66	12.49	12.92	13.38	13.88	14.99
HPI89825	R0.5	**2.0**	4	1.7	12	55	1.95	3.73	12.48	12.90	13.35	13.83	14.91
HPI89826	R0.2	**2.0**	4	1.7	16	55	1.95	2.92	16.63	17.20	17.81	18.48	-
HPI89827	R0.3	**2.0**	4	1.7	16	55	1.95	2.93	16.62	17.19	17.80	18.46	-
HPI89828	R0.5	**2.0**	4	1.7	16	55	1.95	2.96	16.62	17.18	17.78	18.43	-
HPI89829	R0.8	**2.0**	4	1.7	16	55	1.95	3.01	16.61	17.16	17.75	18.39	19.81
HPI89830	R0.2	**2.0**	4	1.7	20	60	1.95	2.42	20.76	21.48	22.25	23.07	-
HPI89831	R0.3	**2.0**	4	1.7	20	60	1.95	2.43	20.76	21.47	22.24	23.06	-
HPI89832	R0.5	**2.0**	4	1.7	20	60	1.95	2.45	20.75	21.46	22.22	23.03	-
HPI89833	R0.8	**2.0**	4	1.7	20	60	1.95	2.49	20.74	21.44	22.18	22.98	-
HPI89834	R0.2	**2.0**	4	1.7	25	65	1.95	2.00	25.93	26.83	27.79	28.82	-
HPI89835	R0.5	**2.0**	4	1.7	25	65	1.95	2.02	25.92	26.81	27.76	28.78	-
HPI89836	R0.2	**2.0**	4	1.7	30	70	1.95	1.70	31.10	32.18	33.33	-	-
HPI89837	R0.5	**2.0**	4	1.7	30	70	1.95	1.72	31.09	32.16	33.30	-	-
HPI89030	R0.2	**3.0**	6	2.5	8	55	2.85	6.26	8.55	8.84	9.16	9.49	10.24
HPI89838	R0.3	**3.0**	6	2.5	8	55	2.85	6.30	8.55	8.84	9.14	9.48	10.22
HPI89839	R0.5	**3.0**	6	2.5	8	55	2.85	6.40	8.54	8.82	9.12	9.45	10.17
HPI89840	R0.2	**3.0**	6	2.5	12	60	2.85	4.85	12.69	13.12	13.59	14.09	15.22
HPI89841	R0.5	**3.0**	6	2.5	12	60	2.85	4.93	12.68	13.10	13.56	14.05	15.14
HPI89842	R0.2	**3.0**	6	2.5	16	60	2.85	3.96	16.82	17.40	18.02	18.69	20.19
HPI89843	R0.3	**3.0**	6	2.5	16	60	2.85	3.98	16.82	17.39	18.01	18.67	20.17
HPI89844	R0.5	**3.0**	6	2.5	16	60	2.85	4.01	16.81	17.38	17.99	18.64	20.12
HPI89845	R0.2	**3.0**	6	2.5	20	65	2.85	3.34	20.96	21.68	22.45	23.29	25.16

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
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◎ : Excellent ○ : Good

ISO	P													M		K					
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Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
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HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	○	○	◎

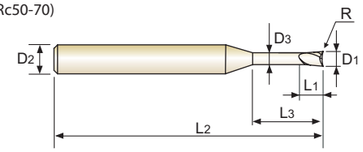
C-COATED SOLID CARBIDE END MILLS

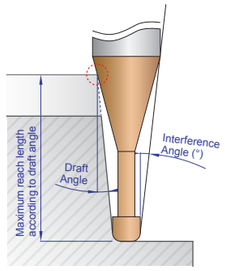
2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK **HPI89**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

✻ NEW SIZE Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI89846	R0.3	**3.0**	6	2.5	20	65	2.85	3.36	20.95	21.67	22.44	23.27	25.14
HPI89847	R0.5	**3.0**	6	2.5	20	65	2.85	3.38	20.95	21.66	22.42	23.24	25.09
HPI89848	R0.2	**3.0**	6	2.5	30	75	2.85	2.41	31.29	32.38	33.54	34.79	-
HPI89849	R0.3	**3.0**	6	2.5	30	75	2.85	2.41	31.29	32.37	33.53	34.77	-
HPI89850	R0.5	**3.0**	6	2.5	30	75	2.85	2.43	31.28	32.36	33.51	34.74	-
HPI89851	R0.2	**3.0**	6	2.5	35	80	2.85	2.11	36.46	37.72	39.08	40.54	-
HPI89852	R0.5	**3.0**	6	2.5	35	80	2.85	2.13	36.45	37.70	39.05	40.49	-
✻ **HPI89040**	R0.1	**4.0**	6	3.5	8	55	3.85	4.76	8.56	8.86	9.18	9.52	10.29
✻ **HPI89859**	R0.2	**4.0**	6	3.5	8	55	3.85	4.76	8.56	8.86	9.18	9.52	10.29
✻ **HPI89866**	R0.3	**4.0**	6	3.5	8	55	3.85	4.76	8.56	8.86	9.18	9.52	10.29
✻ **HPI89853**	R0.1	**4.0**	6	3.5	12	60	3.85	3.57	12.69	13.14	13.61	14.12	15.27
✻ **HPI89860**	R0.2	**4.0**	6	3.5	12	60	3.85	3.57	12.69	13.14	13.61	14.12	15.27
✻ **HPI89867**	R0.3	**4.0**	6	3.5	12	60	3.85	3.57	12.69	13.14	13.61	14.12	15.27
✻ **HPI89873**	R0.5	**4.0**	6	3.5	12	60	3.85	3.57	12.69	13.14	13.61	14.12	15.27
✻ **HPI89879**	R1.0	**4.0**	6	3.5	12	60	3.85	3.57	12.69	13.14	13.61	14.12	15.27
✻ **HPI89854**	R0.1	**4.0**	6	3.5	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
✻ **HPI89861**	R0.2	**4.0**	6	3.5	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
✻ **HPI89868**	R0.3	**4.0**	6	3.5	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
✻ **HPI89874**	R0.5	**4.0**	6	3.5	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
✻ **HPI89880**	R1.0	**4.0**	6	3.5	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
✻ **HPI89855**	R0.1	**4.0**	6	3.5	20	65	3.85	2.38	20.96	21.69	22.48	23.32	-
✻ **HPI89862**	R0.2	**4.0**	6	3.5	20	65	3.85	2.38	20.96	21.69	22.48	23.32	-
✻ **HPI89869**	R0.3	**4.0**	6	3.5	20	65	3.85	2.38	20.96	21.69	22.48	23.32	-
✻ **HPI89875**	R0.5	**4.0**	6	3.5	20	65	3.85	2.38	20.96	21.69	22.48	23.32	-
✻ **HPI89881**	R1.0	**4.0**	6	3.5	20	65	3.85	2.38	20.96	21.69	22.48	23.32	-
✻ **HPI89856**	R0.1	**4.0**	6	3.5	30	75	3.85	1.68	31.30	32.39	33.56	-	-

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
over Ø6	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P															M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20		
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21		
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230		
Recommended					○			○	○		○	○											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

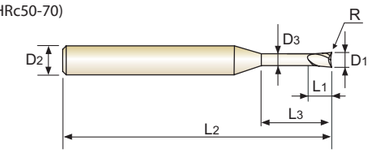
C-COATED SOLID CARBIDE END MILLS

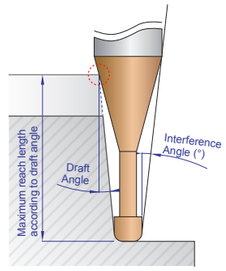
2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK **HPI89**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

✻ NEW SIZE Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
✻ **HPI89863**	R0.2	**4.0**	6	3.5	30	75	3.85	1.68	31.30	32.39	33.56	-	-
✻ **HPI89870**	R0.3	**4.0**	6	3.5	30	75	3.85	1.68	31.30	32.39	33.56	-	-
✻ **HPI89876**	R0.5	**4.0**	6	3.5	30	75	3.85	1.68	31.30	32.39	33.56	-	-
✻ **HPI89882**	R1.0	**4.0**	6	3.5	30	75	3.85	1.68	31.30	32.39	33.56	-	-
✻ **HPI89857**	R0.1	**4.0**	6	3.5	35	80	3.85	1.47	36.47	37.74	-	-	-
✻ **HPI89864**	R0.2	**4.0**	6	3.5	35	80	3.85	1.47	36.47	37.74	-	-	-
✻ **HPI89871**	R0.3	**4.0**	6	3.5	35	80	3.85	1.47	36.47	37.74	-	-	-
✻ **HPI89877**	R0.5	**4.0**	6	3.5	35	80	3.85	1.47	36.47	37.74	-	-	-
✻ **HPI89883**	R1.0	**4.0**	6	3.5	35	80	3.85	1.47	36.47	37.74	-	-	-
✻ **HPI89858**	R0.1	**4.0**	6	3.5	45	90	3.85	1.17	46.80	48.44	-	-	-
✻ **HPI89865**	R0.2	**4.0**	6	3.5	45	90	3.85	1.17	46.80	48.44	-	-	-
✻ **HPI89872**	R0.3	**4.0**	6	3.5	45	90	3.85	1.17	46.80	48.44	-	-	-
✻ **HPI89878**	R0.5	**4.0**	6	3.5	45	90	3.85	1.17	46.80	48.44	-	-	-
✻ **HPI89884**	R1.0	**4.0**	6	3.5	45	90	3.85	1.17	46.80	48.44	-	-	-
✻ **HPI89050**	R0.1	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
✻ **HPI89886**	R0.2	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
✻ **HPI89888**	R0.3	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
✻ **HPI89890**	R0.5	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
✻ **HPI89892**	R1.0	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
✻ **HPI89885**	R0.1	**5.0**	6	4	40	85	4.85	0.68	41.64	-	-	-	-
✻ **HPI89887**	R0.2	**5.0**	6	4	40	85	4.85	0.68	41.64	-	-	-	-
✻ **HPI89889**	R0.3	**5.0**	6	4	40	85	4.85	0.68	41.64	-	-	-	-
✻ **HPI89891**	R0.5	**5.0**	6	4	40	85	4.85	0.68	41.64	-	-	-	-
✻ **HPI89893**	R1.0	**5.0**	6	4	40	85	4.85	0.68	41.64	-	-	-	-
✻ **HPI89060**	R0.1	**6.0**	6	5	12	50	5.85	0.00	-	-	-	-	-
✻ **HPI89898**	R0.2	**6.0**	6	5	12	50	5.85	0.00	-	-	-	-	-

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
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◎ : Excellent ○ : Good

ISO	P															M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20		
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21		
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230		
Recommended					○			○	○		○	○											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

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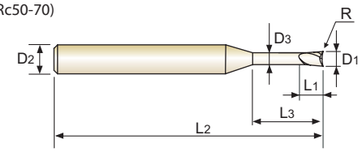

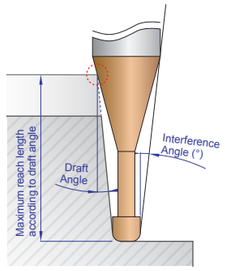

CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

✻ NEW SIZE Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
✻ **HPI89704**	R0.3	**6.0**	6	5	12	50	5.85	0.00	-	-	-	-	-
✻ **HPI89894**	R0.1	**6.0**	6	5	18	60	5.85	0.00	-	-	-	-	-
✻ **HPI89899**	R0.2	**6.0**	6	5	18	60	5.85	0.00	-	-	-	-	-
✻ **HPI89705**	R0.3	**6.0**	6	5	18	60	5.85	0.00	-	-	-	-	-
✻ **HPI89709**	R0.5	**6.0**	6	5	18	60	5.85	0.00	-	-	-	-	-
✻ **HPI89713**	R1.0	**6.0**	6	5	18	60	5.85	0.00	-	-	-	-	-
✻ **HPI89895**	R0.1	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
✻ **HPI89701**	R0.2	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
✻ **HPI89706**	R0.3	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
✻ **HPI89710**	R0.5	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
✻ **HPI89714**	R1.0	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
✻ **HPI89896**	R0.1	**6.0**	6	5	35	80	5.85	0.00	-	-	-	-	-
✻ **HPI89702**	R0.2	**6.0**	6	5	35	80	5.85	0.00	-	-	-	-	-
✻ **HPI89707**	R0.3	**6.0**	6	5	35	80	5.85	0.00	-	-	-	-	-
✻ **HPI89711**	R0.5	**6.0**	6	5	35	80	5.85	0.00	-	-	-	-	-
✻ **HPI89715**	R1.0	**6.0**	6	5	35	80	5.85	0.00	-	-	-	-	-
✻ **HPI89897**	R0.1	**6.0**	6	5	55	100	5.85	0.00	-	-	-	-	-
✻ **HPI89703**	R0.2	**6.0**	6	5	55	100	5.85	0.00	-	-	-	-	-
✻ **HPI89708**	R0.3	**6.0**	6	5	55	100	5.85	0.00	-	-	-	-	-
✻ **HPI89712**	R0.5	**6.0**	6	5	55	100	5.85	0.00	-	-	-	-	-
✻ **HPI89716**	R1.0	**6.0**	6	5	55	100	5.85	0.00	-	-	-	-	-
✻ **HPI89080**	R0.3	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
✻ **HPI89717**	R0.5	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
✻ **HPI89718**	R1.0	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
✻ **HPI89719**	R1.5	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
✻ **HPI89720**	R2.0	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
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NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P												M			K					
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VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
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HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
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HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

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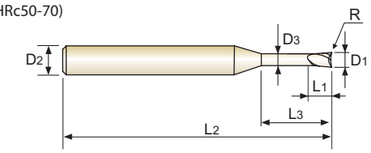
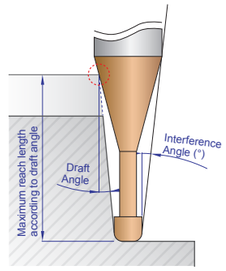




CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.2~D6 D8~D12

✻ NEW SIZE Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
✻ **HPI89100**	R0.3	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
✻ **HPI89721**	R0.5	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
✻ **HPI89722**	R1.0	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
✻ **HPI89723**	R1.5	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
✻ **HPI89724**	R2.0	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
✻ **HPI89120**	R0.5	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-
✻ **HPI89725**	R1.0	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-
✻ **HPI89726**	R1.5	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-
✻ **HPI89727**	R2.0	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-

Size	Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	±0.005	0~-0.010	h4
over Ø6	±0.008		* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

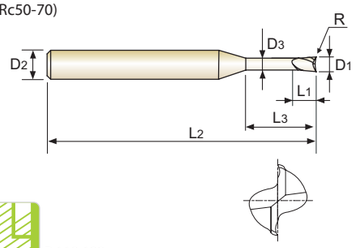
ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

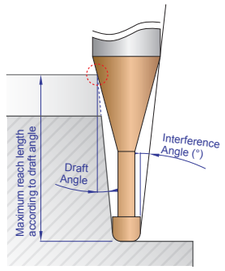
C-COATED SOLID CARBIDE END MILLS

SERIES

2 FLUTE STUB LENGTH CORNER RADIUS with EXTENDED NECK PLAIN SHANK HPK15

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.3~D6 D8~D20

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK15003	R0.02	**0.3**	3	0.45	1	40	0.27	12.49	1.14	1.20	1.27	1.35	1.54
HPK15004	R0.05	**0.4**	3	0.6	1	40	0.37	12.41	1.14	1.20	1.27	1.35	1.54
HPK15005	R0.05	**0.5**	3	0.7	1	40	0.45	12.25	1.20	1.27	1.34	1.42	1.62
HPK15901	R0.05	**0.5**	4	1	1.5	40	0.45	12.16	1.73	1.82	1.93	2.05	2.34
HPK15006	R0.05	**0.6**	3	0.9	2	40	0.55	10.35	2.25	2.38	2.52	2.67	3.05
HPK15902	R0.05	**0.6**	4	1.2	2	40	0.55	11.39	2.25	2.38	2.52	2.67	3.05
HPK15007	R0.05	**0.7**	4	1.4	2	40	0.65	11.31	2.25	2.38	2.52	2.67	3.05
HPK15008	R0.05	**0.8**	3	1.2	2	40	0.75	10.06	2.25	2.38	2.52	2.67	3.05
HPK15903	R0.05	**0.8**	4	1.6	2	40	0.75	11.22	2.25	2.38	2.52	2.67	3.05
HPK15009	R0.05	**0.9**	4	2	3	40	0.85	9.90	3.31	3.49	3.69	3.92	4.47
HPK15010	R0.1	**1.0**	3	1.5	3	40	0.95	8.34	3.31	3.49	3.69	3.92	4.47
HPK15904	R0.1	**1.0**	4	1.5	3	40	0.95	9.79	3.31	3.49	3.69	3.92	4.47
HPK15905	R0.1	**1.0**	6	1.5	3	40	0.95	11.38	3.31	3.49	3.69	3.92	4.47
HPK15015	R0.1	**1.5**	3	2.2	4	40	1.45	6.21	4.23	4.38	4.54	4.71	5.09
HPK15906	R0.1	**1.5**	6	2.2	4	40	1.45	10.21	4.23	4.38	4.54	4.71	5.09
HPK15020	R0.1	**2.0**	3	3	6	40	1.95	3.59	6.30	6.52	6.75	7.01	7.57
HPK15907	R0.1	**2.0**	4	3	6	40	1.95	5.81	6.30	6.52	6.75	7.01	7.57
HPK15908	R0.1	**2.0**	6	3	6	40	1.95	8.39	6.30	6.52	6.75	7.01	7.57
HPK15025	R0.1	**2.5**	3	4	6	40	2.40	2.01	6.39	6.62	6.86	7.11	-
HPK15909	R0.1	**2.5**	6	4	6	40	2.40	7.83	6.39	6.62	6.86	7.11	7.69
HPK15030	R0.1	**3.0**	6	4	7	45	2.85	6.64	7.52	7.79	8.07	8.37	9.05
HPK15035	R0.1	**3.5**	6	5	9	45	3.35	5.12	9.59	9.93	10.29	10.67	11.54
HPK15040	R0.1	**4.0**	6	5	9	45	3.85	4.39	9.59	9.93	10.29	10.67	11.54
HPK15045	R0.1	**4.5**	6	6	10	45	4.35	3.28	10.63	11.00	11.39	11.82	12.78
HPK15050	R0.2	**5.0**	6	6	11	50	4.85	2.18	11.66	12.07	12.50	12.97	-

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)
up to Ø6	±0.005
over Ø6	±0.008

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø12	0~-0.010	h4
over Ø12	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

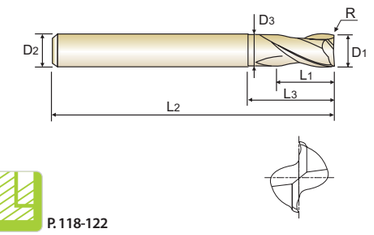
ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

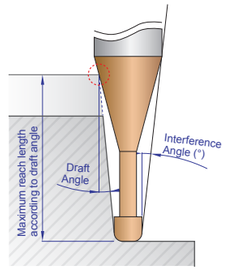
C-COATED SOLID CARBIDE END MILLS

SERIES

2 FLUTE STUB LENGTH CORNER RADIUS with EXTENDED NECK PLAIN SHANK HPK15

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | R ±0.005 | R ±0.008 | PLAIN | C Coating

P. 118-122

D0.3~D6 D8~D20

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK15060	R0.2	**6.0**	6	7	14	50	5.85	0.00	-	-	-	-	-
HPK15080	R0.2	**8.0**	8	9	18	60	7.70	0.00	-	-	-	-	-
HPK15100	R0.2	**10.0**	10	12	25	75	9.70	0.00	-	-	-	-	-
HPK15120	R0.3	**12.0**	12	15	30	75	11.70	0.00	-	-	-	-	-
HPK15160	R0.3	**16.0**	16	18	38	90	15.70	0.00	-	-	-	-	-
HPK15200	R0.3	**20.0**	20	24	45	100	19.70	0.00	-	-	-	-	-

Size	Corner Radius Tolerance (mm)
up to Ø6	±0.005
over Ø6	±0.008

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø12	0~-0.010	h4
over Ø12	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P													M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

2 FLUTE MINIATURE CORNER RADIUS

SERIES

PLAIN SHANK **HPK14**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)

CARBIDE | 2 | 35° | R ±0.005 | PLAIN | C Coating

P. 123

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D_1	D_2	L_1	L_2
HPK14003	R0.02	**0.3**	6	0.45	50
HPK14004	R0.05	**0.4**	6	0.6	50
HPK14005	R0.05	**0.5**	6	0.7	50
HPK14006	R0.05	**0.6**	6	0.9	50
HPK14008	R0.05	**0.8**	6	1.2	50
HPK14010	R0.1	**1.0**	6	1.5	50
HPK14012	R0.1	**1.2**	6	1.8	50
HPK14015	R0.15	**1.5**	6	2.2	50
HPK14020	R0.15	**2.0**	6	2.2	50

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

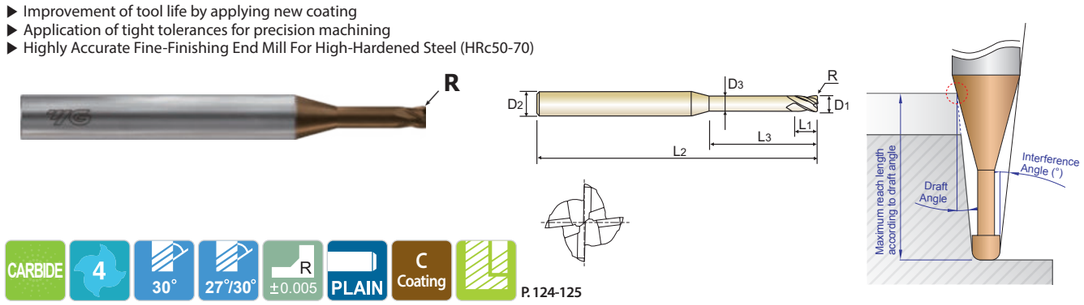
C-COATED SOLID CARBIDE END MILLS

4 FLUTE CORNER RADIUS for RIB PROCESSING with NECK

SERIES

PLAIN SHANK **HPK16**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



CARBIDE | 4 | 30° (up to Ø3) / 27°/30° (Over Ø3) | R ±0.005 | PLAIN | C Coating

P. 124-125

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK16005	R0.02	**0.5**	4	0.4	1	50	0.45	12.93	1.20	1.27	1.34	1.42	1.62
HPK16903	R0.05	**0.5**	4	0.4	1	50	0.45	12.93	1.20	1.27	1.34	1.42	1.62
HPK16906	R0.1	**0.5**	4	0.4	1	50	0.45	12.93	1.20	1.27	1.34	1.42	1.62
HPK16901	R0.02	**0.5**	4	0.4	3	50	0.45	10.31	3.31	3.49	3.69	3.92	4.47
HPK16904	R0.05	**0.5**	4	0.4	3	50	0.45	10.31	3.31	3.49	3.69	3.92	4.47
HPK16907	R0.1	**0.5**	4	0.4	3	50	0.45	10.31	3.31	3.49	3.69	3.92	4.47
HPK16902	R0.02	**0.5**	4	0.4	6	50	0.45	7.89	6.46	6.82	7.21	7.66	8.74
HPK16905	R0.05	**0.5**	4	0.4	6	50	0.45	7.89	6.46	6.82	7.21	7.66	8.74
HPK16908	R0.1	**0.5**	4	0.4	6	50	0.45	7.89	6.46	6.82	7.21	7.66	8.74
HPK16006	R0.02	**0.6**	4	0.5	2	50	0.55	11.39	2.25	2.38	2.52	2.67	3.05
HPK16911	R0.05	**0.6**	4	0.5	2	50	0.55	11.39	2.25	2.38	2.52	2.67	3.05
HPK16914	R0.1	**0.6**	4	0.5	2	50	0.55	11.39	2.25	2.38	2.52	2.67	3.05
HPK16909	R0.02	**0.6**	4	0.5	6	50	0.55	7.78	6.46	6.82	7.21	7.66	8.74
HPK16912	R0.05	**0.6**	4	0.5	6	50	0.55	7.78	6.46	6.82	7.21	7.66	8.74
HPK16915	R0.1	**0.6**	4	0.5	6	50	0.55	7.78	6.46	6.82	7.21	7.66	8.74
HPK16910	R0.02	**0.6**	4	0.5	10	50	0.55	5.90	10.67	11.26	11.91	12.65	13.75
HPK16913	R0.05	**0.6**	4	0.5	10	50	0.55	5.90	10.67	11.26	11.91	12.65	13.75
HPK16916	R0.1	**0.6**	4	0.5	10	50	0.55	5.90	10.67	11.26	11.91	12.65	13.75
HPK16007	R0.02	**0.7**	4	0.55	2	50	0.65	11.31	2.25	2.38	2.52	2.67	3.05
HPK16918	R0.05	**0.7**	4	0.55	2	50	0.65	11.31	2.25	2.38	2.52	2.67	3.05
HPK16920	R0.1	**0.7**	4	0.55	2	50	0.65	11.31	2.25	2.38	2.52	2.67	3.05
HPK16917	R0.02	**0.7**	4	0.55	6	50	0.65	7.67	6.46	6.82	7.21	7.66	8.74
HPK16919	R0.05	**0.7**	4	0.55	6	50	0.65	7.67	6.46	6.82	7.21	7.66	8.74
HPK16921	R0.1	**0.7**	4	0.55	6	50	0.65	7.67	6.46	6.82	7.21	7.66	8.74
HPK16008	R0.02	**0.8**	4	0.65	2	50	0.75	11.22	2.25	2.38	2.52	2.67	3.05
HPK16923	R0.05	**0.8**	4	0.65	2	50	0.75	11.22	2.25	2.38	2.52	2.67	3.05

NEXT PAGE ▶

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

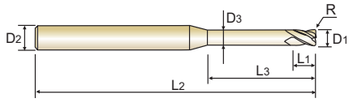
C-COATED SOLID CARBIDE END MILLS

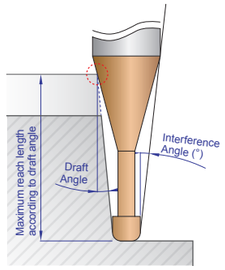
SERIES

4 FLUTE CORNER RADIUS for RIB PROCESSING with NECK

PLAIN SHANK **HPK16**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 30° | 27°/30° | R ±0.005 | PLAIN | C Coating | P. 124-125

up to Ø3 Over Ø3

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK16926	R0.1	**0.8**	4	0.65	2	50	0.75	11.22	2.25	2.38	2.52	2.67	3.05
HPK16929	R0.2	**0.8**	4	0.65	2	50	0.75	11.22	2.25	2.38	2.52	2.67	3.05
HPK16922	R0.02	**0.8**	4	0.65	6	50	0.75	7.55	6.46	6.82	7.21	7.66	8.74
HPK16924	R0.05	**0.8**	4	0.65	6	50	0.75	7.55	6.46	6.82	7.21	7.66	8.74
HPK16927	R0.1	**0.8**	4	0.65	6	50	0.75	7.55	6.46	6.82	7.21	7.66	8.74
HPK16930	R0.2	**0.8**	4	0.65	6	50	0.75	7.55	6.46	6.82	7.21	7.66	8.74
HPK16925	R0.05	**0.8**	4	0.65	12	50	0.75	5.06	12.77	13.48	14.26	15.12	15.97
HPK16928	R0.1	**0.8**	4	0.65	12	50	0.75	5.06	12.77	13.48	14.26	15.12	15.97
HPK16931	R0.2	**0.8**	4	0.65	12	50	0.75	5.06	12.77	13.48	14.26	15.12	15.97
HPK16010	R0.05	**1.0**	4	0.8	2	50	0.95	11.04	2.25	2.38	2.52	2.67	3.05
HPK16937	R0.1	**1.0**	4	0.8	2	50	0.95	11.04	2.25	2.38	2.52	2.67	3.05
HPK16943	R0.2	**1.0**	4	0.8	2	50	0.95	11.04	2.25	2.38	2.52	2.67	3.05
HPK16932	R0.05	**1.0**	4	0.8	3	50	0.95	9.79	3.31	3.49	3.69	3.92	4.47
HPK16938	R0.1	**1.0**	4	0.8	3	50	0.95	9.79	3.31	3.49	3.69	3.92	4.47
HPK16944	R0.2	**1.0**	4	0.8	3	50	0.95	9.79	3.31	3.49	3.69	3.92	4.47
HPK16933	R0.05	**1.0**	4	0.8	4	50	0.95	8.80	4.36	4.60	4.86	5.16	5.89
HPK16939	R0.1	**1.0**	4	0.8	4	50	0.95	8.80	4.36	4.60	4.86	5.16	5.89
HPK16945	R0.2	**1.0**	4	0.8	4	50	0.95	8.80	4.36	4.60	4.86	5.16	5.89
HPK16934	R0.05	**1.0**	4	0.8	5	50	0.95	7.99	5.41	5.71	6.04	6.41	7.32
HPK16940	R0.1	**1.0**	4	0.8	5	50	0.95	7.99	5.41	5.71	6.04	6.41	7.32
HPK16946	R0.2	**1.0**	4	0.8	5	50	0.95	7.99	5.41	5.71	6.04	6.41	7.32
HPK16935	R0.05	**1.0**	4	0.8	6	50	0.95	7.31	6.46	6.82	7.21	7.66	8.74
HPK16941	R0.1	**1.0**	4	0.8	6	50	0.95	7.31	6.46	6.82	7.21	7.66	8.74
HPK16947	R0.2	**1.0**	4	0.8	6	50	0.95	7.31	6.46	6.82	7.21	7.66	8.74
HPK16936	R0.05	**1.0**	4	0.8	8	50	0.95	6.25	8.57	9.04	9.56	10.15	11.18
HPK16942	R0.1	**1.0**	4	0.8	8	50	0.95	6.25	8.57	9.04	9.56	10.15	11.18

NEXT PAGE ▶

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

◎ : Excellent ○ : Good

ISO	P															M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel						Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20		
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21		
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230		
Recommended					○			○	○		○	○											

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel				Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

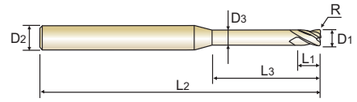
C-COATED SOLID CARBIDE END MILLS

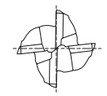
SERIES

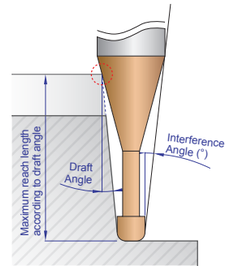
4 FLUTE CORNER RADIUS for RIB PROCESSING with NECK

PLAIN SHANK HPK16

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)







CARBIDE | 4 | 30° | 27°/30° | R ±0.005 | PLAIN | C Coating | P. 124-125

up to Ø3 Over Ø3

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK16948	R0.2	**1.0**	4	0.8	8	50	0.95	6.25	8.57	9.04	9.56	10.15	11.18
HPK16015	R0.1	**1.5**	4	1.2	3	50	1.45	9.15	3.20	3.31	3.43	3.56	3.85
HPK16952	R0.2	**1.5**	4	1.2	3	50	1.45	9.15	3.20	3.31	3.43	3.56	3.85
HPK16955	R0.3	**1.5**	4	1.2	3	50	1.45	9.15	3.20	3.31	3.43	3.56	3.85
HPK16949	R0.1	**1.5**	4	1.2	4	50	1.45	8.12	4.23	4.38	4.54	4.71	5.09
HPK16950	R0.1	**1.5**	4	1.2	6	50	1.45	6.63	6.30	6.52	6.75	7.01	7.57
HPK16953	R0.2	**1.5**	4	1.2	6	50	1.45	6.63	6.30	6.52	6.75	7.01	7.57
HPK16956	R0.3	**1.5**	4	1.2	6	50	1.45	6.63	6.30	6.52	6.75	7.01	7.57
HPK16951	R0.1	**1.5**	4	1.2	12	50	1.45	4.27	12.50	12.94	13.40	13.91	15.03
HPK16954	R0.2	**1.5**	4	1.2	12	50	1.45	4.27	12.50	12.94	13.40	13.91	15.03
HPK16957	R0.3	**1.5**	4	1.2	12	50	1.45	4.27	12.50	12.94	13.40	13.91	15.03
HPK16020	R0.1	**2.0**	4	1.6	4	50	1.95	7.28	4.23	4.38	4.54	4.71	5.09
HPK16961	R0.2	**2.0**	4	1.6	4	50	1.95	7.28	4.23	4.38	4.54	4.71	5.09
HPK16965	R0.3	**2.0**	4	1.6	4	50	1.95	7.28	4.23	4.38	4.54	4.71	5.09
HPK16968	R0.5	**2.0**	4	1.6	4	50	1.95	7.28	4.23	4.38	4.54	4.71	5.09
HPK16958	R0.1	**2.0**	4	1.6	6	50	1.95	5.81	6.30	6.52	6.75	7.01	7.57
HPK16962	R0.2	**2.0**	4	1.6	6	50	1.95	5.81	6.30	6.52	6.75	7.01	7.57
HPK16959	R0.1	**2.0**	4	1.6	8	50	1.95	4.83	8.37	8.66	8.97	9.31	10.06
HPK16963	R0.2	**2.0**	4	1.6	8	50	1.95	4.83	8.37	8.66	8.97	9.31	10.06
HPK16966	R0.3	**2.0**	4	1.6	8	50	1.95	4.83	8.37	8.66	8.97	9.31	10.06
HPK16969	R0.5	**2.0**	4	1.6	8	50	1.95	4.83	8.37	8.66	8.97	9.31	10.06
HPK16960	R0.1	**2.0**	4	1.6	12	50	1.95	3.62	12.50	12.94	13.40	13.91	15.03
HPK16964	R0.2	**2.0**	4	1.6	12	50	1.95	3.62	12.50	12.94	13.40	13.91	15.03
HPK16967	R0.3	**2.0**	4	1.6	12	50	1.95	3.62	12.50	12.94	13.40	13.91	15.03
HPK16970	R0.5	**2.0**	4	1.6	12	50	1.95	3.62	12.50	12.94	13.40	13.91	15.03
HPK16030	R0.2	**3.0**	6	2.5	8	55	2.85	6.17	8.56	8.86	9.18	9.52	10.29

NEXT PAGE ▶

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

◎ : Excellent ○ : Good

ISO	P															M		K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel						Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20		
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21		
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230		
Recommended					○			○	○		○	○											

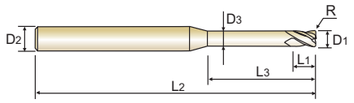
ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel				Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

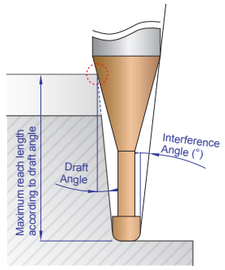
C-COATED SOLID CARBIDE END MILLS

4 FLUTE CORNER RADIUS for RIB PROCESSING with NECK

SERIES **HPK16** PLAIN SHANK

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 30° | 27°/30° | R ±0.005 | PLAIN | C Coating | P. 124-125

up to Ø3 Over Ø3

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK16974	R0.3	**3.0**	6	2.5	8	55	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPK16977	R0.5	**3.0**	6	2.5	8	55	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPK16971	R0.2	**3.0**	6	2.5	12	60	2.85	4.80	12.69	13.14	13.61	14.12	15.27
HPK16972	R0.2	**3.0**	6	2.5	16	60	2.85	3.92	16.83	17.41	18.04	18.72	20.24
HPK16975	R0.3	**3.0**	6	2.5	16	60	2.85	3.92	16.83	17.41	18.04	18.72	20.24
HPK16978	R0.5	**3.0**	6	2.5	16	60	2.85	3.92	16.83	17.41	18.04	18.72	20.24
HPK16973	R0.2	**3.0**	6	2.5	20	65	2.85	3.32	20.96	21.69	22.48	23.32	25.21
HPK16976	R0.3	**3.0**	6	2.5	20	65	2.85	3.32	20.96	21.69	22.48	23.32	25.21
HPK16979	R0.5	**3.0**	6	2.5	20	65	2.85	3.32	20.96	21.69	22.48	23.32	25.21
HPK16980	R0.2	**4.0**	6	3.2	8	55	3.85	4.76	8.56	8.86	9.18	9.52	10.29
HPK16984	R0.3	**4.0**	6	3.2	8	55	3.85	4.76	8.56	8.86	9.18	9.52	10.29
HPK16987	R0.5	**4.0**	6	3.2	8	55	3.85	4.76	8.56	8.86	9.18	9.52	10.29
HPK16990	R1.0	**4.0**	6	3.2	8	55	3.85	4.76	8.56	8.86	9.18	9.52	10.29
HPK16981	R0.2	**4.0**	6	3.2	12	60	3.85	3.57	12.69	13.14	13.61	14.12	15.27
HPK16040	R0.1	**4.0**	6	3.2	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
HPK16982	R0.2	**4.0**	6	3.2	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
HPK16985	R0.3	**4.0**	6	3.2	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
HPK16988	R0.5	**4.0**	6	3.2	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
HPK16991	R1.0	**4.0**	6	3.2	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
HPK16983	R0.2	**4.0**	6	3.2	24	70	3.85	2.04	25.10	25.97	26.91	27.92	-
HPK16986	R0.3	**4.0**	6	3.2	24	70	3.85	2.04	25.10	25.97	26.91	27.92	-
HPK16989	R0.5	**4.0**	6	3.2	24	70	3.85	2.04	25.10	25.97	26.91	27.92	-
HPK16992	R1.0	**4.0**	6	3.2	24	70	3.85	2.04	25.10	25.97	26.91	27.92	-
HPK16050	R0.2	**5.0**	6	4	10	60	4.85	2.36	10.63	11.00	11.39	11.82	-
HPK16995	R0.3	**5.0**	6	4	10	60	4.85	2.36	10.63	11.00	11.39	11.82	-
HPK16998	R0.5	**5.0**	6	4	10	60	4.85	2.36	10.63	11.00	11.39	11.82	-

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

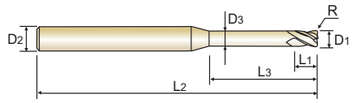
ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

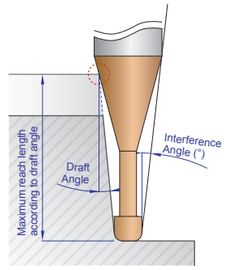
C-COATED SOLID CARBIDE END MILLS

4 FLUTE CORNER RADIUS for RIB PROCESSING with NECK

SERIES **HPK16** PLAIN SHANK

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 30° | 27°/30° | R ±0.005 | PLAIN | C Coating | P. 124-125

up to Ø3 Over Ø3

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK16802	R1.0	**5.0**	6	4	10	60	4.85	2.36	10.63	11.00	11.39	11.82	-
HPK16993	R0.2	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
HPK16996	R0.3	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
HPK16999	R0.5	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
HPK16803	R1.0	**5.0**	6	4	20	65	4.85	1.29	20.96	21.69	-	-	-
HPK16994	R0.2	**5.0**	6	4	25	70	4.85	1.06	26.13	27.04	-	-	-
HPK16997	R0.3	**5.0**	6	4	25	70	4.85	1.06	26.13	27.04	-	-	-
HPK16801	R0.5	**5.0**	6	4	25	70	4.85	1.06	26.13	27.04	-	-	-
HPK16804	R1.0	**5.0**	6	4	25	70	4.85	1.06	26.13	27.04	-	-	-
HPK16060	R0.2	**6.0**	6	5	12	60	5.85	0.00	-	-	-	-	-
HPK16807	R0.3	**6.0**	6	5	12	60	5.85	0.00	-	-	-	-	-
HPK16810	R0.5	**6.0**	6	5	12	60	5.85	0.00	-	-	-	-	-
HPK16813	R1.0	**6.0**	6	5	12	60	5.85	0.00	-	-	-	-	-
HPK16805	R0.2	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
HPK16808	R0.3	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
HPK16811	R0.5	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
HPK16814	R1.0	**6.0**	6	5	24	70	5.85	0.00	-	-	-	-	-
HPK16806	R0.2	**6.0**	6	5	30	80	5.85	0.00	-	-	-	-	-
HPK16809	R0.3	**6.0**	6	5	30	80	5.85	0.00	-	-	-	-	-
HPK16812	R0.5	**6.0**	6	5	30	80	5.85	0.00	-	-	-	-	-
HPK16815	R1.0	**6.0**	6	5	30	80	5.85	0.00	-	-	-	-	-

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

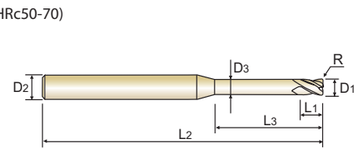
C-COATED SOLID CARBIDE END MILLS

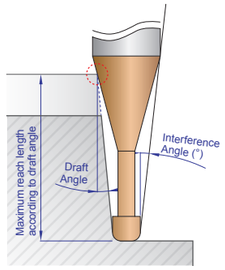
4 FLUTE CORNER RADIUS with NECK

SERIES

PLAIN SHANK **HPK17**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 30° | 27°/30° | R ±0.005 | R ±0.008 | PLAIN | C Coating | P. 124-125

up to Ø3 | Over Ø3 | D1~D6 | D8~D20

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPK17010	R0.1	**1.0**	3	1.5	3	40	0.95	8.34	3.31	3.49	3.69	3.92	4.47
HPK17901	R0.1	**1.0**	6	1.5	3	40	0.95	11.38	3.31	3.49	3.69	3.92	4.47
HPK17015	R0.1	**1.5**	3	2.2	4	40	1.45	6.21	4.23	4.38	4.54	4.71	5.09
HPK17902	R0.1	**1.5**	6	2.2	4	40	1.45	10.21	4.23	4.38	4.54	4.71	5.09
HPK17020	R0.1	**2.0**	3	3	6	40	1.95	3.59	6.30	6.52	6.75	7.01	7.57
HPK17903	R0.1	**2.0**	6	3	6	40	1.95	8.39	6.30	6.52	6.75	7.01	7.57
HPK17025	R0.1	**2.5**	3	4	6	40	2.40	2.01	6.39	6.62	6.86	7.11	-
HPK17904	R0.1	**2.5**	6	4	6	40	2.40	7.83	6.39	6.62	6.86	7.11	7.69
HPK17030	R0.1	**3.0**	6	4	7	45	2.85	6.64	7.52	7.79	8.07	8.37	9.05
HPK17908	R0.5	**3.0**	6	4	10	55	2.85	5.40	10.63	11.00	11.39	11.82	12.78
HPK17905	R0.3	**3.0**	6	4	12	55	2.85	4.80	12.69	13.14	13.61	14.12	15.27
HPK17906	R0.3	**3.0**	6	4	16	55	2.85	3.92	16.83	17.41	18.04	18.72	20.24
HPK17909	R0.5	**3.0**	6	4	16	55	2.85	3.92	16.83	17.41	18.04	18.72	20.24
HPK17907	R0.3	**3.0**	6	4	20	55	2.85	3.32	20.96	21.69	22.48	23.32	25.21
HPK17910	R0.5	**3.0**	6	4	20	55	2.85	3.32	20.96	21.69	22.48	23.32	25.21
HPK17035	R0.1	**3.5**	6	5	9	45	3.35	5.12	9.59	9.93	10.29	10.67	11.54
HPK17040	R0.1	**4.0**	6	5	9	45	3.85	4.39	9.59	9.93	10.29	10.67	11.54
HPK17911	R0.3	**4.0**	6	5	12	55	3.85	3.57	12.69	13.14	13.61	14.12	15.27
HPK17914	R0.5	**4.0**	6	5	12	55	3.85	3.57	12.69	13.14	13.61	14.12	15.27
HPK17917	R1.0	**4.0**	6	5	12	55	3.85	3.57	12.69	13.14	13.61	14.12	15.27
HPK17912	R0.3	**4.0**	6	5	16	55	3.85	2.86	16.83	17.41	18.04	18.72	-
HPK17915	R0.5	**4.0**	6	5	16	55	3.85	2.86	16.83	17.41	18.04	18.72	-
HPK17913	R0.3	**4.0**	6	5	20	55	3.85	2.38	20.96	21.69	22.48	23.32	-
HPK17916	R0.5	**4.0**	6	5	20	55	3.85	2.38	20.96	21.69	22.48	23.32	-
HPK17045	R0.1	**4.5**	6	6	10	45	4.35	3.28	10.63	11.00	11.39	11.82	12.78
HPK17050	R0.2	**5.0**	6	6	11	50	4.85	2.18	11.66	12.07	12.50	12.97	-

NEXT PAGE ▶

Size	Corner Radius Tolerance (mm)
up to Ø6	±0.005
over Ø6	±0.008

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø12	0~-0.010	h4
over Ø12	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

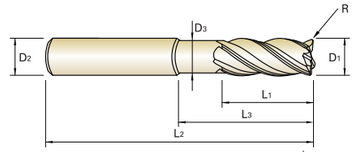
C-COATED SOLID CARBIDE END MILLS

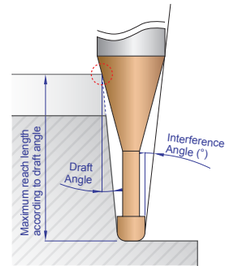
4 FLUTE CORNER RADIUS with NECK

SERIES

PLAIN SHANK **HPK17**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 30° | 27°/30° | R ±0.005 | R ±0.008 | PLAIN | C Coating | P. 124-125

up to Ø3 | Over Ø3 | D1~D6 | D8~D20

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPK17060	R0.2	**6.0**	6	7	14	50	5.85	0.00	-	-	-	-	-
HPK17918	R0.5	**6.0**	6	7	20	60	5.85	0.00	-	-	-	-	-
HPK17920	R1.0	**6.0**	6	7	20	60	5.85	0.00	-	-	-	-	-
HPK17922	R1.5	**6.0**	6	7	20	60	5.85	0.00	-	-	-	-	-
HPK17919	R0.5	**6.0**	6	9	20	90	5.85	0.00	-	-	-	-	-
HPK17921	R1.0	**6.0**	6	9	20	90	5.85	0.00	-	-	-	-	-
HPK17080	R0.2	**8.0**	8	9	18	60	7.70	0.00	-	-	-	-	-
HPK17923	R0.5	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
HPK17925	R1.0	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
HPK17927	R1.5	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
HPK17928	R2.0	**8.0**	8	9	25	60	7.70	0.00	-	-	-	-	-
HPK17924	R0.5	**8.0**	8	12	25	100	7.70	0.00	-	-	-	-	-
HPK17926	R1.0	**8.0**	8	12	25	100	7.70	0.00	-	-	-	-	-
HPK17929	R0.5	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
HPK17931	R1.0	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
HPK17933	R1.5	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
HPK17934	R2.0	**10.0**	10	11	32	70	9.70	0.00	-	-	-	-	-
HPK17100	R0.2	**10.0**	10	12	25	75	9.70	0.00	-	-	-	-	-
HPK17930	R0.5	**10.0**	10	15	32	100	9.70	0.00	-	-	-	-	-
HPK17932	R1.0	**10.0**	10	15	32	100	9.70	0.00	-	-	-	-	-
HPK17935	R2.0	**10.0**	10	15	32	100	9.70	0.00	-	-	-	-	-
HPK17936	R0.5	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-
HPK17938	R1.0	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-
HPK17940	R1.5	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-
HPK17941	R2.0	**12.0**	12	12	38	80	11.70	0.00	-	-	-	-	-
HPK17120	R0.3	**12.0**	12	15	30	75	11.70	0.00	-	-	-	-	-
HPK17937	R0.5	**12.0**	12	18	38	110	11.70	0.00	-	-	-	-	-
HPK17939	R1.0	**12.0**	12	18	38	110	11.70	0.00	-	-	-	-	-
HPK17942	R2.0	**12.0**	12	18	38	110	11.70	0.00	-	-	-	-	-
HPK17160	R0.3	**16.0**	16	18	38	90	15.70	0.00	-	-	-	-	-
HPK17200	R0.3	**20.0**	20	24	45	100	19.70	0.00	-	-	-	-	-

Size	Corner Radius Tolerance (mm)
up to Ø6	±0.005
over Ø6	±0.008

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø12	0~-0.010	h4
over Ø12	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

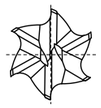
C-COATED SOLID CARBIDE END MILLS

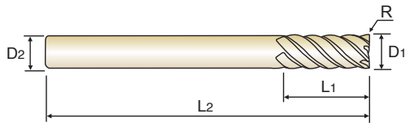
6 FLUTE CORNER RADIUS

SERIES

PLAIN SHANK **HPK18**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 6 | 45° | R ±0.008 | PLAIN | C Coating

P. 126

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D1	D2	L1	L2
HPK18060	R0.5	**6.0**	6	15	60
HPK18080	R0.5	**8.0**	8	20	75
HPK18100	R0.5	**10.0**	10	25	80
HPK18901	R1.0	**10.0**	10	25	80
HPK18120	R0.5	**12.0**	12	30	100
HPK18902	R1.0	**12.0**	12	30	100
HPK18160	R1.0	**16.0**	16	40	110
HPK18200	R1.0	**20.0**	20	45	125
HPK18903	R2.0	**20.0**	20	45	125

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.008	0~-0.015	h4 * Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

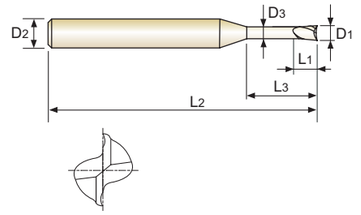
C-COATED SOLID CARBIDE END MILLS

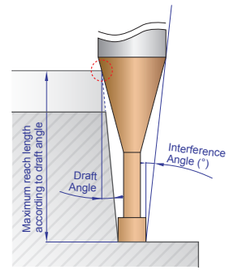
2 FLUTE SQUARE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI88**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | PLAIN | C Coating

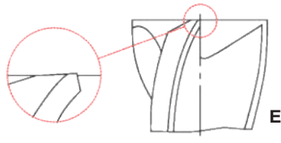
P. 127-134

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPI88001	**0.1**	4	0.08	0.3	45	0.085	14.38	0.36	0.38	0.40	0.43	0.49
HPI88901	**0.1**	4	0.08	0.5	45	0.085	14.03	0.57	0.60	0.64	0.68	0.77
HPI88902	**0.1**	4	0.08	0.75	45	0.085	13.61	0.83	0.88	0.93	0.99	1.13
HPI88903	**0.1**	4	0.08	1	45	0.085	13.21	1.10	1.16	1.22	1.30	1.48
HPI880015	**0.15**	4	0.12	0.3	45	0.135	14.37	0.36	0.38	0.40	0.43	0.49
HPI88904	**0.15**	4	0.12	0.5	45	0.135	14.01	0.57	0.60	0.64	0.68	0.77
HPI88905	**0.15**	4	0.12	0.75	45	0.135	13.59	0.83	0.88	0.93	0.99	1.13
HPI88906	**0.15**	4	0.12	1	45	0.135	13.19	1.10	1.16	1.22	1.30	1.48
HPI88907	**0.15**	4	0.12	1.5	45	0.135	12.46	1.62	1.71	1.81	1.92	2.19
HPI88002	**0.2**	4	0.15	0.5	45	0.17	13.95	0.62	0.65	0.69	0.73	0.83
HPI88908	**0.2**	4	0.15	0.75	45	0.17	13.53	0.88	0.93	0.98	1.04	1.19
HPI88909	**0.2**	4	0.15	1	45	0.17	13.13	1.14	1.20	1.27	1.35	1.54
HPI88910	**0.2**	4	0.15	1.5	45	0.17	12.39	1.67	1.76	1.86	1.98	2.26
HPI88911	**0.2**	4	0.15	2	45	0.17	11.73	2.19	2.31	2.45	2.60	2.97
HPI88912	**0.2**	4	0.15	2.5	45	0.17	11.14	2.72	2.87	3.04	3.22	3.68
HPI88913	**0.2**	4	0.15	3	45	0.17	10.61	3.25	3.42	3.62	3.85	4.39
HPI88003	**0.3**	4	0.25	1	45	0.27	13.08	1.14	1.20	1.27	1.35	1.54
HPI88914	**0.3**	4	0.25	1.5	45	0.27	12.33	1.67	1.76	1.86	1.98	2.26
HPI88915	**0.3**	4	0.25	2	45	0.27	11.67	2.19	2.31	2.45	2.60	2.97
HPI88916	**0.3**	4	0.25	2.5	45	0.27	11.06	2.72	2.87	3.04	3.22	3.68
HPI88917	**0.3**	4	0.25	3	45	0.27	10.52	3.25	3.42	3.62	3.85	4.39
HPI88004	**0.4**	4	0.3	1	45	0.37	13.04	1.14	1.20	1.27	1.35	1.54
HPI88918	**0.4**	4	0.3	1.5	45	0.37	12.27	1.67	1.76	1.86	1.98	2.26
HPI88919	**0.4**	4	0.3	2	45	0.37	11.59	2.19	2.31	2.45	2.60	2.97
HPI88920	**0.4**	4	0.3	2.5	45	0.37	10.98	2.72	2.87	3.04	3.22	3.68
HPI88921	**0.4**	4	0.3	3	45	0.37	10.44	3.25	3.42	3.62	3.85	4.39

NEXT PAGE ▶

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



Enforced Cutting Edge

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

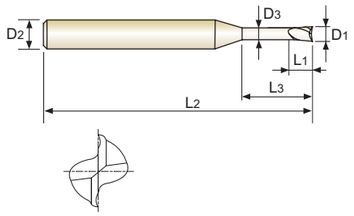
C-COATED SOLID CARBIDE END MILLS

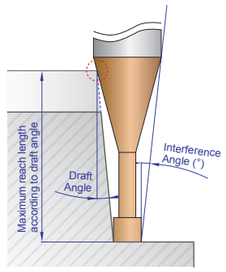
2 FLUTE SQUARE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI88**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | PLAIN | C Coating

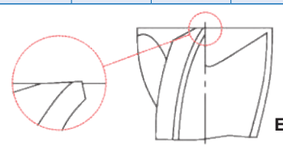
P. 127-134

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPI88922	0.4	4	0.3	3.5	45	0.37	9.94	3.77	3.98	4.21	4.47	5.10
HPI88923	0.4	4	0.3	4	45	0.37	9.49	4.30	4.53	4.80	5.09	5.81
HPI88924	0.4	4	0.3	5	45	0.37	8.69	5.35	5.64	5.97	6.34	7.24
HPI88925	0.4	4	0.3	6	45	0.37	8.02	6.40	6.75	7.15	7.59	8.66
HPI88926	0.4	4	0.3	8	45	0.37	6.95	8.51	8.97	9.50	10.08	11.48
HPI88927	0.4	4	0.3	10	45	0.37	6.13	10.61	11.19	11.84	12.58	13.82
HPI88005	0.5	4	0.4	1	45	0.45	12.93	1.20	1.27	1.34	1.42	1.62
HPI88928	0.5	4	0.4	1.5	45	0.45	12.16	1.73	1.82	1.93	2.05	2.34
HPI88929	0.5	4	0.4	2	45	0.45	11.47	2.25	2.38	2.52	2.67	3.05
HPI88930	0.5	4	0.4	2.5	45	0.45	10.86	2.78	2.93	3.10	3.29	3.76
HPI88931	0.5	4	0.4	3	45	0.45	10.31	3.31	3.49	3.69	3.92	4.47
HPI88932	0.5	4	0.4	3.5	45	0.45	9.81	3.83	4.04	4.28	4.54	5.18
HPI88933	0.5	4	0.4	4	45	0.45	9.35	4.36	4.60	4.86	5.16	5.89
HPI88934	0.5	4	0.4	4.5	45	0.45	8.94	4.88	5.15	5.45	5.79	6.60
HPI88935	0.5	4	0.4	5	45	0.45	8.56	5.41	5.71	6.04	6.41	7.32
HPI88936	0.5	4	0.4	6	45	0.45	7.89	6.46	6.82	7.21	7.66	8.74
HPI88937	0.5	4	0.4	7	45	0.45	7.32	7.51	7.93	8.39	8.91	10.16
HPI88938	0.5	4	0.4	8	50	0.45	6.82	8.57	9.04	9.56	10.15	11.47
HPI88939	0.5	4	0.4	9	50	0.45	6.39	9.62	10.15	10.74	11.40	12.64
HPI88940	0.5	4	0.4	10	50	0.45	6.01	10.67	11.26	11.91	12.65	13.80
HPI88006	0.6	4	0.5	1.5	45	0.55	12.09	1.73	1.82	1.93	2.05	2.34
HPI88941	0.6	4	0.5	2	45	0.55	11.39	2.25	2.38	2.52	2.67	3.05
HPI88942	0.6	4	0.5	3	45	0.55	10.21	3.31	3.49	3.69	3.92	4.47
HPI88943	0.6	4	0.5	4	45	0.55	9.25	4.36	4.60	4.86	5.16	5.89
HPI88944	0.6	4	0.5	5	45	0.55	8.45	5.41	5.71	6.04	6.41	7.32
HPI88945	0.6	4	0.5	6	45	0.55	7.78	6.46	6.82	7.21	7.66	8.74

NEXT PAGE ▶

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



Enforced Cutting Edge

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

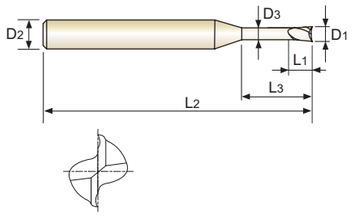
C-COATED SOLID CARBIDE END MILLS

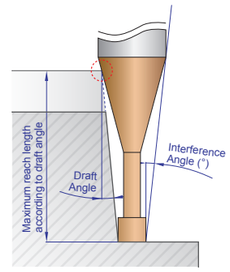
2 FLUTE SQUARE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI88**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | PLAIN | C Coating

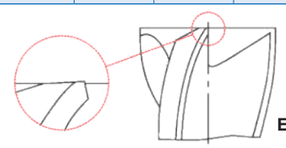
P. 127-134

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPI88007	0.7	4	0.55	2	45	0.65	11.31	2.25	2.38	2.52	2.67	3.05
HPI88946	0.7	4	0.55	4	45	0.65	9.14	4.36	4.60	4.86	5.16	5.89
HPI88947	0.7	4	0.55	6	45	0.65	7.67	6.46	6.82	7.21	7.66	8.74
HPI88948	0.7	4	0.55	8	50	0.65	6.60	8.57	9.04	9.56	10.15	11.35
HPI88949	0.7	4	0.55	10	50	0.65	5.80	10.67	11.26	11.91	12.65	13.69
HPI88008	0.8	4	0.65	3	45	0.75	10.01	3.31	3.49	3.69	3.92	4.47
HPI88950	0.8	4	0.65	4	45	0.75	9.03	4.36	4.60	4.86	5.16	5.89
HPI88951	0.8	4	0.65	5	45	0.75	8.23	5.41	5.71	6.04	6.41	7.32
HPI88952	0.8	4	0.65	6	45	0.75	7.55	6.46	6.82	7.21	7.66	8.74
HPI88953	0.8	4	0.65	8	50	0.75	6.49	8.57	9.04	9.56	10.15	11.29
HPI88954	0.8	4	0.65	10	50	0.75	5.69	10.67	11.26	11.91	12.65	13.63
HPI88955	0.8	4	0.65	12	50	0.75	5.06	12.77	13.48	14.26	15.12	15.97
HPI88010	1.0	4	0.8	2	50	0.95	11.04	2.25	2.38	2.52	2.67	3.05
HPI88956	1.0	4	0.8	3	50	0.95	9.79	3.31	3.49	3.69	3.92	4.47
HPI88957	1.0	4	0.8	4	50	0.95	8.80	4.36	4.60	4.86	5.16	5.89
HPI88958	1.0	4	0.8	5	50	0.95	7.99	5.41	5.71	6.04	6.41	7.32
HPI88959	1.0	4	0.8	6	50	0.95	7.31	6.46	6.82	7.21	7.66	8.74
HPI88960	1.0	4	0.8	7	50	0.95	6.74	7.51	7.93	8.39	8.91	10.01
HPI88961	1.0	4	0.8	8	50	0.95	6.25	8.57	9.04	9.56	10.15	11.18
HPI88962	1.0	4	0.8	9	50	0.95	5.83	9.62	10.15	10.74	11.40	12.35
HPI88963	1.0	4	0.8	10	50	0.95	5.46	10.67	11.26	11.91	12.65	13.52
HPI88964	1.0	4	0.8	12	50	0.95	4.85	12.77	13.48	14.26	15.01	15.85
HPI88965	1.0	4	0.8	14	50	0.95	4.36	14.88	15.70	16.61	17.22	18.19
HPI88966	1.0	4	0.8	16	60	0.95	3.96	16.98	17.92	18.93	19.43	20.53
HPI88967	1.0	4	0.8	18	60	0.95	3.62	19.09	20.13	21.09	21.65	22.86
HPI88968	1.0	4	0.8	20	60	0.95	3.34	21.19	22.35	23.24	23.86	25.20

NEXT PAGE ▶

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



Enforced Cutting Edge

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

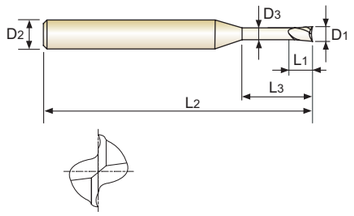
C-COATED SOLID CARBIDE END MILLS

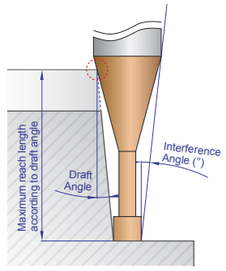
2 FLUTE SQUARE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI88**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | PLAIN | C Coating

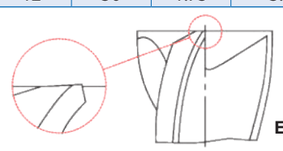
P. 127-134

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPI88969	1.0	4	0.8	22	60	0.95	3.10	23.29	24.57	25.40	26.07	27.53
HPI88012	1.2	4	1	6	50	1.15	7.05	6.30	6.52	6.75	7.01	7.57
HPI88970	1.2	4	1	8	50	1.15	6.00	8.37	8.66	8.97	9.31	10.06
HPI88971	1.2	4	1	10	50	1.15	5.22	10.43	10.80	11.19	11.61	12.55
HPI88972	1.2	4	1	12	50	1.15	4.62	12.50	12.94	13.40	13.91	15.03
HPI88973	1.2	4	1	16	60	1.15	3.76	16.64	17.21	17.84	18.50	20.01
HPI88014	1.4	4	1.1	6	50	1.35	6.77	6.30	6.52	6.75	7.01	7.57
HPI88974	1.4	4	1.1	12	50	1.35	4.39	12.50	12.94	13.40	13.91	15.03
HPI88015	1.5	4	1.2	4	50	1.45	8.12	4.23	4.38	4.54	4.71	5.09
HPI88975	1.5	4	1.2	6	50	1.45	6.63	6.30	6.52	6.75	7.01	7.57
HPI88976	1.5	4	1.2	8	50	1.45	5.60	8.37	8.66	8.97	9.31	10.06
HPI88977	1.5	4	1.2	10	50	1.45	4.84	10.43	10.80	11.19	11.61	12.55
HPI88978	1.5	4	1.2	12	50	1.45	4.27	12.50	12.94	13.40	13.91	15.03
HPI88979	1.5	4	1.2	14	60	1.45	3.81	14.57	15.08	15.62	16.21	17.52
HPI88980	1.5	4	1.2	16	60	1.45	3.45	16.64	17.21	17.84	18.50	20.01
HPI88981	1.5	4	1.2	18	60	1.45	3.14	18.70	19.35	20.05	20.80	22.49
HPI88982	1.5	4	1.2	20	60	1.45	2.89	20.77	21.49	22.27	23.10	-
HPI88983	1.5	4	1.2	25	70	1.45	2.41	25.94	26.84	27.81	28.85	-
HPI88984	1.5	4	1.2	30	70	1.45	2.06	31.11	32.19	33.35	34.60	-
HPI88985	1.5	4	1.2	35	80	1.45	1.80	36.27	37.54	38.89	-	-
HPI88016	1.6	4	1.3	6	50	1.55	6.48	6.30	6.52	6.75	7.01	7.57
HPI88986	1.6	4	1.3	8	50	1.55	5.45	8.37	8.66	8.97	9.31	10.06
HPI88018	1.8	4	1.4	6	50	1.75	6.16	6.30	6.52	6.75	7.01	7.57
HPI88987	1.8	4	1.4	8	50	1.75	5.15	8.37	8.66	8.97	9.31	10.06
HPI88988	1.8	4	1.4	10	50	1.75	4.43	10.43	10.80	11.19	11.61	12.55
HPI88989	1.8	4	1.4	12	50	1.75	3.88	12.50	12.94	13.40	13.91	15.03

NEXT PAGE ▶

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



Enforced Cutting Edge

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

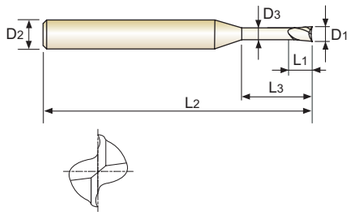
C-COATED SOLID CARBIDE END MILLS

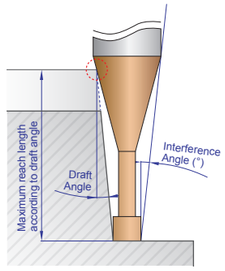
2 FLUTE SQUARE for RIB PROCESSING

SERIES

PLAIN SHANK HPI88

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 2 | 35° | PLAIN | C Coating

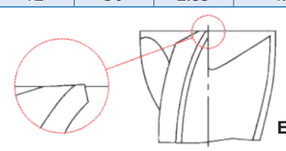
P. 127-134

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPI88990	1.8	4	1.4	14	50	1.75	3.46	14.57	15.08	15.62	16.21	17.52
HPI88991	1.8	4	1.4	16	60	1.75	3.12	16.64	17.21	17.84	18.50	20.01
HPI88992	1.8	4	1.4	18	60	1.75	2.84	18.70	19.35	20.05	20.80	-
HPI88020	2.0	4	1.6	4	50	1.95	7.28	4.23	4.38	4.54	4.71	5.09
HPI88993	2.0	4	1.6	6	50	1.95	5.81	6.30	6.52	6.75	7.01	7.57
HPI88994	2.0	4	1.6	8	50	1.95	4.83	8.37	8.66	8.97	9.31	10.06
HPI88995	2.0	4	1.6	10	50	1.95	4.14	10.43	10.80	11.19	11.61	12.55
HPI88996	2.0	4	1.6	12	50	1.95	3.62	12.50	12.94	13.40	13.91	15.03
HPI88997	2.0	4	1.6	14	60	1.95	3.21	14.57	15.08	15.62	16.21	17.52
HPI88998	2.0	4	1.6	16	60	1.95	2.89	16.64	17.21	17.84	18.50	-
HPI88999	2.0	4	1.6	18	60	1.95	2.62	18.70	19.35	20.05	20.80	-
HPI88801	2.0	4	1.6	20	60	1.95	2.40	20.77	21.49	22.27	23.10	-
HPI88802	2.0	4	1.6	25	70	1.95	1.99	25.94	26.84	27.81	-	-
HPI88803	2.0	4	1.6	30	70	1.95	1.69	31.11	32.19	33.35	-	-
HPI88804	2.0	4	1.6	35	80	1.95	1.48	36.27	37.54	-	-	-
HPI88805	2.0	4	1.6	40	90	1.95	1.31	41.44	42.89	-	-	-
HPI88806	2.0	4	1.6	50	100	1.95	1.06	51.78	53.58	-	-	-
HPI88025	2.5	4	2	8	50	2.4	3.91	8.46	8.76	9.07	9.41	10.18
HPI88807	2.5	4	2	12	50	2.4	2.87	12.60	13.04	13.51	14.01	-
HPI88808	2.5	4	2	16	60	2.4	2.26	16.73	17.31	17.94	18.61	-
HPI88809	2.5	4	2	20	60	2.4	1.87	20.87	21.59	22.37	-	-
HPI88810	2.5	4	2	30	70	2.4	1.30	31.20	32.29	-	-	-
HPI88811	2.5	4	2	40	90	2.4	1.00	41.54	-	-	-	-
HPI88812	2.5	4	2	50	100	2.4	0.81	51.88	-	-	-	-
HPI88030	3.0	6	4.5	8	50	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPI88813	3.0	6	4.5	12	50	2.85	4.80	12.69	13.14	13.61	14.12	15.27

NEXT PAGE ▶

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



Enforced Cutting Edge

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

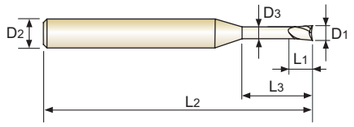
ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

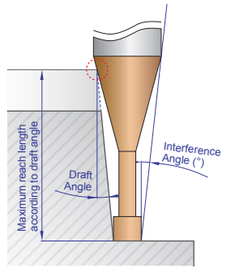
C-COATED SOLID CARBIDE END MILLS

2 FLUTE SQUARE for RIB PROCESSING

SERIES
PLAIN SHANK **HPI88**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



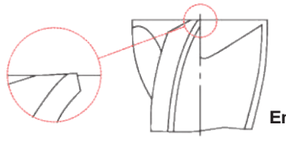


CARBIDE | 2 | 35° | PLAIN | C Coating | P. 127-134

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPI88814	**3.0**	6	4.5	16	60	2.85	3.92	16.83	17.41	18.04	18.72	20.24
HPI88815	**3.0**	6	4.5	20	60	2.85	3.32	20.96	21.69	22.48	23.32	25.21
HPI88816	**3.0**	6	4.5	25	70	2.85	2.78	26.13	27.04	28.02	29.07	-
HPI88817	**3.0**	6	4.5	30	70	2.85	2.39	31.30	32.39	33.56	34.82	-
HPI88040	**4.0**	6	6	12	60	3.85	3.57	12.69	13.14	13.61	14.12	15.27
HPI88818	**4.0**	6	6	16	60	3.85	2.86	16.83	17.41	18.04	18.72	-
HPI88819	**4.0**	6	6	20	70	3.85	2.38	20.96	21.69	22.48	23.32	-
HPI88820	**4.0**	6	6	30	80	3.85	1.68	31.30	32.39	33.56	-	-
HPI88821	**4.0**	6	6	40	90	3.85	1.30	41.64	43.09	-	-	-
HPI88822	**4.0**	6	6	50	100	3.85	1.06	51.97	53.78	-	-	-
HPI88050	**5.0**	6	7.5	20	70	4.85	1.29	20.96	21.69	-	-	-
HPI88823	**5.0**	6	7.5	30	80	4.85	0.89	31.30	-	-	-	-
HPI88824	**5.0**	6	7.5	40	90	4.85	0.68	41.64	-	-	-	-
HPI88825	**5.0**	6	7.5	50	100	4.85	0.55	51.97	-	-	-	-
HPI88060	**6.0**	6	9	20	70	5.85	0.00	-	-	-	-	-
HPI88826	**6.0**	6	9	30	80	5.85	0.00	-	-	-	-	-
HPI88827	**6.0**	6	9	40	90	5.85	0.00	-	-	-	-	-
HPI88828	**6.0**	6	9	50	100	5.85	0.00	-	-	-	-	-

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



Enforced Cutting Edge

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

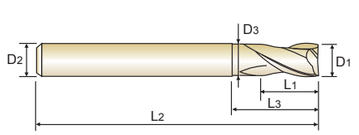
ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

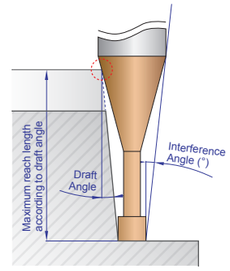
C-COATED SOLID CARBIDE END MILLS

2 FLUTE SQUARE with EXTENDED NECK

SERIES
PLAIN SHANK **HPK19**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



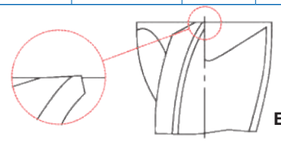


CARBIDE | 2 | 35° | PLAIN | C Coating | P. 127-134

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK19001	**0.1**	4	0.2	0.3	40	0.085	14.38	0.36	0.38	0.40	0.43	0.49
HPK19002	**0.2**	4	0.4	0.5	40	0.17	13.95	0.62	0.65	0.69	0.73	0.83
HPK19003	**0.3**	4	0.6	1	40	0.27	13.08	1.14	1.20	1.27	1.35	1.54
HPK19004	**0.4**	4	0.8	1	40	0.37	13.04	1.14	1.20	1.27	1.35	1.54
HPK19005	**0.5**	4	1	1.5	40	0.45	12.16	1.73	1.82	1.93	2.05	2.34
HPK19006	**0.6**	4	1.2	2	40	0.55	11.39	2.25	2.38	2.52	2.67	3.05
HPK19007	**0.7**	4	1.4	2	40	0.65	11.31	2.25	2.38	2.52	2.67	3.05
HPK19008	**0.8**	4	1.6	2	40	0.75	11.22	2.25	2.38	2.52	2.67	3.05
HPK19009	**0.9**	4	2	3	40	0.85	9.90	3.31	3.49	3.69	3.92	4.47
HPK19010	**1.0**	4	1.5	3	50	0.95	9.79	3.31	3.49	3.69	3.92	4.47
HPK19901	**1.0**	6	1.5	3	50	0.95	11.38	3.31	3.49	3.69	3.92	4.47
HPK19015	**1.5**	4	1.7	4	50	1.45	8.12	4.23	4.38	4.54	4.71	5.09
HPK19902	**1.5**	6	1.7	4	50	1.45	10.21	4.23	4.38	4.54	4.71	5.09
HPK19020	**2.0**	4	2	5	50	1.95	6.46	5.26	5.45	5.64	5.86	6.33
HPK19903	**2.0**	6	2	5	50	1.95	9.05	5.26	5.45	5.64	5.86	6.33
HPK19025	**2.5**	4	2.5	6	55	2.40	4.77	6.39	6.62	6.86	7.11	7.69
HPK19904	**2.5**	6	2.5	6	55	2.40	7.83	6.39	6.62	6.86	7.11	7.69
HPK19030	**3.0**	6	3	8	55	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPK19035	**3.5**	6	3.5	9	55	3.35	5.12	9.59	9.93	10.29	10.67	11.54
HPK19040	**4.0**	6	4	10	55	3.85	4.08	10.63	11.00	11.39	11.82	12.78
HPK19050	**5.0**	6	5	13	55	4.85	1.89	13.73	14.21	14.72	-	-
HPK19060	**6.0**	6	6	15	55	5.85	0.00	-	-	-	-	-
HPK19080	**8.0**	8	8	20	65	7.70	0.00	-	-	-	-	-
HPK19100	**10.0**	10	10	25	75	9.70	0.00	-	-	-	-	-
HPK19120	**12.0**	12	12	28	85	11.70	0.00	-	-	-	-	-
HPK19160	**16.0**	16	16	32	90	15.70	0.00	-	-	-	-	-
HPK19200	**20.0**	20	20	40	105	19.70	0.00	-	-	-	-	-

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø12	0~-0.010	h4
over Ø12	0~-0.012	* Shank Dia.>ø6 : h5



Enforced Cutting Edge

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

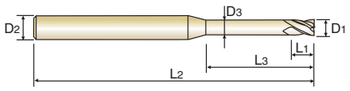
ISO	N										S							H						
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

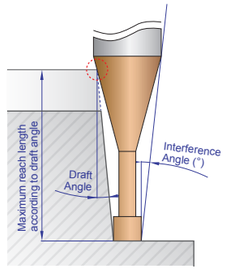
C-COATED SOLID CARBIDE END MILLS

4 FLUTE SQUARE for RIB PROCESSING with NECK

SERIES
PLAIN SHANK **HPK20**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 30° | 27°/30° | PLAIN | C Coating | P. 135

up to Ø3 Over Ø3

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK20010	**1.0**	4	0.8	4	50	0.95	8.80	4.36	4.60	4.86	5.16	5.89
HPK20901	**1.0**	4	0.8	10	50	0.95	5.46	10.67	11.26	11.91	12.65	13.52
HPK20012	**1.2**	4	1	6	50	1.15	7.05	6.30	6.52	6.75	7.01	7.57
HPK20902	**1.2**	4	1	12	50	1.15	4.62	12.50	12.94	13.40	13.91	15.03
HPK20015	**1.5**	4	1.2	6	50	1.45	6.63	6.30	6.52	6.75	7.01	7.57
HPK20903	**1.5**	4	1.2	10	50	1.45	4.84	10.43	10.80	11.19	11.61	12.55
HPK20904	**1.5**	4	1.2	16	60	1.45	3.45	16.64	17.21	17.84	18.50	20.01
HPK20018	**1.8**	4	1.4	6	50	1.75	6.16	6.30	6.52	6.75	7.01	7.57
HPK20905	**1.8**	4	1.4	12	50	1.75	3.88	12.50	12.94	13.40	13.91	15.03
HPK20906	**1.8**	4	1.4	18	60	1.75	2.84	18.70	19.35	20.05	20.80	-
HPK20020	**2.0**	4	1.6	6	50	1.95	5.81	6.30	6.52	6.75	7.01	7.57
HPK20907	**2.0**	4	1.6	14	60	1.95	3.21	14.57	15.08	15.62	16.21	17.52
HPK20908	**2.0**	4	1.6	20	60	1.95	2.40	20.77	21.49	22.27	23.10	-
HPK20025	**2.5**	4	2	8	50	2.4	3.91	8.46	8.76	9.07	9.41	10.18
HPK20909	**2.5**	4	2	16	60	2.4	2.26	16.73	17.31	17.94	18.61	-
HPK20910	**2.5**	4	2	25	70	2.4	1.54	26.03	26.94	27.91	-	-
HPK20030	**3.0**	6	4.5	8	50	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPK20911	**3.0**	6	4.5	16	60	2.85	3.92	16.83	17.41	18.04	18.72	20.24
HPK20912	**3.0**	6	4.5	30	70	2.85	2.39	31.30	32.39	33.56	34.82	-
HPK20040	**4.0**	6	6	12	50	3.85	3.57	12.69	13.14	13.61	14.12	15.27
HPK20913	**4.0**	6	6	25	70	3.85	1.97	26.13	27.04	28.02	-	-
HPK20914	**4.0**	6	6	40	90	3.85	1.30	41.64	43.09	-	-	-
HPK20050	**5.0**	6	7.5	16	60	4.85	1.58	16.83	17.41	18.04	-	-
HPK20915	**5.0**	6	7.5	50	110	4.85	0.55	51.97	-	-	-	-
HPK20060	**6.0**	6	9	20	80	5.85	0.00	-	-	-	-	-
HPK20916	**6.0**	6	9	50	110	5.85	0.00	-	-	-	-	-

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø12	0~-0.010	h4
over Ø12	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

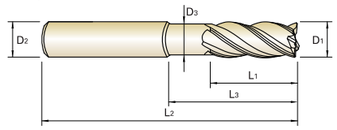
ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

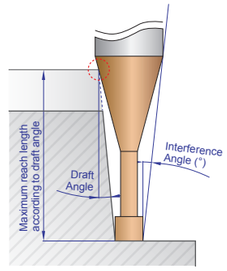
C-COATED SOLID CARBIDE END MILLS

4 FLUTE SQUARE with EXTENDED NECK

SERIES
PLAIN SHANK **HPK21**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 30° | 27°/30° | PLAIN | C Coating | P. 135

up to Ø3 Over Ø3

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	D_1	D_2	L_1	L_3	L_2	D_3		0.5°	1°	1.5°	2°	3°
HPK21010	**1.0**	6	1.5	3	50	0.95	11.38	3.31	3.49	3.69	3.92	4.47
HPK21020	**2.0**	6	2	5	50	1.95	9.05	5.26	5.45	5.64	5.86	6.33
HPK21030	**3.0**	6	3	8	55	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPK21040	**4.0**	6	4	10	55	3.85	4.08	10.63	11.00	11.39	11.82	12.78
HPK21050	**5.0**	6	5	13	55	4.85	1.89	13.73	14.21	14.72	-	-
HPK21060	**6.0**	6	6	15	55	5.85	0.00	-	-	-	-	-
HPK21080	**8.0**	8	8	20	65	7.70	0.00	-	-	-	-	-
HPK21100	**10.0**	10	10	25	75	9.70	0.00	-	-	-	-	-
HPK21120	**12.0**	12	12	28	85	11.70	0.00	-	-	-	-	-
HPK21160	**16.0**	16	16	32	90	15.70	0.00	-	-	-	-	-
HPK21200	**20.0**	20	20	40	105	19.70	0.00	-	-	-	-	-

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø12	0~-0.010	h4
over Ø12	0~-0.012	* Shank Dia.>ø6 : h5

◎ : Excellent ○ : Good

ISO	P												M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

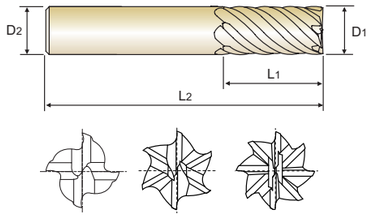
ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

C-COATED SOLID CARBIDE END MILLS

MULTI FLUTE SQUARE

SERIES
PLAIN SHANK **HPK23**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)



CARBIDE | 4&6&8 | 45° | PLAIN | C Coating

P. 136-137

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Overall Length	No. of Flute
	D1	D2	L1	L2	
HPK23010	1.0	6	2	60	4
* HPK23901	1.0	6	3.5	60	4
HPK23020	2.0	6	4	60	4
* HPK23902	2.0	6	7	60	4
HPK23030	3.0	6	6	60	4
* HPK23903	3.0	6	10	60	4
* HPK23904	3.0	6	15	60	4
HPK23040	4.0	6	8	60	4
* HPK23905	4.0	6	12	60	4
* HPK23906	4.0	6	20	65	4
HPK23050	5.0	6	10	60	4
* HPK23907	5.0	6	15	60	4
* HPK23908	5.0	6	25	70	4
HPK23060	6.0	6	15	60	6
* HPK23909	6.0	6	24	70	6
HPK23080	8.0	8	20	75	6
* HPK23910	8.0	8	35	90	6
HPK23100	10.0	10	25	80	6
* HPK23911	10.0	10	45	100	6
HPK23120	12.0	12	30	100	6
* HPK23912	12.0	12	55	120	6
HPK23140	14.0	16	35	105	6
HPK23160	16.0	16	40	105	6
* HPK23913	16.0	16	65	135	6
HPK23180	18.0	20	40	120	8
HPK23200	20.0	20	45	125	8
* HPK23914	20.0	20	75	155	8
HPK23250	25.0	25	50	140	8
* HPK23915	25.0	25	90	180	8

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.015	h4 * Shank Dia.>ø6 : h5

* Mill Dia. Tolerance(mm) for Long Type : 0~-0.02

◎ : Excellent ○ : Good

ISO	P													M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

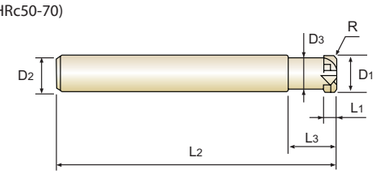
ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

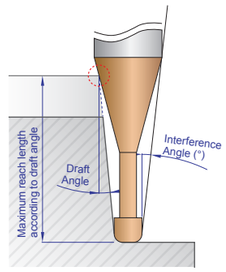
C-COATED SOLID CARBIDE END MILLS

4 FLUTE CORNER RADIUS - HIGH FEED

SERIES
PLAIN SHANK **HPK22**

- Improvement of tool life by applying new coating
- Application of tight tolerances for precision machining
- Highly Accurate Fine-Finishing End Mill For High-Hardened Steel (HRc50-70)





CARBIDE | 4 | 0° | R ±0.005 | PLAIN | C Coating

P. 138-139

Unit : mm

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
	R	D1	D2	L1	L3	L2	D3		0.5°	1°	1.5°	2°	3°
HPK22020	R0.5	2.0	6	1	6	50	1.95	8.39	6.30	6.52	6.75	7.01	7.57
HPK22901	R0.5	2.0	6	1	6	70	1.95	8.39	6.30	6.52	6.75	7.01	7.57
HPK22030	R0.5	3.0	6	1.2	8	50	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPK22902	R0.5	3.0	6	1.2	8	70	2.85	6.17	8.56	8.86	9.18	9.52	10.29
HPK22040	R0.5	4.0	6	1.5	10	50	3.85	4.08	10.63	11.00	11.39	11.82	12.78
HPK22903	R0.5	4.0	6	1.5	10	70	3.85	4.08	10.63	11.00	11.39	11.82	12.78
HPK22050	R0.5	5.0	6	2	10	70	4.85	2.36	10.63	11.00	11.39	11.82	-
HPK22060	R0.5	6.0	6	2.5	12	60	5.85	0.00	-	-	-	-	-
HPK22904	R0.5	6.0	6	2.5	12	90	5.85	0.00	-	-	-	-	-
HPK22905	R1.0	6.0	6	2.5	12	60	5.85	0.00	-	-	-	-	-
HPK22906	R1.0	6.0	6	2.5	12	90	5.85	0.00	-	-	-	-	-
HPK22907	R1.0	8.0	8	3.5	16	60	7.70	0.00	-	-	-	-	-
HPK22080	R1.0	8.0	8	3.5	16	100	7.70	0.00	-	-	-	-	-
HPK22908	R2.0	8.0	8	3.5	16	60	7.70	0.00	-	-	-	-	-
HPK22909	R2.0	8.0	8	3.5	16	100	7.70	0.00	-	-	-	-	-
HPK22100	R1.0	10.0	10	4	20	70	9.70	0.00	-	-	-	-	-
HPK22910	R1.0	10.0	10	4	20	100	9.70	0.00	-	-	-	-	-
HPK22911	R2.0	10.0	10	4	20	70	9.70	0.00	-	-	-	-	-
HPK22912	R2.0	10.0	10	4	20	100	9.70	0.00	-	-	-	-	-
HPK22120	R2.0	12.0	12	5	25	80	11.70	0.00	-	-	-	-	-
HPK22913	R2.0	12.0	12	5	25	110	11.70	0.00	-	-	-	-	-
HPK22914	R3.0	12.0	12	5	25	80	11.70	0.00	-	-	-	-	-
HPK22915	R3.0	12.0	12	5	25	110	11.70	0.00	-	-	-	-	-
HPK22160	R3.0	16.0	16	6.5	30	130	15.70	0.00	-	-	-	-	-

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.015	h4 * Shank Dia.>ø6 : h5

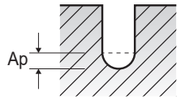
◎ : Excellent ○ : Good

ISO	P													M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel				Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	44	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230
Recommended					○			○	○		○	○									

ISO	N										S							H					
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials			Heat Resistant Super Alloys					Titanium Alloys		Hardened steel					Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41
HRc											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	421-469	481-560	577-654	670-739		400	550
Recommended																		◎	◎	◎	◎	◎	○	◎

HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



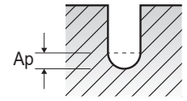
Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Material Description	Para-meter	Diameter (Ø)																			
				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				LBS	0.3	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	5	0.5	0.6	0.75	1	1.25	1.5	1.75	2	2.25
P	5	Non-alloy steel	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42	42	42
			fz	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010	0.010	0.007	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	44260	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1475	1239	1239	1239
			Ap	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.001	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005
	8	Low alloy steel	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42	42	42
			fz	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010	0.010	0.007	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	44260	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1475	1239	1239	1239
			Ap	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.001	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005
	9		Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42	42	42
			fz	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010	0.010	0.007	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	44260	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1475	1239	1239	1239
			Ap	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.001	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005
	11.1	High alloyed steel, and tool steel	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42	42	42
			fz	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010	0.010	0.007	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	44260	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1475	1239	1239	1239
			Ap	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.001	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005
	11.2		Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42	42	42
			fz	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.007	0.014	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	44260	44260
			FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1377	1151	1151	1151
			Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004
H	38.1	Hardened steel	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42	42	42
			fz	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.007	0.014	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	44260	44260
			FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1377	1151	1151	1151
			Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004
	38.2		Vc	29	29	29	29	26	26	26	26	23	23	9	41	41	41	41	41	41	37	37	37
			fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.012
			RPM	45900	45900	45900	45900	41310	41310	41310	41310	36720	36720	13770	43714	43714	43714	43714	43714	43714	39343	39343	39343
			FEED	918	918	918	918	744	744	744	744	588	588	165	1137	1137	1137	1137	1137	1137	944	944	944
			Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004
	39.1		Vc	26	26	26	26	23	23	23	23	21	21	8	41	41	41	41	41	41	37	37	37
			fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011
			RPM	40983	40983	40983	40983	36885	36885	36885	36885	32786	32786	12295	43714	43714	43714	43714	43714	43714	39343	39343	39343
			FEED	820	820	820	820	664	664	664	664	525	525	148	1049	1049	1049	1049	1049	1049	866	866	866
			Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004
	39.2		Vc	21	21	21	21	19	19	19	19	16	16	6	36	36	36	36	36	36	32	32	32
			fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011
			RPM	32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	9836	38250	38250	38250	38250	38250	38250	34425	34425	34425
			FEED	656	656	656	656	531	531	531	531	420	420	118	918	918	918	918	918	918	757	757	757
			Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004
	39.3		Vc	21	21	21	21	19	19	19	19	16	16	6	31	31	31	31	31	31	28	28	28
			fz	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.007	0.007	0.005	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010
			RPM	32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	9836	32786	32786	32786	32786	32786	32786	29507	29507	29507
			FEED	590	590	590	590	472	472	472	472	367	367	98	721	721	721	721	721	721	590	590	590
			Ap	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003
	40	Chilled Cast Iron	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42	42	42
			fz	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.007	0.014	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	44260	44260
			FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1377	1151	1151	1151
			Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004
	41	Hardened Cast Iron	Vc	29	29	29	29	26	26	26	26	23	23	9	41	41	41	41	41	41	37	37	37
			fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.012
			RPM	45900	45900	45900	45900	41310	41310	41310	41310	36720	36720	13770	43714	43714	43714	43714	43714	43714	39343	39343	39343
			FEED	918	918	918	918	744	744	744	744	588	588	165	1137	1137	1137	1137	1137	1137	944	944	944
			Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004

NEXT PAGE ▶

HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																				
			0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
		LBS	2.5	3	3.5	4	5	7	0.5	0.8	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7	1	1.25	1.5
P	5	Vc	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82	82	82
		fz	0.014	0.014	0.012	0.012	0.011	0.009	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.024	0.024	0.024
		RPM	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	52458	52458
		FEED	1239	1239	944	944	649	266	2025	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518	2518	2518
		Ap	0.004	0.004	0.004	0.004	0.003	0.002	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.010	0.010	0.010
	8	Vc	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82	82	82
		fz	0.014	0.014	0.012	0.012	0.011	0.009	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.024	0.024	0.024
		RPM	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	52458	52458
		FEED	1239	1239	944	944	649	266	2025	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518	2518	2518
		Ap	0.004	0.004	0.004	0.004	0.003	0.002	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.010	0.010	0.010
	9	Vc	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82	82	82
		fz	0.014	0.014	0.012	0.012	0.011	0.009	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.024	0.024	0.024
		RPM	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	52458	52458
		FEED	1239	1239	944	944	649	266	2025	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518	2518	2518
		Ap	0.004	0.004	0.004	0.004	0.003	0.002	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.010	0.010	0.010
	11.1	Vc	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82	82	82
		fz	0.014	0.014	0.012	0.012	0.011	0.009	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.024	0.024	0.024
		RPM	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	52458	52458
		FEED	1239	1239	944	944	649	266	2025	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518	2518	2518
		Ap	0.004	0.004	0.004	0.004	0.003	0.002	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.010	0.010	0.010
	11.2	Vc	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82	82	82
		fz	0.013	0.013	0.011	0.011	0.010	0.008	0.017	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.021	0.021	0.021
		RPM	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	52458	52458
		FEED	1151	1151	866	866	590	236	1811	1811	1811	1811	1811	1438	1438	1438	1438	1193	1193	1193	767	2203	2203	2203
		Ap	0.004	0.004	0.004	0.003	0.003	0.001	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.003	0.009	0.009	0.009
H	38.1	Vc	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82	82	82
		fz	0.013	0.013	0.011	0.011	0.010	0.008	0.017	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.021	0.021	0.021
		RPM	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	52458	52458
		FEED	1151	1151	866	866	590	236	1811	1811	1811	1811	1811	1438	1438	1438	1438	1193	1193	1193	767	2203	2203	2203
		Ap	0.004	0.004	0.004	0.003	0.003	0.001	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.003	0.009	0.009	0.009
	38.2	Vc	37	37	33	33	25	12	57	57	57	57	57	51	51	51	51	45	45	45	34	72	72	72
		fz	0.012	0.012	0.010	0.010	0.009	0.008	0.017	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.021	0.021	0.021
		RPM	39343	39343	34971	34971	26228	13114	45081	45081	45081	45081	45081	40573	40573	40573	40573	36065	36065	36065	27049	45900	45900	45900
		FEED	944	944	699	699	472	210	1533	1533	1533	1533	1533	1217	1217	1217	1217	1010	1010	1010	649	1928	1928	1928
		Ap	0.004	0.004	0.004	0.003	0.003	0.001	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.003	0.009	0.009	0.009
	39.1	Vc	37	37	33	33	25	12	52	52	52	52	52	46	46	46	46	41	41	41	31	67	67	67
		fz	0.011	0.011	0.010	0.010	0.008	0.007	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.012	0.012	0.012	0.011	0.019	0.019	0.019
		RPM	39343	39343	34971	34971	26228	13114	40983	40983	40983	40983	40983	36885	36885	36885	36885	32786	32786	32786	24590	42621	42621	42621
		FEED	866	866	699	699	420	184	1229	1229	1229	1229	1229	1033	1033	1033	1033	787	787	787	541	1620	1620	1620
		Ap	0.003	0.003	0.003	0.003	0.002	0.001	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.008	0.008	0.008
	39.2	Vc	32	32	29	29	22	11	46	46	46	46	46	42	42	42	42	37	37	37	28	57	57	57
		fz	0.011	0.011	0.010	0.010	0.008	0.007	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.012	0.012	0.012	0.011	0.019	0.019	0.019
		RPM	34425	34425	30600	30600	22950	11475	36884	36884	36884	36884	36884	33196	33196	33196	33196	29507	29507	29507	22130	36064	36064	36064
		FEED	757	757	612	612	367	161	1107	1107	1107	1107	1107	929	929	929	929	708	708	708	487	1370	1370	1370
		Ap	0.003	0.003	0.003	0.003	0.002	0.001	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.008	0.008	0.008
	39.3	Vc	28	28	25	25	19	9	41	41	41	41	41	37	37	37	37	33	33	33	25	52	52	52
		fz	0.010	0.010	0.009	0.009	0.008	0.007	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.011	0.011	0.011	0.010	0.017	0.017	0.017
		RPM	29507	29507	26229	26229	19672	9836	32786	32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	26229	19672	32786	32786	32786
		FEED	590	590	472	472	315	138	918	918	918	918	918	767	767	767	767	577	577	577	393	1115	1115	1115
		Ap	0.003	0.003	0.003	0.003	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.007	0.007	0.007
	40	Vc	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82	82	82
		fz	0.013	0.013	0.011	0.011	0.010	0.008	0.017	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.021	0.021	0.021
		RPM	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	52458	52458
		FEED	1151	1151	866	866	590	236	1811	1811	1811	1811	1811	1438	1438	1438	1438	1193	1193	1193	767	2203	2203	2203
		Ap	0.004	0.004	0.004	0.003	0.003	0.001	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.003	0.009	0.009	0.009
	41	Vc	37	37	33	33	25	12	57	57	57	57	57	51	51	51	51	45	45	45	34	72	72	72
		fz	0.012	0.012	0.010	0.010	0.009	0.008	0.017	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.021	0.021	0.021
		RPM	39343	39343	34971	34971	26228	13114	45081	45081	45081	45081	45081	40573	40573	40573	40573	36065	36065	36065	27049	45900	45900	45900
		FEED	944	944	699	699	472	210	1533	1533	1533	1533	1533	1217	1217	1217	1217	1010	1010	1010	649	1928	1928	1928
		Ap	0.004	0.004	0.004	0.003	0.003	0.001	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.003	0.009	0.009	0.009

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HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING

Ap

Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		LBS	2	2.5	3	3.5	4	4.5	5	5.5	6	8	10	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
P	5	Vc	82	82	74	74	74	74	74	66	66	49	49	98	98	98	98	98	88	88	88	88	88	88
		fz	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.019	0.017	0.017	0.029	0.029	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.026	0.026
		RPM	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	51911	51911	51911	51911	51911	46720	46720	46720	46720	46720	46720
		FEED	2518	2518	2077	2077	2077	2077	2077	1595	1595	1070	1070	3011	3011	3011	3011	3011	2429	2429	2429	2429	2429	2429
		Ap	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.005	0.012	0.012	0.011	0.011	0.011	0.010	0.010	0.010	0.008	0.008	0.008
	8	Vc	82	82	74	74	74	74	74	66	66	49	49	98	98	98	98	98	88	88	88	88	88	88
		fz	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.019	0.017	0.017	0.029	0.029	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.026	0.026
		RPM	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	51911	51911	51911	51911	51911	46720	46720	46720	46720	46720	46720
		FEED	2518	2518	2077	2077	2077	2077	2077	1595	1595	1070	1070	3011	3011	3011	3011	3011	2429	2429	2429	2429	2429	2429
		Ap	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.005	0.012	0.012	0.011	0.011	0.011	0.010	0.010	0.010	0.008	0.008	0.008
	9	Vc	82	82	74	74	74	74	74	66	66	49	49	98	98	98	98	98	88	88	88	88	88	88
		fz	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.019	0.017	0.017	0.029	0.029	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.026	0.026
		RPM	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	51911	51911	51911	51911	51911	46720	46720	46720	46720	46720	46720
		FEED	2518	2518	2077	2077	2077	2077	2077	1595	1595	1070	1070	3011	3011	3011	3011	3011	2429	2429	2429	2429	2429	2429
		Ap	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.005	0.012	0.012	0.011	0.011	0.011	0.010	0.010	0.010	0.008	0.008	0.008
	11.1	Vc	82	82	74	74	74	74	74	66	66	49	49	98	98	98	98	98	88	88	88	88	88	88
		fz	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.019	0.017	0.017	0.029	0.029	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.026	0.026
		RPM	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	51911	51911	51911	51911	51911	46720	46720	46720	46720	46720	46720
		FEED	2518	2518	2077	2077	2077	2077	2077	1595	1595	1070	1070	3011	3011	3011	3011	3011	2429	2429	2429	2429	2429	2429
		Ap	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.005	0.012	0.012	0.011	0.011	0.011	0.010	0.010	0.010	0.008	0.008	0.008
	11.2	Vc	82	82	74	74	74	74	74	66	66	49	49	98	98	98	98	98	88	88	88	88	88	88
		fz	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.025	0.025	0.025	0.025	0.025	0.023	0.023	0.023	0.023	0.023	0.023
		RPM	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	51911	51911	51911	51911	51911	46720	46720	46720	46720	46720	46720
		FEED	2203	2203	1794	1794	1794	1794	1794	1427	1427	944	944	2596	2596	2596	2596	2596	2149	2149	2149	2149	2149	2149
		Ap	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.004	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
H	38.1	Vc	82	82	74	74	74	74	74	66	66	49	49	98	98	98	98	98	88	88	88	88	88	88
		fz	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.025	0.025	0.025	0.025	0.025	0.023	0.023	0.023	0.023	0.023	0.023
		RPM	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	51911	51911	51911	51911	51911	46720	46720	46720	46720	46720	46720
		FEED	2203	2203	1794	1794	1794	1794	1794	1427	1427	944	944	2596	2596	2596	2596	2596	2149	2149	2149	2149	2149	2149
		Ap	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.004	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
	38.2	Vc	72	72	65	65	65	65	65	58	58	43	43	88	88	88	88	88	79	79	79	79	79	79
		fz	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.024	0.024	0.024	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.022
		RPM	45900	45900	41310	41310	41310	41310	41310	36720	36720	27540	27540	46447	46447	46447	46447	46447	41802	41802	41802	41802	41802	41802
		FEED	1928	1928	1570	1570	1570	1570	1570	1248	1248	826	826	2229	2229	2229	2229	2229	1839	1839	1839	1839	1839	1839
		Ap	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.004	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
	39.1	Vc	67	67	60	60	60	60	60	54	54	40	40	77	77	77	77	77	70	70	70	70	70	70
		fz	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015	0.013	0.013	0.023	0.023	0.023	0.023	0.023	0.021	0.021	0.021	0.021	0.021	0.021
		RPM	42621	42621	38359	38359	38359	38359	38359	34097	34097	25573	25573	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	36885
		FEED	1620	1620	1304	1304	1304	1304	1304	1023	1023	665	665	1885	1885	1885	1885	1885	1549	1549	1549	1549	1549	1549
		Ap	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
	39.2	Vc	57	57	51	51	51	51	51	45	45	34	34	67	67	67	67	67	60	60	60	60	60	60
		fz	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015	0.013	0.013	0.023	0.023	0.023	0.023	0.023	0.021	0.021	0.021	0.021	0.021	0.021
		RPM	36064	36064	32458	32458	32458	32458	32458	28851	28851	21638	21638	35519	35519	35519	35519	35519	31967	31967	31967	31967	31967	31967
		FEED	1370	1370	1104	1104	1104	1104	1104	866	866	563	563	1634	1634	1634	1634	1634	1343	1343	1343	1343	1343	1343
		Ap	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
	39.3	Vc	52	52	46	46	46	46	46	41	41	31	31	62	62	62	62	62	56	56	56	56	56	56
		fz	0.017	0.017	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.012	0.012	0.022	0.022	0.022	0.022	0.022	0.020	0.020	0.020	0.020	0.020	0.020
		RPM	32786	32786	29507	29507	29507	29507	29507	26229	26229	19672	19672	32786	32786	32786	32786	32786	29507	29507	29507	29507	29507	29507
		FEED	1115	1115	885	885	885	885	885	734	734	472	472	1443	1443	1443	1443	1443	1180	1180	1180	1180	1180	1180
		Ap	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.003	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005
	40	Vc	82	82	74	74	74	74	74	66	66	49	49	98	98	98	98	98	88	88	88	88	88	88
		fz	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.025	0.025	0.025	0.025	0.025	0.023	0.023	0.023	0.023	0.023	0.023
		RPM	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	51911	51911	51911	51911	51911	46720	46720	46720	46720	46720	46720
		FEED	2203	2203	1794	1794	1794	1794	1794	1427	1427	944	944	2596	2596	2596	2596	2596	2149	2149	2149	2149	2149	2149
		Ap	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.004	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
	41	Vc	72	72	65	65	65	65	65	58	58	43	43	88	88	88	88	88	79	79	79	79	79	79
		fz	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.024	0.024	0.024	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.022
		RPM	45900	45900	41310	41310	41310	41310	41310	36720	36720	27540	27540	46447	46447	46447	46447	46447	41802	41802	41802	41802	41802	41802
		FEED	1928	1928	1570	1570	1570	1570	1570	1248	1248	826	826	2229	2229	2229	2229	2229	1839	1839	1839	1839	1839	1839
		Ap	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.004	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007

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HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING

Ap

Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
		LBS	7	8	9	10	12	2	4	6	8	2	3	4	5	6	7	8	10	12	2	4	6	8
P	5	Vc	78	78	78	59	59	114	103	103	91	129	129	129	116	116	116	116	103	103	145	145	130	130
		fz	0.023	0.023	0.023	0.020	0.020	0.029	0.026	0.026	0.023	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.031	0.031	0.039	0.039	0.035	0.035
		RPM	41529	41529	41529	31147	31147	51911	46720	46720	41529	51228	51228	51228	46105	46105	46105	46105	40982	40982	51228	51228	46105	46105
		FEED	1910	1910	1910	1246	1246	3011	2429	2429	1910	3996	3996	3996	3227	3227	3227	3227	2541	2541	3996	3996	3227	3227
		Ap	0.008	0.008	0.008	0.006	0.006	0.014	0.011	0.010	0.010	0.016	0.014	0.014	0.013	0.013	0.011	0.011	0.011	0.010	0.018	0.016	0.014	0.013
	8	Vc	78	78	78	59	59	114	103	103	91	129	129	129	116	116	116	116	103	103	145	145	130	130
		fz	0.023	0.023	0.023	0.020	0.020	0.029	0.026	0.026	0.023	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.031	0.031	0.039	0.039	0.035	0.035
		RPM	41529	41529	41529	31147	31147	51911	46720	46720	41529	51228	51228	51228	46105	46105	46105	46105	40982	40982	51228	51228	46105	46105
		FEED	1910	1910	1910	1246	1246	3011	2429	2429	1910	3996	3996	3996	3227	3227	3227	3227	2541	2541	3996	3996	3227	3227
		Ap	0.008	0.008	0.008	0.006	0.006	0.014	0.011	0.010	0.010	0.016	0.014	0.014	0.013	0.013	0.011	0.011	0.011	0.010	0.018	0.016	0.014	0.013
	9	Vc	78	78	78	59	59	114	103	103	91	129	129	129	116	116	116	116	103	103	145	145	130	130
		fz	0.023	0.023	0.023	0.020	0.020	0.029	0.026	0.026	0.023	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.031	0.031	0.039	0.039	0.035	0.035
		RPM	41529	41529	41529	31147	31147	51911	46720	46720	41529	51228	51228	51228	46105	46105	46105	46105	40982	40982	51228	51228	46105	46105
		FEED	1910	1910	1910	1246	1246	3011	2429	2429	1910	3996	3996	3996	3227	3227	3227	3227	2541	2541	3996	3996	3227	3227
		Ap	0.008	0.008	0.008	0.006	0.006	0.014	0.011	0.010	0.010	0.016	0.014	0.014	0.013	0.013	0.011	0.011	0.011	0.010	0.018	0.016	0.014	0.013
	11.1	Vc	78	78	78	59	59	114	103	103	91	129	129	129	116	116	116	116	103	103	145	145	130	130
		fz	0.023	0.023	0.023	0.020	0.020	0.029	0.026	0.026	0.023	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.031	0.031	0.039	0.039	0.035	0.035
		RPM	41529	41529	41529	31147	31147	51911	46720	46720	41529	51228	51228	51228	46105	46105	46105	46105	40982	40982	51228	51228	46105	46105
		FEED	1910	1910	1910	1246	1246	3011	2429	2429	1910	3996	3996	3996	3227	3227	3227	3227	2541	2541	3996	3996	3227	3227
		Ap	0.008	0.008	0.008	0.006	0.006	0.014	0.011	0.010	0.010	0.016	0.014	0.014	0.013	0.013	0.011	0.011	0.011	0.010	0.018	0.016	0.014	0.013
	11.2	Vc	78	78	78	59	59	114	103	103	91	129	129	129	116	116	116	116	103	103	145	145	130	130
		fz	0.020	0.020	0.020	0.018	0.018	0.025	0.023	0.023	0.020	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.026	0.026	0.033	0.033	0.030	0.030
		RPM	41529	41529	41529	31147	31147	51911	46720	46720	41529	51228	51228	51228	46105	46105	46105	46105	40982	40982	51228	51228	46105	46105
		FEED	1661	1661	1661	1121	1121	2596	2149	2149	1661	3381	3381	3381	2766	2766	2766	2766	2131	2131	3381	3381	2766	2766
		Ap	0.007	0.007	0.007	0.005	0.005	0.012	0.010	0.008	0.008	0.014	0.012	0.012	0.011	0.011	0.010	0.010	0.010	0.009	0.015	0.014	0.012	0.011
H	38.1	Vc	78	78	78	59	59	114	103	103	91	129	129	129	116	116	116	116	103	103	145	145	130	130
		fz	0.020	0.020	0.020	0.018	0.018	0.025	0.023	0.023	0.020	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.026	0.026	0.033	0.033	0.030	0.030
		RPM	41529	41529	41529	31147	31147	51911	46720	46720	41529	51228	51228	51228	46105	46105	46105	46105	40982	40982	51228	51228	46105	46105
		FEED	1661	1661	1661	1121	1121	2596	2149	2149	1661	3381	3381	3381	2766	2766	2766	2766	2131	2131	3381	3381	2766	2766
		Ap	0.007	0.007	0.007	0.005	0.005	0.012	0.010	0.008	0.008	0.014	0.012	0.012	0.011	0.011	0.010	0.010	0.010	0.009	0.015	0.014	0.012	0.011
	38.2	Vc	70	70	70	53	53	102	92	92	82	118	118	118	107	107	107	107	95	95	133	133	120	120
		fz	0.019	0.019	0.019	0.017	0.017	0.024	0.022	0.022	0.019	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.026	0.026	0.033	0.033	0.030	0.030
		RPM	37158	37158	37158	27868	27868	46447	41802	41802	37158	47130	47130	47130	42417	42417	42417	42417	37704	37704	47130	47130	42417	42417
		FEED	1412	1412	1412	948	948	2229	1839	1839	1412	3111	3111	3111	2545	2545	2545	2545	1961	1961	3111	3111	2545	2545
		Ap	0.007	0.007	0.007	0.005	0.005	0.012	0.010	0.008	0.008	0.014	0.012	0.012	0.011	0.011	0.010	0.010	0.010	0.009	0.015	0.014	0.012	0.011
	39.1	Vc	62	62	62	46	46	90	81	81	72	103	103	103	93	93	93	93	82	82	116	116	104	104
		fz	0.018	0.018	0.018	0.016	0.016	0.023	0.021	0.021	0.018	0.030	0.030	0.030	0.027	0.027	0.027	0.027	0.024	0.024	0.030	0.030	0.027	0.027
		RPM	32786	32786	32786	24590	24590	40983	36885	36885	32786	40983	40983	40983	36885	36885	36885	36885	32786	32786	40983	40983	36885	36885
		FEED	1180	1180	1180	787	787	1885	1549	1549	1180	2459	2459	2459	1992	1992	1992	1992	1574	1574	2459	2459	1992	1992
		Ap	0.007	0.006	0.006	0.005	0.005	0.011	0.009	0.008	0.008	0.013	0.012	0.012	0.010	0.010	0.009	0.009	0.009	0.008	0.014	0.013	0.012	0.010
	39.2	Vc	54	54	54	40	40	78	70	70	62	93	93	93	83	83	83	83	74	74	104	104	94	94
		fz	0.018	0.018	0.018	0.016	0.016	0.023	0.021	0.021	0.018	0.030	0.030	0.030	0.027	0.027	0.027	0.027	0.024	0.024	0.030	0.030	0.027	0.027
		RPM	28415	28415	28415	21311	21311	35519	31967	31967	28415	36884	36884	36884	33196	33196	33196	33196	29507	29507	36884	36884	33196	33196
		FEED	1023	1023	1023	682	682	1634	1343	1343	1023	2213	2213	2213	1793	1793	1793	1793	1416	1416	2213	2213	1793	1793
		Ap	0.007	0.006	0.006	0.005	0.005	0.011	0.009	0.008	0.008	0.013	0.012	0.012	0.010	0.010	0.009	0.009	0.009	0.008	0.014	0.013	0.012	0.010
	39.3	Vc	49	49	49	37	37	72	65	65	58	82	82	82	74	74	74	74	66	66	93	93	83	83
		fz	0.018	0.018	0.018	0.015	0.015	0.022	0.020	0.020	0.018	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.023	0.023	0.029	0.029	0.026	0.026
		RPM	26229	26229	26229	19672	19672	32786	29507	29507	26229	32786	32786	32786	29507	29507	29507	29507	26229	26229	32786	32786	29507	29507
		FEED	944	944	944	590	590	1443	1180	1180	944	1902	1902	1902	1534	1534	1534	1534	1207	1207	1902	1902	1534	1534
		Ap	0.005	0.005	0.005	0.004	0.004	0.009	0.007	0.006	0.006	0.010	0.009	0.009	0.008	0.008	0.007	0.007	0.007	0.007	0.012	0.011	0.009	0.008
	40	Vc	78	78	78	59	59	114	103	103	91	129	129	129	116	116	116	116	103	103	145	145	130	130
		fz	0.020	0.020	0.020	0.018	0.018	0.025	0.023	0.023	0.020	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.026	0.026	0.033	0.033	0.030	0.030
		RPM	41529	41529	41529	31147	31147	51911	46720	46720	41529	51228	51228	51228	46105	46105	46105	46105	40982	40982	51228	51228	46105	46105
		FEED	1661	1661	1661	1121	1121	2596	2149	2149	1661	3381	3381	3381	2766	2766	2766	2766	2131	2131	3381	3381	2766	2766
		Ap	0.007	0.007	0.007	0.005	0.005	0.012	0.010	0.008	0.008	0.014	0.012	0.012	0.011	0.011	0.010	0.010	0.010	0.009	0.015	0.014	0.012	0.011
	41	Vc	70	70	70	53	53	102	92	92	82	118	118	118	107	107	107	107	95	95	133	133	120	120
		fz	0.019	0.019	0.019	0.017	0.017	0.024	0.022	0.022	0.019	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.026	0.026	0.033	0.033	0.030	0.030
		RPM	37158	37158	37158	27868	27868	46447	41802	41802	37158	47130	47130	47130	42417	42417	42417	42417	37704	37704	47130	47130	42417	42417
		FEED	1412	1412	1412	948	948	2229	1839	1839	1412	3111	3111	3111	2545	2545	2545	2545	1961	1961	3111	3111	2545	2545
		Ap	0.007	0.007	0.007	0.005	0.005	0.012	0.010	0.008	0.008	0.014	0.012	0.012	0.011	0.011	0.010	0.010	0.010	0.009	0.015	0.014	0.012	0.011

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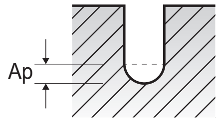
HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1.2	1.2
		LBS	2	2.5	3	4	5	6	7	8	9	10	12	13	14	16	18	20	22	25	30	2.4	4	6
P	5	Vc	160	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	48	196	196	196
		fz	0.048	0.048	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.051	0.051	0.051
		RPM	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	15245	51911	51911	51911
		FEED	4879	4879	4879	4879	4879	3933	3933	3933	3933	3933	3090	3090	3090	2073	2073	2073	884	884	884	5295	5295	5295
		Ap	0.020	0.020	0.020	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013	0.010	0.010	0.005	0.005	0.005	0.024	0.022	0.022
	8	Vc	160	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	48	196	196	196
		fz	0.048	0.048	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.051	0.051	0.051
		RPM	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	15245	51911	51911	51911
		FEED	4879	4879	4879	4879	4879	3933	3933	3933	3933	3933	3090	3090	3090	2073	2073	2073	884	884	884	5295	5295	5295
		Ap	0.020	0.020	0.020	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013	0.010	0.010	0.005	0.005	0.005	0.024	0.022	0.022
	9	Vc	160	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	48	196	196	196
		fz	0.048	0.048	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.051	0.051	0.051
		RPM	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	15245	51911	51911	51911
		FEED	4879	4879	4879	4879	4879	3933	3933	3933	3933	3933	3090	3090	3090	2073	2073	2073	884	884	884	5295	5295	5295
		Ap	0.020	0.020	0.020	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013	0.010	0.010	0.005	0.005	0.005	0.024	0.022	0.022
	11.1	Vc	160	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	48	196	196	196
		fz	0.048	0.048	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.051	0.051	0.051
		RPM	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	15245	51911	51911	51911
		FEED	4879	4879	4879	4879	4879	3933	3933	3933	3933	3933	3090	3090	3090	2073	2073	2073	884	884	884	5295	5295	5295
		Ap	0.020	0.020	0.020	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013	0.010	0.010	0.005	0.005	0.005	0.024	0.022	0.022
	11.2	Vc	160	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	48	185	185	185
		fz	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025	0.025	0.045	0.045	0.045
		RPM	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	15245	49178	49178	49178
		FEED	4269	4269	4269	4269	4269	3476	3476	3476	3476	3476	2764	2764	2764	1768	1768	1768	762	762	762	4426	4426	4426
		Ap	0.017	0.017	0.017	0.015	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.012	0.011	0.011	0.009	0.009	0.004	0.004	0.004	0.020	0.018	0.018
H	38.1	Vc	160	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	48	185	185	185
		fz	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025	0.025	0.045	0.045	0.045
		RPM	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	15245	49178	49178	49178
		FEED	4269	4269	4269	4269	4269	3476	3476	3476	3476	3476	2764	2764	2764	1768	1768	1768	762	762	762	4426	4426	4426
		Ap	0.017	0.017	0.017	0.015	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.012	0.011	0.011	0.009	0.009	0.004	0.004	0.004	0.020	0.018	0.018
	38.2	Vc	144	144	144	144	144	130	130	130	130	130	115	115	115	87	87	87	43	43	43	165	165	165
		fz	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025	0.025	0.045	0.045	0.045
		RPM	45900	45900	45900	45900	45900	41310	41310	41310	41310	41310	36720	36720	36720	27540	27540	27540	13770	13770	13770	43714	43714	43714
		FEED	3856	3856	3856	3856	3856	3140	3140	3140	3140	3140	2497	2497	2497	1597	1597	1597	689	689	689	3934	3934	3934
		Ap	0.017	0.017	0.017	0.015	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.012	0.011	0.011	0.009	0.009	0.004	0.004	0.004	0.020	0.018	0.018
	39.1	Vc	129	129	129	129	129	116	116	116	116	116	103	103	103	77	77	77	39	39	39	149	149	149
		fz	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.034	0.034	0.030	0.030	0.030	0.027	0.027	0.027	0.023	0.023	0.023	0.039	0.039	0.039
		RPM	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	32786	32786	32786	24590	24590	24590	12295	12295	12295	39616	39616	39616
		FEED	3115	3115	3115	3115	3115	2508	2508	2508	2508	2508	1967	1967	1967	1328	1328	1328	566	566	566	3090	3090	3090
		Ap	0.016	0.016	0.016	0.014	0.014	0.013	0.013	0.013	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008	0.004	0.004	0.004	0.019	0.017	0.017
	39.2	Vc	113	113	113	113	113	102	102	102	102	102	91	91	91	68	68	68	34	34	34	134	134	134
		fz	0.037	0.037	0.037	0.037	0.037	0.033	0.033	0.033	0.033	0.033	0.030	0.030	0.030	0.026	0.026	0.026	0.022	0.022	0.022	0.040	0.040	0.040
		RPM	36064	36064	36064	36064	36064	32458	32458	32458	32458	32458	28851	28851	28851	21638	21638	21638	10819	10819	10819	35519	35519	35519
		FEED	2669	2669	2669	2669	2669	2142	2142	2142	2142	2142	1731	1731	1731	1125	1125	1125	476	476	476	2842	2842	2842
		Ap	0.016	0.016	0.016	0.014	0.014	0.013	0.013	0.013	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008	0.004	0.004	0.004	0.019	0.017	0.017
	39.3	Vc	113	113	113	113	113	102	102	102	102	102	91	91	91	68	68	68	34	34	34	118	118	118
		fz	0.033	0.033	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.030	0.026	0.026	0.026	0.023	0.023	0.023	0.020	0.020	0.020	0.038	0.038	0.038
		RPM	36064	36064	36064	36064	36064	32458	32458	32458	32458	32458	28851	28851	28851	21638	21638	21638	10819	10819	10819	31420	31420	31420
		FEED	2380	2380	2380	2380	2380	1947	1947	1947	1947	1947	1500	1500	1500	995	995	995	433	433	433	2388	2388	2388
		Ap	0.013	0.013	0.013	0.012	0.012	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.003	0.003	0.003	0.016	0.014	0.014
	40	Vc	160	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	48	185	185	185
		fz	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025	0.025	0.045	0.045	0.045
		RPM	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	15245	49178	49178	49178
		FEED	4269	4269	4269	4269	4269	3476	3476	3476	3476	3476	2764	2764	2764	1768	1768	1768	762	762	762	4426	4426	4426
		Ap	0.017	0.017	0.017	0.015	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.012	0.011	0.011	0.009	0.009	0.004	0.004	0.004	0.020	0.018	0.018
	41	Vc	144	144	144	144	144	130	130	130	130	130	115	115	115	87	87	87	43	43	43	165	165	165
		fz	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025	0.025	0.045	0.045	0.045
		RPM	45900	45900	45900	45900	45900	41310	41310	41310	41310	41310	36720	36720	36720	27540	27540	27540	13770	13770	13770	43714	43714	43714
		FEED	3856	3856	3856	3856	3856	3140	3140	3140	3140	3140	2497	2497	2497	1597	1597	1597	689	689	689	3934	3934	3934
		Ap	0.017	0.017	0.017	0.015	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.012	0.011	0.011	0.009	0.009	0.004	0.004	0.004	0.020	0.018	0.018

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HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING

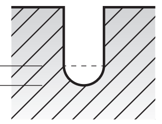
Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			1.2	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
		LBS	8	10	12	14	16	8	12	16	3	3.75	3.8	4	6	8	10	12	14	15	16	18	20	22
P	5	Vc	176	176	176	157	157	197	197	175	242	242	242	242	242	218	218	218	218	218	194	194	194	194
		fz	0.046	0.046	0.046	0.041	0.041	0.048	0.048	0.042	0.054	0.054	0.054	0.054	0.054	0.049	0.049	0.049	0.049	0.049	0.043	0.043	0.043	0.043
		RPM	46720	46720	46720	41529	41529	44814	44814	39834	51365	51365	51365	51365	51365	46229	46229	46229	46229	46229	41092	41092	41092	41092
		FEED	4298	4298	4298	3405	3405	4302	4302	3346	5547	5547	5547	5547	5547	4530	4530	4530	4530	4530	3534	3534	3534	3534
		Ap	0.019	0.017	0.017	0.017	0.016	0.022	0.020	0.020	0.030	0.030	0.030	0.030	0.027	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.020	0.020
	8	Vc	176	176	176	157	157	197	197	175	242	242	242	242	242	218	218	218	218	218	194	194	194	194
		fz	0.046	0.046	0.046	0.041	0.041	0.048	0.048	0.042	0.054	0.054	0.054	0.054	0.054	0.049	0.049	0.049	0.049	0.049	0.043	0.043	0.043	0.043
		RPM	46720	46720	46720	41529	41529	44814	44814	39834	51365	51365	51365	51365	51365	46229	46229	46229	46229	46229	41092	41092	41092	41092
		FEED	4298	4298	4298	3405	3405	4302	4302	3346	5547	5547	5547	5547	5547	4530	4530	4530	4530	4530	3534	3534	3534	3534
		Ap	0.019	0.017	0.017	0.017	0.016	0.022	0.020	0.020	0.030	0.030	0.030	0.030	0.027	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.020	0.020
	9	Vc	176	176	176	157	157	197	197	175	242	242	242	242	242	218	218	218	218	218	194	194	194	194
		fz	0.046	0.046	0.046	0.041	0.041	0.048	0.048	0.042	0.054	0.054	0.054	0.054	0.054	0.049	0.049	0.049	0.049	0.049	0.043	0.043	0.043	0.043
		RPM	46720	46720	46720	41529	41529	44814	44814	39834	51365	51365	51365	51365	51365	46229	46229	46229	46229	46229	41092	41092	41092	41092
		FEED	4298	4298	4298	3405	3405	4302	4302	3346	5547	5547	5547	5547	5547	4530	4530	4530	4530	4530	3534	3534	3534	3534
		Ap	0.019	0.017	0.017	0.017	0.016	0.022	0.020	0.020	0.030	0.030	0.030	0.030	0.027	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.020	0.020
	11.1	Vc	176	176	176	157	157	197	197	175	242	242	242	242	242	218	218	218	218	218	194	194	194	194
		fz	0.046	0.046	0.046	0.041	0.041	0.048	0.048	0.042	0.054	0.054	0.054	0.054	0.054	0.049	0.049	0.049	0.049	0.049	0.043	0.043	0.043	0.043
		RPM	46720	46720	46720	41529	41529	44814	44814	39834	51365	51365	51365	51365	51365	46229	46229	46229	46229	46229	41092	41092	41092	41092
		FEED	4298	4298	4298	3405	3405	4302	4302	3346	5547	5547	5547	5547	5547	4530	4530	4530	4530	4530	3534	3534	3534	3534
		Ap	0.019	0.017	0.017	0.017	0.016	0.022	0.020	0.020	0.030	0.030	0.030	0.030	0.027	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.020	0.020
	11.2	Vc	167	167	167	148	148	189	189	168	232	232	232	232	232	209	209	209	209	209	185	185	185	185
		fz	0.041	0.041	0.041	0.036	0.036	0.041	0.041	0.037	0.047	0.047	0.047	0.047	0.047	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038
		RPM	44260	44260	44260	39342	39342	42971	42971	38197	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	39342	39342	39342	39342
		FEED	3585	3585	3585	2833	2833	3558	3558	2811	4623	4623	4623	4623	4623	3718	3718	3718	3718	3718	2990	2990	2990	2990
		Ap	0.016	0.014	0.014	0.014	0.013	0.019	0.017	0.017	0.026	0.026	0.026	0.026	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.018	0.017	0.017
H	38.1	Vc	167	167	167	148	148	189	189	168	232	232	232	232	232	209	209	209	209	209	185	185	185	185
		fz	0.041	0.041	0.041	0.036	0.036	0.041	0.041	0.037	0.047	0.047	0.047	0.047	0.047	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038
		RPM	44260	44260	44260	39342	39342	42971	42971	38197	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	39342	39342	39342	39342
		FEED	3585	3585	3585	2833	2833	3558	3558	2811	4623	4623	4623	4623	4623	3718	3718	3718	3718	3718	2990	2990	2990	2990
		Ap	0.016	0.014	0.014	0.014	0.013	0.019	0.017	0.017	0.026	0.026	0.026	0.026	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.018	0.017	0.017
	38.2	Vc	148	148	148	132	132	172	172	153	211	211	211	211	211	190	190	190	190	190	169	169	169	169
		fz	0.041	0.041	0.041	0.036	0.036	0.041	0.041	0.037	0.047	0.047	0.047	0.047	0.047	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038
		RPM	39343	39343	39343	34971	34971	39084	39084	34742	44807	44807	44807	44807	44807	40326	40326	40326	40326	40326	35846	35846	35846	35846
		FEED	3226	3226	3226	2518	2518	3205	3205	2571	4212	4212	4212	4212	4212	3387	3387	3387	3387	3387	2724	2724	2724	2724
		Ap	0.016	0.014	0.014	0.014	0.013	0.019	0.017	0.017	0.026	0.026	0.026	0.026	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.018	0.017	0.017
	39.1	Vc	134	134	134	119	119	147	147	130	180	180	180	180	180	162	162	162	162	162	144	144	144	144
		fz	0.035	0.035	0.035	0.031	0.031	0.037	0.037	0.033	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.034
		RPM	35654	35654	35654	31693	31693	33354	33354	29648	38250	38250	38250	38250	38250	34425	34425	34425	34425	34425	30600	30600	30600	30600
		FEED	2496	2496	2496	1965	1965	2468	2468	1957	3213	3213	3213	3213	3213	2616	2616	2616	2616	2616	2081	2081	2081	2081
		Ap	0.015	0.013	0.013	0.013	0.012	0.018	0.016	0.016	0.024	0.024	0.024	0.024	0.022	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.016	0.016
	39.2	Vc	121	121	121	107	107	130	130	115	160	160	160	160	160	144	144	144	144	144	128	128	128	128
		fz	0.036	0.036	0.036	0.032	0.032	0.037	0.037	0.033	0.041	0.041	0.041	0.041	0.041	0.037	0.037	0.037	0.037	0.037	0.033	0.033	0.033	0.033
		RPM	31967	31967	31967	28415	28415	29466	29466	26192	33879	33879	33879	33879	33879	30491	30491	30491	30491	30491	27103	27103	27103	27103
		FEED	2302	2302	2302	1819	1819	2180	2180	1729	2778	2778	2778	2778	2778	2256	2256	2256	2256	2256	1789	1789	1789	1789
		Ap	0.015	0.013	0.013	0.013	0.012	0.018	0.016	0.016	0.024	0.024	0.024	0.024	0.022	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.016	0.016
	39.3	Vc	107	107	107	95	95	117	117	104	144	144	144	144	144	130	130	130	130	130	115	115	115	115
		fz	0.034	0.034	0.034	0.030	0.030	0.035	0.035	0.031	0.039	0.039	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.035	0.031	0.031	0.031	0.031
		RPM	28278	28278	28278	25136	25136	26601	26601	23646	30600	30600	30600	30600	30600	27540	27540	27540	27540	27540	24480	24480	24480	24480
		FEED	1923	1923	1923	1508	1508	1862	1862	1466	2387	2387	2387	2387	2387	1928	1928	1928	1928	1928	1518	1518	1518	1518
		Ap	0.012	0.011	0.011	0.011	0.010	0.015	0.013	0.013	0.020	0.020	0.020	0.020	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013
	40	Vc	167	167	167	148	148	189	189	168	232	232	232	232	232	209	209	209	209	209	185	185	185	185
		fz	0.041	0.041	0.041	0.036	0.036	0.041	0.041	0.037	0.047	0.047	0.047	0.047	0.047	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038
		RPM	44260	44260	44260	39342	39342	42971	42971	38197	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	39342	39342	39342	39342
		FEED	3585	3585	3585	2833	2833	3558	3558	2811	4623	4623	4623	4623	4623	3718	3718	3718	3718	3718	2990	2990	2990	2990
		Ap	0.016	0.014	0.014	0.014	0.013	0.019	0.017	0.017	0.026	0.026	0.026	0.026	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.018	0.017	0.017
	41	Vc	148	148	148	132	132	172	172	153	211	211	211	211	211	190	190	190	190	190	169	169	169	169
		fz	0.041	0.041	0.041	0.036	0.036	0.041	0.041	0.037	0.047	0.047	0.047	0.047	0.047	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038
		RPM	39343	39343	39343	34971	34971	39084	39084	34742	44807	44807	44807	44807	44807	40326	40326	40326	40326	40326	35846	35846	35846	35846
		FEED	3226	3226	3226	2518	2518	3205	3205	2571	4212	4212	4212	4212	4212	3387	3387	3387	3387	3387	2724	2724	2724	2724
		Ap	0.016	0.014	0.014	0.014	0.013	0.019	0.017	0.017	0.026	0.026	0.026	0.026	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.018	0.017	0.017

NEXT PAGE ▶

HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			1.5	1.5	1.6	1.6	1.6	1.6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		LBS	25	30	8	12	16	20	3	4	5	6	8	10	12	13	14	16	18	20	22	25	30	35
P	5	Vc	145	145	258	232	232	206	319	319	319	319	319	319	287	287	287	287	287	287	255	255	255	192
		fz	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	0.046	0.046	0.040
		RPM	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654	40654	40654	30491
		FEED	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	3740	3740	2439
		Ap	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.028	0.028	0.028	0.028	0.026	0.020
	8	Vc	145	145	258	232	232	206	319	319	319	319	319	319	287	287	287	287	287	287	255	255	255	192
		fz	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	0.046	0.046	0.040
		RPM	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654	40654	40654	30491
		FEED	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	3740	3740	2439
		Ap	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.028	0.028	0.028	0.028	0.026	0.020
	9	Vc	145	145	258	232	232	206	319	319	319	319	319	319	287	287	287	287	287	287	255	255	255	192
		fz	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	0.046	0.046	0.040
		RPM	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654	40654	40654	30491
		FEED	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	3740	3740	2439
		Ap	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.028	0.028	0.028	0.028	0.026	0.020
	11.1	Vc	145	145	258	232	232	206	319	319	319	319	319	319	287	287	287	287	287	287	255	255	255	192
		fz	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	0.046	0.046	0.040
		RPM	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654	40654	40654	30491
		FEED	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	3740	3740	2439
		Ap	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.028	0.028	0.028	0.028	0.026	0.020
	11.2	Vc	139	139	247	222	222	198	309	309	309	309	309	309	278	278	278	278	278	278	247	247	247	185
		fz	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342	39342	39342	29507
		FEED	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147	3147	3147	2065
		Ap	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024	0.024	0.022	0.017
H	38.1	Vc	139	139	247	222	222	198	309	309	309	309	309	309	278	278	278	278	278	278	247	247	247	185
		fz	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342	39342	39342	29507
		FEED	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147	3147	3147	2065
		Ap	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024	0.024	0.022	0.017
	38.2	Vc	127	127	225	202	202	180	258	258	258	258	258	258	232	232	232	232	232	232	206	206	206	155
		fz	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	26884	26884	44671	40204	40204	35737	40983	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	36885	32786	32786	32786	24590
		FEED	1774	1774	4288	3458	3458	2716	4098	4098	4098	4098	4098	4098	3320	3320	3320	3320	3320	3320	2623	2623	2623	1721
		Ap	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024	0.024	0.022	0.017
	39.1	Vc	108	108	192	172	172	153	227	227	227	227	227	227	204	204	204	204	204	204	181	181	181	136
		fz	0.029	0.029	0.043	0.039	0.039	0.034	0.045	0.045	0.045	0.045	0.045	0.045	0.041	0.041	0.041	0.041	0.041	0.041	0.036	0.036	0.036	0.032
		RPM	22950	22950	38114	34303	34303	30491	36064	36064	36064	36064	36064	36064	32458	32458	32458	32458	32458	32458	28851	28851	28851	21638
		FEED	1331	1331	3278	2676	2676	2073	3246	3246	3246	3246	3246	3246	2662	2662	2662	2662	2662	2662	2077	2077	2077	1385
		Ap	0.012	0.012	0.023	0.020	0.018	0.018	0.032	0.032	0.032	0.032	0.029	0.029	0.026	0.026	0.026	0.026	0.022	0.022	0.022	0.022	0.021	0.016
	39.2	Vc	96	96	170	153	153	136	206	206	206	206	206	206	185	185	185	185	185	185	165	165	165	124
		fz	0.029	0.029	0.043	0.039	0.039	0.034	0.044	0.044	0.044	0.044	0.044	0.044	0.040	0.040	0.040	0.040	0.040	0.040	0.035	0.035	0.035	0.031
		RPM	20327	20327	33811	30430	30430	27049	32786	32786	32786	32786	32786	32786	29507	29507	29507	29507	29507	29507	26229	26229	26229	19672
		FEED	1179	1179	2908	2374	2374	1839	2885	2885	2885	2885	2885	2885	2361	2361	2361	2361	2361	2361	1836	1836	1836	1220
		Ap	0.012	0.012	0.023	0.020	0.018	0.018	0.032	0.032	0.032	0.032	0.029	0.029	0.026	0.026	0.026	0.026	0.022	0.022	0.022	0.022	0.021	0.016
	39.3	Vc	87	87	153	138	138	123	185	185	185	185	185	185	167	167	167	167	167	167	148	148	148	111
		fz	0.027	0.027	0.039	0.035	0.035	0.031	0.040	0.040	0.040	0.040	0.040	0.040	0.036	0.036	0.036	0.036	0.036	0.036	0.032	0.032	0.032	0.028
		RPM	18360	18360	30532	27479	27479	24426	29507	29507	29507	29507	29507	29507	26556	26556	26556	26556	26556	26556	23606	23606	23606	17704
		FEED	991	991	2381	1924	1924	1514	2361	2361	2361	2361	2361	2361	1912	1912	1912	1912	1912	1912	1511	1511	1511	991
		Ap	0.010	0.010	0.019	0.017	0.015	0.015	0.026	0.026	0.026	0.026	0.023	0.023	0.021	0.021	0.021	0.021	0.018	0.018	0.018	0.018	0.017	0.013
	40	Vc	139	139	247	222	222	198	309	309	309	309	309	309	278	278	278	278	278	278	247	247	247	185
		fz	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342	39342	39342	29507
		FEED	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147	3147	3147	2065
		Ap	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024	0.024	0.022	0.017
	41	Vc	127	127	225	202	202	180	258	258	258	258	258	258	232	232	232	232	232	232	206	206	206	155
		fz	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	26884	26884	44671	40204	40204	35737	40983	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	36885	32786	32786	32786	24590
		FEED	1774	1774	4288	3458	3458	2716	4098	4098	4098	4098	4098	4098	3320	3320	3320	3320	3320	3320	2623	2623	2623	1721
		Ap	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024	0.024	0.022	0.017

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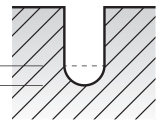
HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	3	3	3	3	3
		LBS	40	50	6	6.25	8	10	15	20	25	30	35	6	7.5	8	10	12	14	15	16	20	25	30
P	5	Vc	192	96	320	320	320	320	288	288	288	256	256	319	319	319	319	319	319	319	287	287	287	287
		fz	0.040	0.034	0.074	0.074	0.074	0.074	0.066	0.066	0.066	0.059	0.059	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.082	0.082	0.082	0.082
		RPM	30491	15245	40685	40685	40685	40685	36617	36617	36617	32548	32548	33879	33879	33879	33879	33879	33879	33879	30491	30491	30491	30491
		FEED	2439	1037	6021	6021	6021	6021	4833	4833	4833	3841	3841	6166	6166	6166	6166	6166	6166	6166	5001	5001	5001	5001
		Ap	0.020	0.010	0.050	0.050	0.045	0.045	0.040	0.040	0.035	0.035	0.033	0.060	0.060	0.060	0.054	0.054	0.054	0.054	0.048	0.048	0.042	0.042
	8	Vc	192	96	320	320	320	320	288	288	288	256	256	319	319	319	319	319	319	319	287	287	287	287
		fz	0.040	0.034	0.074	0.074	0.074	0.074	0.066	0.066	0.066	0.059	0.059	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.082	0.082	0.082	0.082
		RPM	30491	15245	40685	40685	40685	40685	36617	36617	36617	32548	32548	33879	33879	33879	33879	33879	33879	33879	30491	30491	30491	30491
		FEED	2439	1037	6021	6021	6021	6021	4833	4833	4833	3841	3841	6166	6166	6166	6166	6166	6166	6166	5001	5001	5001	5001
		Ap	0.020	0.010	0.050	0.050	0.045	0.045	0.040	0.040	0.035	0.035	0.033	0.060	0.060	0.060	0.054	0.054	0.054	0.054	0.048	0.048	0.042	0.042
	9	Vc	192	96	320	320	320	320	288	288	288	256	256	319	319	319	319	319	319	319	287	287	287	287
		fz	0.040	0.034	0.074	0.074	0.074	0.074	0.066	0.066	0.066	0.059	0.059	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.082	0.082	0.082	0.082
		RPM	30491	15245	40685	40685	40685	40685	36617	36617	36617	32548	32548	33879	33879	33879	33879	33879	33879	33879	30491	30491	30491	30491
		FEED	2439	1037	6021	6021	6021	6021	4833	4833	4833	3841	3841	6166	6166	6166	6166	6166	6166	6166	5001	5001	5001	5001
		Ap	0.020	0.010	0.050	0.050	0.045	0.045	0.040	0.040	0.035	0.035	0.033	0.060	0.060	0.060	0.054	0.054	0.054	0.054	0.048	0.048	0.042	0.042
	11.1	Vc	192	96	320	320	320	320	288	288	288	256	256	319	319	319	319	319	319	319	287	287	287	287
		fz	0.040	0.034	0.074	0.074	0.074	0.074	0.066	0.066	0.066	0.059	0.059	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.082	0.082	0.082	0.082
		RPM	30491	15245	40685	40685	40685	40685	36617	36617	36617	32548	32548	33879	33879	33879	33879	33879	33879	33879	30491	30491	30491	30491
		FEED	2439	1037	6021	6021	6021	6021	4833	4833	4833	3841	3841	6166	6166	6166	6166	6166	6166	6166	5001	5001	5001	5001
		Ap	0.020	0.010	0.050	0.050	0.045	0.045	0.040	0.040	0.035	0.035	0.033	0.060	0.060	0.060	0.054	0.054	0.054	0.054	0.048	0.048	0.042	0.042
	11.2	Vc	185	93	309	309	309	309	278	278	278	247	247	309	309	309	309	309	309	309	278	278	278	278
		fz	0.035	0.030	0.066	0.066	0.066	0.066	0.059	0.059	0.059	0.053	0.053	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.075	0.075	0.075	0.075
		RPM	29507	14753	39295	39295	39295	39295	35366	35366	35366	31436	31436	32786	32786	32786	32786	32786	32786	32786	29507	29507	29507	29507
		FEED	2065	885	5187	5187	5187	5187	4173	4173	4173	3332	3332	5442	5442	5442	5442	5442	5442	5442	4426	4426	4426	4426
		Ap	0.017	0.009	0.043	0.043	0.038	0.038	0.034	0.034	0.030	0.030	0.028	0.051	0.051	0.051	0.046	0.046	0.046	0.046	0.041	0.041	0.036	0.036
H	38.1	Vc	185	93	309	309	309	309	278	278	278	247	247	309	309	309	309	309	309	309	278	278	278	278
		fz	0.035	0.030	0.066	0.066	0.066	0.066	0.059	0.059	0.059	0.053	0.053	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.075	0.075	0.075	0.075
		RPM	29507	14753	39295	39295	39295	39295	35366	35366	35366	31436	31436	32786	32786	32786	32786	32786	32786	32786	29507	29507	29507	29507
		FEED	2065	885	5187	5187	5187	5187	4173	4173	4173	3332	3332	5442	5442	5442	5442	5442	5442	5442	4426	4426	4426	4426
		Ap	0.017	0.009	0.043	0.043	0.038	0.038	0.034	0.034	0.030	0.030	0.028	0.051	0.051	0.051	0.046	0.046	0.046	0.046	0.041	0.041	0.036	0.036
	38.2	Vc	155	77	257	257	257	257	232	232	232	206	206	258	258	258	258	258	258	258	232	232	232	232
		fz	0.035	0.030	0.063	0.063	0.063	0.063	0.056	0.056	0.056	0.050	0.050	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.068	0.068	0.068	0.068
		RPM	24590	12295	32754	32754	32754	32754	29479	29479	29479	26203	26203	27322	27322	27322	27322	27322	27322	27322	24590	24590	24590	24590
		FEED	1721	738	4127	4127	4127	4127	3302	3302	3302	2620	2620	4098	4098	4098	4098	4098	4098	4098	3344	3344	3344	3344
		Ap	0.017	0.009	0.043	0.043	0.038	0.038	0.034	0.034	0.030	0.030	0.028	0.051	0.051	0.051	0.046	0.046	0.046	0.046	0.041	0.041	0.036	0.036
	39.1	Vc	136	68	227	227	227	227	204	204	204	181	181	227	227	227	227	227	227	227	204	204	204	204
		fz	0.032	0.027	0.056	0.056	0.056	0.056	0.050	0.050	0.050	0.045	0.045	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.060	0.060	0.060	0.060
		RPM	21638	10819	28840	28840	28840	28840	25956	25956	25956	23072	23072	24043	24043	24043	24043	24043	24043	24043	21639	21639	21639	21639
		FEED	1385	584	3230	3230	3230	3230	2596	2596	2596	2076	2076	3222	3222	3222	3222	3222	3222	3222	2597	2597	2597	2597
		Ap	0.016	0.008	0.040	0.040	0.036	0.036	0.032	0.032	0.028	0.028	0.026	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.038	0.038	0.034	0.034
	39.2	Vc	124	62	206	206	206	206	186	186	186	165	165	206	206	206	206	206	206	206	185	185	185	185
		fz	0.031	0.026	0.055	0.055	0.055	0.055	0.050	0.050	0.050	0.044	0.044	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.060	0.060	0.060	0.060
		RPM	19672	9836	26265	26265	26265	26265	23639	23639	23639	21012	21012	21858	21858	21858	21858	21858	21858	21858	19672	19672	19672	19672
		FEED	1220	511	2889	2889	2889	2889	2364	2364	2364	1849	1849	2929	2929	2929	2929	2929	2929	2929	2361	2361	2361	2361
		Ap	0.016	0.008	0.040	0.040	0.036	0.036	0.032	0.032	0.028	0.028	0.026	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.038	0.038	0.034	0.034
	39.3	Vc	111	56	185	185	185	185	167	167	167	148	148	185	185	185	185	185	185	185	167	167	167	167
		fz	0.028	0.024	0.051	0.051	0.051	0.051	0.045	0.045	0.045	0.040	0.040	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.055	0.055	0.055	0.055
		RPM	17704	8852	23587	23587	23587	23587	21228	21228	21228	18870	18870	19672	19672	19672	19672	19672	19672	19672	17705	17705	17705	17705
		FEED	991	425	2406	2406	2406	2406	1911	1911	1911	1510	1510	2400	2400	2400	2400	2400	2400	2400	1948	1948	1948	1948
		Ap	0.013	0.007	0.033	0.033	0.029	0.029	0.026	0.026	0.023	0.023	0.021	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.031	0.031	0.027	0.027
	40	Vc	185	93	309	309	309	309	278	278	278	247	247	309	309	309	309	309	309	309	278	278	278	278
		fz	0.035	0.030	0.066	0.066	0.066	0.066	0.059	0.059	0.059	0.053	0.053	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.075	0.075	0.075	0.075
		RPM	29507	14753	39295	39295	39295	39295	35366	35366	35366	31436	31436	32786	32786	32786	32786	32786	32786	32786	29507	29507	29507	29507
		FEED	2065	885	5187	5187	5187	5187	4173	4173	4173	3332	3332	5442	5442	5442	5442	5442	5442	5442	4426	4426	4426	4426
		Ap	0.017	0.009	0.043	0.043	0.038	0.038	0.034	0.034	0.030	0.030	0.028	0.051	0.051	0.051	0.046	0.046	0.046	0.046	0.041	0.041	0.036	0.036
	41	Vc	155	77	257	257	257	257	232	232	232	206	206	258	258	258	258	258	258	258	232	232	232	232
		fz	0.035	0.030	0.063	0.063	0.063	0.063	0.056	0.056	0.056	0.050	0.050	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.068	0.068	0.068	0.068
		RPM	24590	12295	32754	32754	32754	32754	29479	29479	29479	26203	26203	27322	27322	27322	27322	27322	27322	27322	24590	24590	24590	24590
		FEED	1721	738	4127	4127	4127	4127	3302	3302	3302	2620	2620	4098	4098	4098	4098	4098	4098	4098	3344	3344	3344	3344
		Ap	0.017	0.009	0.043	0.043	0.038	0.038	0.034	0.034	0.030	0.030	0.028	0.051	0.051	0.051	0.046	0.046	0.046	0.046	0.041	0.041	0.036	0.036

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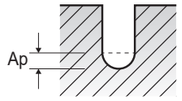
HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																						
			3	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4	4	4	4	4	4
			LBS	35	40	50	8.75	15	20	25	30	35	40	45	8	10	12	14	15	20	25	30	35	40	45
P	5	Vc	255	255	192	324	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	260	
		fz	0.073	0.073	0.064	0.105	0.105	0.094	0.094	0.094	0.094	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	0.096	
		RPM	27103	27103	20327	29510	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237	20655	
		FEED	3957	3957	2602	6197	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019	3966	
		Ap	0.042	0.039	0.030	0.070	0.063	0.056	0.056	0.049	0.049	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.072	0.064	0.064	0.056	0.056	0.056	
	8	Vc	255	255	192	324	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	260	
		fz	0.073	0.073	0.064	0.105	0.105	0.094	0.094	0.094	0.094	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	0.096	
		RPM	27103	27103	20327	29510	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237	20655	
		FEED	3957	3957	2602	6197	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019	3966	
		Ap	0.042	0.039	0.030	0.070	0.063	0.056	0.056	0.049	0.049	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.072	0.064	0.064	0.056	0.056	0.056	
	9	Vc	255	255	192	324	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	260	
		fz	0.073	0.073	0.064	0.105	0.105	0.094	0.094	0.094	0.094	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	0.096	
		RPM	27103	27103	20327	29510	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237	20655	
		FEED	3957	3957	2602	6197	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019	3966	
		Ap	0.042	0.039	0.030	0.070	0.063	0.056	0.056	0.049	0.049	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.072	0.064	0.064	0.056	0.056	0.056	
	11.1	Vc	255	255	192	324	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	260	
		fz	0.073	0.073	0.064	0.105	0.105	0.094	0.094	0.094	0.094	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	0.096	
		RPM	27103	27103	20327	29510	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237	20655	
		FEED	3957	3957	2602	6197	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019	3966	
		Ap	0.042	0.039	0.030	0.070	0.063	0.056	0.056	0.049	0.049	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.072	0.064	0.064	0.056	0.056	0.056	
	11.2	Vc	247	247	185	309	309	278	278	278	278	247	247	309	309	309	309	309	309	278	278	278	278	247	
		fz	0.066	0.066	0.058	0.097	0.097	0.087	0.087	0.087	0.087	0.078	0.078	0.111	0.111	0.111	0.111	0.111	0.111	0.100	0.100	0.100	0.100	0.089	
		RPM	26229	26229	19672	28068	28068	25261	25261	25261	25261	22454	22454	24589	24589	24589	24589	24589	24589	22130	22130	22130	22130	19671	
		FEED	3462	3462	2282	5445	5445	4395	4395	4395	4395	3503	3503	5459	5459	5459	5459	5459	5459	4426	4426	4426	4426	3501	
		Ap	0.036	0.033	0.026	0.060	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.048	
H	38.1	Vc	247	247	185	309	309	278	278	278	278	247	247	309	309	309	309	309	309	278	278	278	278	247	
		fz	0.066	0.066	0.058	0.097	0.097	0.087	0.087	0.087	0.087	0.078	0.078	0.111	0.111	0.111	0.111	0.111	0.111	0.100	0.100	0.100	0.100	0.089	
		RPM	26229	26229	19672	28068	28068	25261	25261	25261	25261	22454	22454	24589	24589	24589	24589	24589	24589	22130	22130	22130	22130	19671	
		FEED	3462	3462	2282	5445	5445	4395	4395	4395	4395	3503	3503	5459	5459	5459	5459	5459	5459	4426	4426	4426	4426	3501	
		Ap	0.036	0.033	0.026	0.060	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.048	
	38.2	Vc	206	206	155	258	258	232	232	232	232	206	206	257	257	257	257	257	257	232	232	232	232	206	
		fz	0.060	0.060	0.053	0.087	0.087	0.079	0.079	0.079	0.079	0.070	0.070	0.100	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.090	0.090	0.080	
		RPM	21858	21858	16393	23433	23433	21090	21090	21090	21090	18746	18746	20491	20491	20491	20491	20491	20491	18442	18442	18442	18442	16393	
		FEED	2623	2623	1738	4077	4077	3332	3332	3332	3332	2624	2624	4098	4098	4098	4098	4098	4098	3320	3320	3320	3320	2623	
		Ap	0.036	0.033	0.026	0.060	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.048	
	39.1	Vc	181	181	136	227	227	204	204	204	204	181	181	227	227	227	227	227	227	204	204	204	204	181	
		fz	0.054	0.054	0.047	0.079	0.079	0.071	0.071	0.071	0.071	0.063	0.063	0.090	0.090	0.090	0.090	0.090	0.090	0.081	0.081	0.081	0.081	0.072	
		RPM	19234	19234	14426	20600	20600	18540	18540	18540	18540	16480	16480	18032	18032	18032	18032	18032	18032	16229	16229	16229	16229	14426	
		FEED	2077	2077	1356	3255	3255	2633	2633	2633	2633	2076	2076	3246	3246	3246	3246	3246	3246	2629	2629	2629	2629	2077	
		Ap	0.034	0.031	0.024	0.056	0.050	0.045	0.045	0.039	0.039	0.039	0.039	0.064	0.064	0.064	0.058	0.058	0.058	0.051	0.051	0.045	0.045	0.045	
	39.2	Vc	165	165	124	206	206	186	186	186	186	165	165	206	206	206	206	206	206	185	185	185	185	165	
		fz	0.054	0.054	0.047	0.078	0.078	0.070	0.070	0.070	0.070	0.062	0.062	0.088	0.088	0.088	0.088	0.088	0.088	0.079	0.079	0.079	0.079	0.070	
		RPM	17486	17486	13115	18746	18746	16871	16871	16871	16871	14997	14997	16392	16392	16392	16392	16392	16392	14753	14753	14753	14753	13114	
		FEED	1888	1888	1233	2924	2924	2362	2362	2362	2362	1860	1860	2885	2885	2885	2885	2885	2885	2331	2331	2331	2331	1836	
		Ap	0.034	0.031	0.024	0.056	0.050	0.045	0.045	0.039	0.039	0.039	0.039	0.064	0.064	0.064	0.058	0.058	0.058	0.051	0.051	0.045	0.045	0.045	
	39.3	Vc	148	148	111	186	186	167	167	167	167	149	149	185	185	185	185	185	185	167	167	167	167	148	
		fz	0.049	0.049	0.043	0.070	0.070	0.063	0.063	0.063	0.063	0.056	0.056	0.079	0.079	0.079	0.079	0.079	0.079	0.071	0.071	0.071	0.071	0.063	
		RPM	15738	15738	11803	16892	16892	15203	15203	15203	15203	13514	13514	14754	14754	14754	14754	14754	14754	13279	13279	13279	13279	11803	
		FEED	1542	1542	1015	2365	2365	1916	1916	1916	1916	1514	1514	2331	2331	2331	2331	2331	2331	1886	1886	1886	1886	1487	
		Ap	0.027	0.025	0.020	0.046	0.041	0.036	0.036	0.032	0.032	0.032	0.032	0.052	0.052	0.052	0.047	0.047	0.047	0.042	0.042	0.036	0.036	0.036	
	40	Vc	247	247	185	309	309	278	278	278	278	247	247	309	309	309	309	309	309	278	278	278	278	247	
		fz	0.066	0.066	0.058	0.097	0.097	0.087	0.087	0.087	0.087	0.078	0.078	0.111	0.111	0.111	0.111	0.111	0.111	0.100	0.100	0.100	0.100	0.089	
		RPM	26229	26229	19672	28068	28068	25261	25261	25261	25261	22454	22454	24589	24589	24589	24589	24589	24589	22130	22130	22130	22130	19671	
		FEED	3462	3462	2282	5445	5445	4395	4395	4395	4395	3503	3503	5459	5459	5459	5459	5459	5459	4426	4426	4426	4426	3501	
		Ap	0.036	0.033	0.026	0.060	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.048	
	41	Vc	206	206	155	258	258	232	232	232	232	206	206	257	257	257	257	257	257	232	232	232	232	206	
		fz	0.060	0.060	0.053	0.087	0.087	0.079	0.079	0.079	0.079	0.070	0.070	0.100	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.090	0.090	0.080	
		RPM	21858	21858	16393	23433	23433	21090	21090	21090	21090	18746	18746	20491	20491	20491	20491	20491	20491	18442	18442	18442	18442	16393	
		FEED	2623	2623	1738	4077	4077	3332	3332	3332	3332	2624	2624	4098	4098	4098	4098	4098	4098	3320	3320	3320	3320	2623	
		Ap	0.036	0.033	0.026	0.060	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.048	

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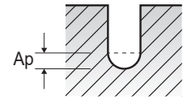
HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																						
			4	4	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6				
			LBS	50	61.1	10	12	12.5	15	20	25	30	40	10	15	20	25	30	35	40	50	60			
P	5	Vc	260	195	299	299	299	299	299	299	269	269	268	268	268	268	268	241	241	241	241				
		fz	0.096	0.084	0.156	0.156	0.156	0.156	0.156	0.156	0.140	0.140	0.174	0.174	0.174	0.174	0.174	0.157	0.157	0.157	0.157				
		RPM	20655	15491	19016	19016	19016	19016	19016	19016	17114	17114	14207	14207	14207	14207	14207	12786	12786	12786	12786				
		FEED	3966	2602	5933	5933	5933	5933	5933	5933	4792	4792	4944	4944	4944	4944	4944	4015	4015	4015	4015				
		Ap	0.056	0.052	0.100	0.100	0.100	0.100	0.090	0.090	0.080	0.080	0.120	0.120	0.108	0.108	0.108	0.096	0.096	0.084	0.084				
	8	Vc	260	195	299	299	299	299	299	299	269	269	268	268	268	268	268	241	241	241	241				
		fz	0.096	0.084	0.156	0.156	0.156	0.156	0.156	0.156	0.140	0.140	0.174	0.174	0.174	0.174	0.174	0.157	0.157	0.157	0.157				
		RPM	20655	15491	19016	19016	19016	19016	19016	19016	17114	17114	14207	14207	14207	14207	14207	12786	12786	12786	12786				
		FEED	3966	2602	5933	5933	5933	5933	5933	5933	4792	4792	4944	4944	4944	4944	4944	4015	4015	4015	4015				
		Ap	0.056	0.052	0.100	0.100	0.100	0.100	0.090	0.090	0.080	0.080	0.120	0.120	0.108	0.108	0.108	0.096	0.096	0.084	0.084				
	9	Vc	260	195	299	299	299	299	299	299	269	269	268	268	268	268	268	241	241	241	241				
		fz	0.096	0.084	0.156	0.156	0.156	0.156	0.156	0.156	0.140	0.140	0.174	0.174	0.174	0.174	0.174	0.157	0.157	0.157	0.157				
		RPM	20655	15491	19016	19016	19016	19016	19016	19016	17114	17114	14207	14207	14207	14207	14207	12786	12786	12786	12786				
		FEED	3966	2602	5933	5933	5933	5933	5933	5933	4792	4792	4944	4944	4944	4944	4944	4015	4015	4015	4015				
		Ap	0.056	0.052	0.100	0.100	0.100	0.100	0.090	0.090	0.080	0.080	0.120	0.120	0.108	0.108	0.108	0.096	0.096	0.084	0.084				
	11.1	Vc	260	195	299	299	299	299	299	299	269	269	268	268	268	268	268	241	241	241	241				
		fz	0.096	0.084	0.156	0.156	0.156	0.156	0.156	0.156	0.140	0.140	0.174	0.174	0.174	0.174	0.174	0.157	0.157	0.157	0.157				
		RPM	20655	15491	19016	19016	19016	19016	19016	19016	17114	17114	14207	14207	14207	14207	14207	12786	12786	12786	12786				
		FEED	3966	2602	5933	5933	5933	5933	5933	5933	4792	4792	4944	4944	4944	4944	4944	4015	4015	4015	4015				
		Ap	0.056	0.052	0.100	0.100	0.100	0.100	0.090	0.090	0.080	0.080	0.120	0.120	0.108	0.108	0.108	0.096	0.096	0.084	0.084				
	11.2	Vc	247	185	288	288	288	288	288	288	260	260	263	263	263	263	263	236	236	236	236				
		fz	0.089	0.078	0.138	0.138	0.138	0.138	0.138	0.138	0.124	0.124	0.153	0.153	0.153	0.153	0.153	0.138	0.138	0.138	0.138				
		RPM	19671	14753	18360	18360	18360	18360	18360	18360	16524	16524	13934	13934	13934	13934	13934	12541	12541	12541	12541				
		FEED	3501	2301	5067	5067	5067	5067	5067	5067	4098	4098	4264	4264	4264	4264	4264	3461	3461	3461	3461				
		Ap	0.048	0.044	0.085	0.085	0.085	0.085	0.077	0.077	0.068	0.068	0.102	0.102	0.092	0.092	0.092	0.082	0.082	0.071	0.071				
H	38.1	Vc	247	185	288	288	288	288	288	288	260	260	263	263	263	263	263	236	236	236	236				
		fz	0.089	0.078	0.138	0.138	0.138	0.138	0.138	0.138	0.124	0.124	0.153	0.153	0.153	0.153	0.153	0.138	0.138	0.138	0.138				
		RPM	19671	14753	18360	18360	18360	18360	18360	18360	16524	16524	13934	13934	13934	13934	13934	12541	12541	12541	12541				
		FEED	3501	2301	5067	5067	5067	5067	5067	5067	4098	4098	4264	4264	4264	4264	4264	3461	3461	3461	3461				
		Ap	0.048	0.044	0.085	0.085	0.085	0.085	0.077	0.077	0.068	0.068	0.102	0.102	0.092	0.092	0.092	0.082	0.082	0.071	0.071				
	38.2	Vc	206	155	242	242	242	242	242	242	218	218	211		211	211	211	190	190	190	190				
		fz	0.080	0.070	0.125	0.125	0.125	0.125	0.125	0.125	0.113	0.113	0.141	0.141	0.141	0.141	0.141	0.127	0.127	0.127	0.127				
		RPM	16393	12295	15410	15410	15410	15410	15410	15410	13869	13869	11202	11202	11202	11202	11202	10082	10082	10082	10082				
		FEED	2623	1721	3853	3853	3853	3853	3853	3853	3134	3134	3159	3159	3159	3159	3159	2561	2561	2561	2561				
		Ap	0.048	0.044	0.085	0.085	0.085	0.085	0.077	0.077	0.068	0.068	0.102	0.102	0.092	0.092	0.092	0.082	0.082	0.071	0.071				
	39.1	Vc	181	136	216	216	216	216	216	216	195	195	196	196	196	196	196	176	176	176	176				
		fz	0.072	0.063	0.113	0.113	0.113	0.113	0.113	0.113	0.102	0.102	0.125	0.125	0.125	0.125	0.125	0.113	0.113	0.113	0.113				
		RPM	14426	10819	13770	13770	13770	13770	13770	13770	12393	12393	10382	10382	10382	10382	10382	9344	9344	9344	9344				
		FEED	2077	1363	3112	3112	3112	3112	3112	3112	2528	2528	2596	2596	2596	2596	2596	2112	2112	2112	2112				
		Ap	0.045	0.042	0.080	0.080	0.080	0.080	0.072	0.072	0.064	0.064	0.096	0.096	0.086	0.086	0.086	0.077	0.077	0.067	0.067				
	39.2	Vc	165	124	185	185	185	185	185	185	167	167	170	170	170	170	170	153	153	153	153				
		fz	0.070	0.062	0.111	0.111	0.111	0.111	0.111	0.111	0.100	0.100	0.122	0.122	0.122	0.122	0.122	0.110	0.110	0.110	0.110				
		RPM	13114	9835	11803	11803	11803	11803	11803	11803	10623	10623	9017	9017	9017	9017	9017	8115	8115	8115	8115				
		FEED	1836	1220	2620	2620	2620	2620	2620	2620	2125	2125	2200	2200	2200	2200	2200	1785	1785	1785	1785				
		Ap	0.045	0.042	0.080	0.080	0.080	0.080	0.072	0.072	0.064	0.064	0.096	0.096	0.086	0.086	0.086	0.077	0.077	0.067	0.067				
	39.3	Vc	148	111	170	170	170	170	170	170	153	153	155	155	155	155	155	139	139	139	139				
		fz	0.063	0.055	0.100	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.109	0.109	0.109	0.109	0.109	0.098	0.098	0.098	0.098				
		RPM	11803	8852	10819	10819	10819	10819	10819	10819	9737	9737	8197	8197	8197	8197	8197	7377	7377	7377	7377				
		FEED	1487	974	2164	2164	2164	2164	2164	2164	1753	1753	1787	1787	1787	1787	1787	1446	1446	1446	1446				
		Ap	0.036	0.034	0.065	0.065	0.065	0.065	0.059	0.059	0.052	0.052	0.078	0.078	0.070	0.070	0.070	0.062	0.062	0.055	0.055				
	40	Vc	247	185	288	288	288	288	288	288	260	260	263	263	263	263	263	236	236	236	236				
		fz	0.089	0.078	0.138	0.138	0.138	0.138	0.138	0.138	0.124	0.124	0.153	0.153	0.153	0.153	0.153	0.138	0.138	0.138	0.138				
		RPM	19671	14753	18360	18360	18360	18360	18360	18360	16524	16524	13934	13934	13934	13934	13934	12541	12541	12541	12541				
		FEED	3501	2301	5067	5067	5067	5067	5067	5067	4098	4098	4264	4264	4264	4264	4264	3461	3461	3461	3461				
		Ap	0.048	0.044	0.085	0.085	0.085	0.085	0.077	0.077	0.068	0.068	0.102	0.102	0.092	0.092	0.092	0.082	0.082	0.071	0.071				
	41	Vc	206	155	242	242	242	242	242	242	218	218	211		211	211	211	190	190	190	190				
		fz	0.080	0.070	0.125	0.125	0.125	0.125	0.125	0.125	0.113	0.113	0.141	0.141	0.141	0.141	0.141	0.127	0.127	0.127	0.127				
		RPM	16393	12295	15410	15410	15410	15410	15410	15410	13869	13869	11202	11202	11202	11202	11202	10082	10082	10082	10082				
		FEED	2623	1721	3853	3853	3853	3853	3853	3853	3134	3134	3159	3159	3159	3159	3159	2561	2561	2561	2561				
		Ap	0.048	0.044	0.085	0.085	0.085	0.085	0.077	0.077	0.068	0.068	0.102	0.102	0.092	0.092	0.092	0.082	0.082	0.071	0.071				

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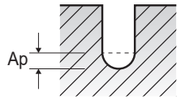
HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



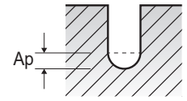
Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																	
			7	7	7	8	8	8	8	8	8	8	8	8	8	10	10	10	10	
		LBS	40	45	60	20	24	35	50	55	60	70	80	98	120	25	30	35	55	
P	5	Vc	255	255	255	288	288	288	260	260	260	260	260	231	231	299	299	299	269	
		fz	0.162	0.162	0.162	0.189	0.189	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.199	0.199	0.179	
		RPM	11588	11588	11588	11475	11475	11475	10328	10328	10328	10328	10328	9180	9180	9508	9508	9508	8557	
		FEED	3755	3755	3755	4338	4338	4338	3512	3512	3512	3512	3512	2772	2772	3784	3784	3784	3063	
		Ap	0.112	0.112	0.098	0.160	0.160	0.144	0.128	0.128	0.128	0.112	0.112	0.112	0.104	0.200	0.200	0.180	0.160	
	8	Vc	255	255	255	288	288	288	260	260	260	260	260	231	231	299	299	299	269	
		fz	0.162	0.162	0.162	0.189	0.189	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.199	0.199	0.179	
		RPM	11588	11588	11588	11475	11475	11475	10328	10328	10328	10328	10328	9180	9180	9508	9508	9508	8557	
		FEED	3755	3755	3755	4338	4338	4338	3512	3512	3512	3512	3512	2772	2772	3784	3784	3784	3063	
		Ap	0.112	0.112	0.098	0.160	0.160	0.144	0.128	0.128	0.128	0.112	0.112	0.112	0.104	0.200	0.200	0.180	0.160	
	9	Vc	255	255	255	288	288	288	260	260	260	260	260	231	231	299	299	299	269	
		fz	0.162	0.162	0.162	0.189	0.189	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.199	0.199	0.179	
		RPM	11588	11588	11588	11475	11475	11475	10328	10328	10328	10328	10328	9180	9180	9508	9508	9508	8557	
		FEED	3755	3755	3755	4338	4338	4338	3512	3512	3512	3512	3512	2772	2772	3784	3784	3784	3063	
		Ap	0.112	0.112	0.098	0.160	0.160	0.144	0.128	0.128	0.128	0.112	0.112	0.112	0.104	0.200	0.200	0.180	0.160	
	11.1	Vc	255	255	255	288	288	288	260	260	260	260	260	231	231	299	299	299	269	
		fz	0.162	0.162	0.162	0.189	0.189	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.199	0.199	0.179	
		RPM	11588	11588	11588	11475	11475	11475	10328	10328	10328	10328	10328	9180	9180	9508	9508	9508	8557	
		FEED	3755	3755	3755	4338	4338	4338	3512	3512	3512	3512	3512	2772	2772	3784	3784	3784	3063	
		Ap	0.112	0.112	0.098	0.160	0.160	0.144	0.128	0.128	0.128	0.112	0.112	0.112	0.104	0.200	0.200	0.180	0.160	
	11.2	Vc	246	246	246	278	278	278	250	250	250	250	250	222	222	288	288	288	260	
		fz	0.143	0.143	0.143	0.164	0.164	0.164	0.148	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.174	0.174	0.157	
		RPM	11171	11171	11171	11065	11065	11065	9959	9959	9959	9959	9959	8852	8852	9180	9180	9180	8262	
		FEED	3195	3195	3195	3629	3629	3629	2948	2948	2948	2948	2948	2319	2319	3195	3195	3195	2594	
		Ap	0.095	0.095	0.083	0.136	0.136	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.170	0.170	0.153	0.136	
H	38.1	Vc	246	246	246	278	278	278	250	250	250	250	250	222	222	288	288	288	260	
		fz	0.143	0.143	0.143	0.164	0.164	0.164	0.148	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.174	0.174	0.157	
		RPM	11171	11171	11171	11065	11065	11065	9959	9959	9959	9959	9959	8852	8852	9180	9180	9180	8262	
		FEED	3195	3195	3195	3629	3629	3629	2948	2948	2948	2948	2948	2319	2319	3195	3195	3195	2594	
		Ap	0.095	0.095	0.083	0.136	0.136	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.170	0.170	0.153	0.136	
	38.2	Vc	199	199	199	232	232	232	209	209	209	209	209	185	185	242	242	242	218	
		fz	0.133	0.133	0.133	0.150	0.150	0.150	0.135	0.135	0.135	0.135	0.135	0.120	0.120	0.160	0.160	0.160	0.144	
		RPM	9048	9048	9048	9221	9221	9221	8299	8299	8299	8299	8299	7377	7377	7704	7704	7704	6934	
		FEED	2407	2407	2407	2766	2766	2766	2241	2241	2241	2241	2241	1770	1770	2465	2465	2465	1997	
		Ap	0.095	0.095	0.083	0.136	0.136	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.170	0.170	0.153	0.136	
	39.1	Vc	180	180	180	206	206	206	185	185	185	185	185	165	165	211	211	211	190	
		fz	0.118	0.118	0.118	0.134	0.134	0.134	0.121	0.121	0.121	0.121	0.121	0.107	0.107	0.144	0.144	0.144	0.130	
		RPM	8204	8204	8204	8197	8197	8197	7377	7377	7377	7377	7377	6558	6558	6721	6721	6721	6049	
		FEED	1936	1936	1936	2197	2197	2197	1785	1785	1785	1785	1785	1403	1403	1936	1936	1936	1573	
		Ap	0.090	0.090	0.078	0.128	0.128	0.115	0.102	0.102	0.102	0.090	0.090	0.090	0.083	0.160	0.160	0.144	0.128	
	39.2	Vc	158	158	158	180	180	180	162	162	162	162	162	144	144	185	185	185	167	
		fz	0.115	0.115	0.115	0.132	0.132	0.132	0.119	0.119	0.119	0.119	0.119	0.106	0.106	0.142	0.142	0.142	0.128	
		RPM	7185	7185	7185	7172	7172	7172	6455	6455	6455	6455	6455	5738	5738	5902	5902	5902	5312	
		FEED	1653	1653	1653	1893	1893	1893	1536	1536	1536	1536	1536	1216	1216	1676	1676	1676	1360	
		Ap	0.090	0.090	0.078	0.128	0.128	0.115	0.102	0.102	0.102	0.090	0.090	0.090	0.083	0.160	0.160	0.144	0.128	
	39.3	Vc	148	148	148	170	170	170	153	153	153	153	153	136	136	170	170	170	153	
		fz	0.102	0.102	0.102	0.119	0.119	0.119	0.107	0.107	0.107	0.107	0.107	0.095	0.095	0.130	0.130	0.130	0.117	
		RPM	6731	6731	6731	6762	6762	6762	6086	6086	6086	6086	6086	5410	5410	5410	5410	5410	4869	
		FEED	1373	1373	1373	1609	1609	1609	1302	1302	1302	1302	1302	1028	1028	1407	1407	1407	1139	
		Ap	0.073	0.073	0.064	0.104	0.104	0.094	0.083	0.083	0.083	0.073	0.073	0.073	0.068	0.130	0.130	0.117	0.104	
	40	Vc	246	246	246	278	278	278	250	250	250	250	250	222	222	288	288	288	260	
		fz	0.143	0.143	0.143	0.164	0.164	0.164	0.148	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.174	0.174	0.157	
		RPM	11171	11171	11171	11065	11065	11065	9959	9959	9959	9959	9959	8852	8852	9180	9180	9180	8262	
		FEED	3195	3195	3195	3629	3629	3629	2948	2948	2948	2948	2948	2319	2319	3195	3195	3195	2594	
		Ap	0.095	0.095	0.083	0.136	0.136	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.170	0.170	0.153	0.136	
	41	Vc	199	199	199	232	232	232	209	209	209	209	209	185	185	242	242	242	218	
		fz	0.133	0.133	0.133	0.150	0.150	0.150	0.135	0.135	0.135	0.135	0.135	0.120	0.120	0.160	0.160	0.160	0.144	
		RPM	9048	9048	9048	9221	9221	9221	8299	8299	8299	8299	8299	7377	7377	7704	7704	7704	6934	
		FEED	2407	2407	2407	2766	2766	2766	2241	2241	2241	2241	2241	1770	1770	2465	2465	2465	1997	
		Ap	0.095	0.095	0.083	0.136	0.136	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.170	0.170	0.153	0.136	

NEXT PAGE ▶

HPI91, HPI92, HPK10 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING

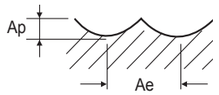


Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																	
			10	10	10	10	10	12	12	12	12	12	12	14	16	18	20	25		
		LBS	60	65	75	86	120	30	36	60	80	106	120	28	32	36	40	50		
P	5	Vc	269	269	269	269	239	268	268	268	241	241	241	288	288	288	288	288		
		fz	0.179	0.179	0.179	0.179	0.159	0.212	0.212	0.212	0.191	0.191	0.191	0.219	0.238	0.253	0.264	0.281		
		RPM	8557	8557	8557	8557	7606	7104	7104	7104	6394	6394	6394	6551	5737	5099	4590	3667		
		FEED	3063	3063	3063	3063	2419	3012	3012	3012	2443	2443	2443	2872	2732	2577	2424	2060		
		Ap	0.160	0.160	0.160	0.140	0.140	0.240	0.240	0.216	0.192	0.168	0.168	0.280	0.320	0.360	0.400	0.500		
	8	Vc	269	269	269	269	239	268	268	268	241	241	241	288	288	288	288	288		
		fz	0.179	0.179	0.179	0.179	0.159	0.212	0.212	0.212	0.191	0.191	0.191	0.219	0.238	0.253	0.264	0.281		
		RPM	8557	8557	8557	8557	7606	7104	7104	7104	6394	6394	6394	6551	5737	5099	4590	3667		
		FEED	3063	3063	3063	3063	2419	3012	3012	3012	2443	2443	2443	2872	2732	2577	2424	2060		
		Ap	0.160	0.160	0.160	0.140	0.140	0.240	0.240	0.216	0.192	0.168	0.168	0.280	0.320	0.360	0.400	0.500		
	9	Vc	269	269	269	269	239	268	268	268	241	241	241	288	288	288	288	288		
		fz	0.179	0.179	0.179	0.179	0.159	0.212	0.212	0.212	0.191	0.191	0.191	0.219	0.238	0.253	0.264	0.281		
		RPM	8557	8557	8557	8557	7606	7104	7104	7104	6394	6394	6394	6551	5737	5099	4590	3667		
		FEED	3063	3063	3063	3063	2419	3012	3012	3012	2443	2443	2443	2872	2732	2577	2424	2060		
		Ap	0.160	0.160	0.160	0.140	0.140	0.240	0.240	0.216	0.192	0.168	0.168	0.280	0.320	0.360	0.400	0.500		
	11.1	Vc	269	269	269	269	239	268	268	268	241	241	241	288	288	288	288	288		
		fz	0.179	0.179	0.179	0.179	0.159	0.212	0.212	0.212	0.191	0.191	0.191	0.219	0.238	0.253	0.264	0.281		
		RPM	8557	8557	8557	8557	7606	7104	7104	7104	6394	6394	6394	6551	5737	5099	4590	3667		
		FEED	3063	3063	3063	3063	2419	3012	3012	3012	2443	2443	2443	2872	2732	2577	2424	2060		
		Ap	0.160	0.160	0.160	0.140	0.140	0.240	0.240	0.216	0.192	0.168	0.168	0.280	0.320	0.360	0.400	0.500		
	11.2	Vc	260	260	260	260	231	257	257	257	232	232	232	279	278	278	278	278		
		fz	0.157	0.157	0.157	0.157	0.139	0.187	0.187	0.187	0.168	0.168	0.168	0.191	0.206	0.218	0.227	0.247		
		RPM	8262	8262	8262	8262	7344	6830	6830	6830	6147	6147	6147	6335	5532	4923	4426	3543		
		FEED	2594	2594	2594	2594	2042	2554	2554	2554	2065	2065	2065	2416	2279	2144	2010	1751		
		Ap	0.136	0.136	0.136	0.119	0.119	0.204	0.204	0.184	0.163	0.143	0.143	0.238	0.272	0.306	0.340	0.425		
H	38.1	Vc	260	260	260	260	231	257	257	257	232	232	232	279	278	278	278	278		
		fz	0.157	0.157	0.157	0.157	0.139	0.187	0.187	0.187	0.168	0.168	0.168	0.191	0.206	0.218	0.227	0.247		
		RPM	8262	8262	8262	8262	7344	6830	6830	6830	6147	6147	6147	6335	5532	4923	4426	3543		
		FEED	2594	2594	2594	2594	2042	2554	2554	2554	2065	2065	2065	2416	2279	2144	2010	1751		
		Ap	0.136	0.136	0.136	0.119	0.119	0.204	0.204	0.184	0.163	0.143	0.143	0.238	0.272	0.306	0.340	0.425		
	38.2	Vc	218	218	218	218	194	216	216	216	195	195	195	227	232	232	232	231		
		fz	0.144	0.144	0.144	0.144	0.128	0.170	0.170	0.170	0.153	0.153	0.153	0.179	0.189	0.200	0.208	0.219		
		RPM	6934	6934	6934	6934	6163	5737	5737	5737	5163	5163	5163	5150	4610	4099	3688	2946		
		FEED	1997	1997	1997	1997	1578	1951	1951	1951	1580	1580	1580	1847	1743	1639	1535	1288		
		Ap	0.136	0.136	0.136	0.119	0.119	0.204	0.204	0.184	0.163	0.143	0.143	0.238	0.272	0.306	0.340	0.425		
	39.1	Vc	190	190	190	190	169	196	196	196	176	176	176	206	206	206	206	206		
		fz	0.130	0.130	0.130	0.130	0.115	0.155	0.155	0.155	0.140	0.140	0.140	0.160	0.169	0.180	0.188	0.196		
		RPM	6049	6049	6049	6049	5377	5191	5191	5191	4672	4672	4672	4687	4098	3636	3278	2627		
		FEED	1573	1573	1573	1573	1237	1609	1609	1609	1308	1308	1308	1497	1385	1309	1233	1030		
		Ap	0.128	0.128	0.128	0.112	0.112	0.192	0.192	0.173	0.154	0.134	0.134	0.224	0.256	0.288	0.320	0.400		
	39.2	Vc	167	167	167	167	148	170	170	170	153	153	153	181	180	181	180	180		
		fz	0.128	0.128	0.128	0.128	0.114	0.142	0.142	0.142	0.128	0.128	0.128	0.143	0.143	0.143	0.143	0.157		
		RPM	5312	5312	5312	5312	4722	4508	4508	4508	4057	4057	4057	4110	3586	3193	2869	2297		
		FEED	1360	1360	1360	1360	1077	1280	1280	1280	1039	1039	1039	1174	1026	912	821	721		
		Ap	0.128	0.128	0.128	0.112	0.112	0.192	0.192	0.173	0.154	0.134	0.134	0.224	0.256	0.288	0.320	0.400		
	39.3	Vc	153	153	153	153	136	154	154	154	139	139	139	160	165	165	165	165		
		fz	0.117	0.117	0.117	0.117	0.104	0.131	0.131	0.131	0.118	0.118	0.118	0.132	0.133	0.133	0.129	0.140		
		RPM	4869	4869	4869	4869	4328	4098	4098	4098	3688	3688	3688	3636	3278	2910	2622	2101		
		FEED	1139	1139	1139	1139	900	1074	1074	1074	870	870	870	958	872	775	677	587		
		Ap	0.104	0.104	0.104	0.091	0.091	0.156	0.156	0.140	0.125	0.109	0.109	0.182	0.208	0.234	0.260	0.325		
	40	Vc	260	260	260	260	231	257	257	257	232	232	232	279	278	278	278	278		
		fz	0.157	0.157	0.157	0.157	0.139	0.187	0.187	0.187	0.168	0.168	0.168	0.191	0.206	0.218	0.227	0.247		
		RPM	8262	8262	8262	8262	7344	6830	6830	6830	6147	6147	6147	6335	5532	4923	4426	3543		
		FEED	2594	2594	2594	2594	2042	2554	2554	2554	2065	2065	2065	2416	2279	2144	2010	1751		
		Ap	0.136	0.136	0.136	0.119	0.119	0.204	0.204	0.184	0.163	0.143	0.143	0.238	0.272	0.306	0.340	0.425		
	41	Vc	218	218	218	218	194	216	216	216	195	195	195	227	232	232	232	231		
		fz	0.144	0.144	0.144	0.144	0.128	0.170	0.170	0.170	0.153	0.153	0.153	0.179	0.189	0.200	0.208	0.219		
		RPM	6934	6934	6934	6934	6163	5737	5737	5737	5163	5163	5163	5150	4610	4099	3688	2946		
		FEED	1997	1997	1997	1997	1578	1951	1951	1951	1580	1580	1580	1847	1743	1639	1535	1288		
		Ap	0.136	0.136	0.136	0.119	0.119	0.204	0.204	0.184	0.163	0.143	0.143	0.238	0.272	0.306	0.340	0.425		

HPI90 SERIES

2 FLUTE BALL NOSE - PLANE



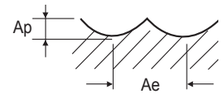
Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Ae	Ap	Para-meter	Diameter (Ø)									
						0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5	2.0
P	5	Non-alloy steel	0.05D	0.02D	Vc	31	46	67	82	98	129	160	196	242	319
					fz	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057
					RPM	49178	49178	53277	52458	51911	51228	50818	51911	51365	50818
					FEED	1180	1475	2025	2518	3011	3995	4878	5295	5548	5794
	8	Low alloy steel	0.05D	0.02D	Vc	31	46	67	82	98	129	160	196	242	319
					fz	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057
					RPM	49178	49178	53277	52458	51911	51228	50818	51911	51365	50818
					FEED	1180	1475	2025	2518	3011	3995	4878	5295	5548	5794
	9		0.05D	0.02D	Vc	31	46	67	82	98	129	160	196	242	319
					fz	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057
					RPM	49178	49178	53277	52458	51911	51228	50818	51911	51365	50818
					FEED	1180	1475	2025	2518	3011	3995	4878	5295	5548	5794
	11.1	High alloyed steel, and tool steel	0.05D	0.02D	Vc	31	46	67	82	98	129	160	196	242	319
					fz	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057
					RPM	49178	49178	53277	52458	51911	51228	50818	51911	51365	50818
					FEED	1180	1475	2025	2518	3011	3995	4878	5295	5548	5794
	11.2		0.05D	0.02D	Vc	31	46	67	82	98	129	160	185	232	309
					fz	0.011	0.014	0.017	0.021	0.025	0.033	0.042	0.045	0.047	0.050
					RPM	49178	49178	53277	52458	51911	51228	50818	49178	49178	49178
					FEED	1082	1377	1812	2203	2596	3381	4268	4426	4623	4918
H	38.1	Hardened steel	0.05D	0.02D	Vc	31	46	67	82	98	129	160	185	232	309
					fz	0.011	0.014	0.017	0.021	0.025	0.033	0.042	0.045	0.047	0.050
					RPM	49178	49178	53277	52458	51911	51228	50818	49178	49178	49178
					FEED	1082	1377	1812	2203	2596	3381	4268	4426	4623	4918
	38.2		0.05D	0.02D	Vc	29	41	57	72	88	118	144	165	211	258
					fz	0.010	0.013	0.017	0.021	0.024	0.033	0.042	0.045	0.047	0.050
					RPM	45900	43714	45081	45900	46447	47130	45900	43714	44807	40983
					FEED	918	1136	1533	1928	2230	3111	3855	3935	4212	4098
	39.1		0.05D	0.02D	Vc	26	41	52	67	77	103	129	149	180	227
					fz	0.010	0.012	0.015	0.019	0.023	0.030	0.038	0.039	0.042	0.045
					RPM	40983	43714	40983	42621	40983	40983	40983	39616	38250	36064
					FEED	820	1050	1230	1619	1885	2459	3115	3090	3213	3246
	39.2		0.05D	0.02D	Vc	21	36	46	57	67	93	113	134	160	206
					fz	0.010	0.012	0.015	0.019	0.023	0.030	0.037	0.040	0.041	0.044
					RPM	32786	38250	36884	36064	35519	36884	36064	35519	33879	32786
					FEED	656	918	1106	1371	1634	2213	2669	2842	2778	2885
	39.3		0.05D	0.02D	Vc	21	31	41	52	62	82	113	118	144	185
					fz	0.009	0.011	0.014	0.017	0.022	0.029	0.033	0.038	0.039	0.040
					RPM	32786	32786	32786	32786	32786	32786	36064	31420	30600	29507
					FEED	590	721	918	1114	1443	1901	2380	2388	2387	2361
	40	Chilled Cast Iron	0.05D	0.02D	Vc	31	46	67	82	98	129	160	185	232	309
					fz	0.011	0.014	0.017	0.021	0.025	0.033	0.042	0.045	0.047	0.050
					RPM	49178	49178	53277	52458	51911	51228	50818	49178	49178	49178
					FEED	1082	1377	1812	2203	2596	3381	4268	4426	4623	4918
	41	Hardened Cast Iron	0.05D	0.02D	Vc	29	41	57	72	88	118	144	165	211	258
					fz	0.010	0.013	0.017	0.021	0.024	0.033	0.042	0.045	0.047	0.050
					RPM	45900	43714	45081	45900	46447	47130	45900	43714	44807	40983
					FEED	918	1136	1533	1928	2230	3111	3855	3935	4212	4098

NEXT PAGE ▶

HPI90 SERIES

2 FLUTE BALL NOSE - PLANE

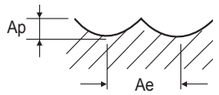


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Para-meter	Diameter (Ø)									
			2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	Vc	320	319	324	299	268	288	299	268	288	288
		fz	0.074	0.091	0.120	0.156	0.174	0.189	0.199	0.212	0.238	0.264
		RPM	40685	33879	25819	19016	14207	11475	9508	7104	5737	4590
		FEED	5979	6166	6196	5933	4944	4337	3784	3012	2732	2424
	8	Vc	320	319	324	299	268	288	299	268	288	288
		fz	0.074	0.091	0.120	0.156	0.174	0.189	0.199	0.212	0.238	0.264
		RPM	40685	33879	25819	19016	14207	11475	9508	7104	5737	4590
		FEED	5979	6166	6196	5933	4944	4337	3784	3012	2732	2424
	9	Vc	320	319	324	299	268	288	299	268	288	288
		fz	0.074	0.091	0.120	0.156	0.174	0.189	0.199	0.212	0.238	0.264
		RPM	40685	33879	25819	19016	14207	11475	9508	7104	5737	4590
		FEED	5979	6166	6196	5933	4944	4337	3784	3012	2732	2424
	11.1	Vc	320	319	324	299	268	288	299	268	288	288
		fz	0.074	0.091	0.120	0.156	0.174	0.189	0.199	0.212	0.238	0.264
		RPM	40685	33879	25819	19016	14207	11475	9508	7104	5737	4590
		FEED	5979	6166	6196	5933	4944	4337	3784	3012	2732	2424
	11.2	Vc	309	309	309	288	263	278	288	257	278	278
		fz	0.066	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
		RPM	39295	32786	24589	18360	13934	11065	9180	6830	5532	4426
		FEED	5180	5443	5459	5068	4264	3630	3195	2554	2279	2010
H	38.1	Vc	309	309	309	288	263	278	288	257	278	278
		fz	0.066	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
		RPM	39295	32786	24589	18360	13934	11065	9180	6830	5532	4426
		FEED	5180	5443	5459	5068	4264	3630	3195	2554	2279	2010
	38.2	Vc	257	258	257	242	211	232	242	216	232	232
		fz	0.063	0.075	0.100	0.125	0.141	0.150	0.160	0.170	0.189	0.208
		RPM	32754	27322	20491	15410	11202	9221	7704	5737	4610	3688
		FEED	4098	4098	4098	3852	3159	2767	2466	1951	1743	1535
	39.1	Vc	227	227	227	216	196	206	211	196	206	206
		fz	0.056	0.067	0.090	0.113	0.125	0.134	0.144	0.155	0.169	0.188
		RPM	28840	24043	18032	13770	10382	8197	6721	5191	4098	3278
		FEED	3233	3222	3246	3112	2596	2197	1935	1609	1385	1233
	39.2	Vc	206	206	206	185	170	180	185	170	180	180
		fz	0.055	0.067	0.088	0.111	0.122	0.132	0.142	0.142	0.143	0.143
		RPM	26265	21858	16392	11803	9017	7172	5902	4508	3586	2869
		FEED	2907	2929	2885	2620	2200	1893	1676	1280	1026	821
	39.3	Vc	185	185	185	170	155	170	170	154	165	165
		fz	0.051	0.061	0.079	0.100	0.109	0.119	0.130	0.131	0.133	0.129
		RPM	23587	19672	14754	10819	8197	6762	5410	4098	3278	2622
		FEED	2380	2400	2331	2164	1787	1609	1407	1073	872	677
	40	Vc	309	309	309	288	263	278	288	257	278	278
		fz	0.066	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
		RPM	39295	32786	24589	18360	13934	11065	9180	6830	5532	4426
		FEED	5180	5443	5459	5068	4264	3630	3195	2554	2279	2010
	41	Vc	257	258	257	242	211	232	242	216	232	232
		fz	0.063	0.075	0.100	0.125	0.141	0.150	0.160	0.170	0.189	0.208
		RPM	32754	27322	20491	15410	11202	9221	7704	5737	4610	3688
		FEED	4098	4098	4098	3852	3159	2767	2466	1951	1743	1535

HPK44 SERIES

2 FLUTE BALL NOSE - PLANE



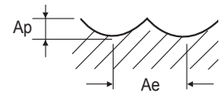
Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Ae	Ap	Para-meter	Diameter (Ø)									
						0.2	0.3	0.4	0.5	0.6	0.8	1	1.2	1.5	2
P	5	Non-alloy steel	0.08D	0.05D	Vc	20	29	39	48	59	77	97	116	145	193
					fz	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057
					RPM	31147	30600	31147	30819	31147	30737	30819	30873	30819	30655
					FEED	748	918	1184	1479	1807	2397	2959	3149	3328	3495
	8	Low alloy steel	0.08D	0.05D	Vc	20	29	39	48	59	77	97	116	145	193
					fz	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057
					RPM	31147	30600	31147	30819	31147	30737	30819	30873	30819	30655
					FEED	748	918	1184	1479	1807	2397	2959	3149	3328	3495
	9		0.08D	0.05D	Vc	20	29	39	48	59	77	97	112	140	185
					fz	0.011	0.014	0.017	0.021	0.025	0.033	0.042	0.045	0.047	0.050
					RPM	31147	30600	31147	30819	31147	30737	30819	29781	29726	29507
					FEED	685	857	1059	1294	1557	2029	2589	2680	2794	2951
	11.1	High alloyed steel, and tool steel	0.08D	0.05D	Vc	20	29	39	48	59	77	97	116	145	193
					fz	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057
					RPM	31147	30600	31147	30819	31147	30737	30819	30873	30819	30655
					FEED	748	918	1184	1479	1807	2397	2959	3149	3328	3495
	11.2		0.08D	0.05D	Vc	20	29	39	48	59	77	97	112	140	185
					fz	0.011	0.014	0.017	0.021	0.025	0.033	0.042	0.045	0.047	0.050
					RPM	31147	30600	31147	30819	31147	30737	30819	29781	29726	29507
					FEED	685	857	1059	1294	1557	2029	2589	2680	2794	2951
H	38.1	Hardened steel	0.08D	0.05D	Vc	17	25	34	42	51	68	85	97	122	151
					fz	0.011	0.013	0.017	0.021	0.024	0.033	0.042	0.045	0.047	0.050
					RPM	27056	26526	27056	26738	27056	27056	27056	25730	25889	24032
					FEED	595	690	920	1123	1299	1786	2273	2316	2434	2403
	38.2		0.08D	0.05D	Vc	17	25	34	42	51	68	85	97	122	151
					fz	0.011	0.013	0.017	0.021	0.024	0.033	0.042	0.045	0.047	0.050
					RPM	27056	26526	27056	26738	27056	27056	27056	25730	25889	24032
					FEED	595	690	920	1123	1299	1786	2273	2316	2434	2403
	40	Chilled Cast Iron	0.08D	0.05D	Vc	20	29	39	48	59	77	97	112	140	185
					fz	0.011	0.014	0.017	0.021	0.025	0.033	0.042	0.045	0.047	0.050
					RPM	31147	30600	31147	30819	31147	30737	30819	29781	29726	29507
					FEED	685	857	1059	1294	1557	2029	2589	2680	2794	2951
	41	Hardened Cast Iron	0.08D	0.05D	Vc	17	25	34	42	51	68	85	97	122	151
					fz	0.011	0.013	0.017	0.021	0.024	0.033	0.042	0.045	0.047	0.050
					RPM	27056	26526	27056	26738	27056	27056	27056	25730	25889	24032
					FEED	595	690	920	1123	1299	1786	2273	2316	2434	2403

NEXT PAGE

HPK44 SERIES

2 FLUTE BALL NOSE - PLANE

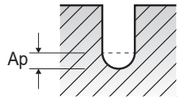


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Para-meter	Diameter (Ø)									
			2.5	3	4	5	6	8	10	12	16	20
P	5	Vc	193	193	193	180	162	172	180	162	173	173
		fz	0.074	0.091	0.121	0.156	0.174	0.189	0.199	0.212	0.238	0.264
		RPM	24524	20437	15327	11475	8579	6844	5738	4289	3443	2754
		FEED	3630	3719	3709	3580	2985	2587	2284	1819	1639	1454
	8	Vc	193	193	193	180	162	172	180	162	173	173
		fz	0.074	0.091	0.121	0.156	0.174	0.189	0.199	0.212	0.238	0.264
		RPM	24524	20437	15327	11475	8579	6844	5738	4289	3443	2754
		FEED	3630	3719	3709	3580	2985	2587	2284	1819	1639	1454
	9	Vc	185	185	185	173	157	166	173	156	166	167
		fz	0.066	0.083	0.111	0.138	0.153	0.164	0.174	0.188	0.206	0.227
		RPM	23606	19672	14754	11016	8306	6598	5508	4126	3299	2656
		FEED	3116	3265	3275	3040	2542	2164	1917	1551	1359	1206
	11.1	Vc	193	193	193	180	162	172	180	162	173	173
		fz	0.074	0.091	0.121	0.156	0.174	0.189	0.199	0.212	0.238	0.264
		RPM	24524	20437	15327	11475	8579	6844	5738	4289	3443	2754
		FEED	3630	3719	3709	3580	2985	2587	2284	1819	1639	1454
	11.2	Vc	185	185	185	173	157	166	173	156	166	167
		fz	0.066	0.083	0.111	0.138	0.153	0.164	0.174	0.188	0.206	0.227
		RPM	23606	19672	14754	11016	8306	6598	5508	4126	3299	2656
		FEED	3116	3265	3275	3040	2542	2164	1917	1551	1359	1206
H	38.1	Vc	151	151	151	141	124	136	141	127	136	136
		fz	0.063	0.075	0.100	0.125	0.141	0.150	0.160	0.170	0.189	0.208
		RPM	19226	16022	12016	8976	6578	5411	4488	3369	2706	2165
		FEED	2422	2403	2403	2244	1855	1623	1436	1145	1023	900
	38.2	Vc	151	151	151	141	124	136	141	127	136	136
		fz	0.063	0.075	0.100	0.125	0.141	0.150	0.160	0.170	0.189	0.208
		RPM	19226	16022	12016	8976	6578	5411	4488	3369	2706	2165
		FEED	2422	2403	2403	2244	1855	1623	1436	1145	1023	900
	40	Vc	185	185	185	173	157	166	173	156	166	167
		fz	0.066	0.083	0.111	0.138	0.153	0.164	0.174	0.188	0.206	0.227
		RPM	23606	19672	14754	11016	8306	6598	5508	4126	3299	2656
		FEED	3116	3265	3275	3040	2542	2164	1917	1551	1359	1206
	41	Vc	151	151	151	141	124	136	141	127	136	136
		fz	0.063	0.075	0.100	0.125	0.141	0.150	0.160	0.170	0.189	0.208
		RPM	19226	16022	12016	8976	6578	5411	4488	3369	2706	2165
		FEED	2422	2403	2403	2244	1855	1623	1436	1145	1023	900

HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Material Description	Para-meter	Diameter (Ø)																			
				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				LBS	0.3	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	5	0.5	0.6	0.75	1	1.25	1.5	1.75	2	2.25
P	5	Non-alloy steel	Vc	32	32	32	32	29	29	29	29	26	26	10	48	48	48	48	48	48	43	43	43
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004
			RPM	50818	50818	50818	50818	45900	45900	45900	45900	40983	40654	15245	51365	51365	51365	51365	51365	51365	45900	45900	45900
			FEED	305	305	305	305	275	275	275	275	164	163	61	514	514	514	514	514	514	367	367	367
			Ap	0.018	0.018	0.013	0.013	0.007	0.007	0.005	0.005	0.005	0.003	0.001	0.027	0.027	0.027	0.020	0.020	0.020	0.011	0.011	0.011
	8	Low alloy steel	Vc	32	32	32	32	29	29	29	29	26	26	10	48	48	48	48	48	48	43	43	43
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004
			RPM	50818	50818	50818	50818	45900	45900	45900	45900	40983	40654	15245	51365	51365	51365	51365	51365	51365	45900	45900	45900
			FEED	305	305	305	305	275	275	275	275	164	163	61	514	514	514	514	514	514	367	367	367
			Ap	0.018	0.018	0.013	0.013	0.007	0.007	0.005	0.005	0.005	0.003	0.001	0.027	0.027	0.027	0.020	0.020	0.020	0.011	0.011	0.011
	9		Vc	30	30	30	30	27	27	27	27	24	24	9	46	46	46	46	46	46	41	41	41
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			RPM	48277	48277	48277	48277	43605	43605	43605	43605	38934	38621	14483	48797	48797	48797	48797	48797	48797	43605	43605	43605
			FEED	259	259	259	259	234	234	234	234	139	139	52	437	437	437	437	437	437	312	312	312
			Ap	0.014	0.014	0.010	0.010	0.005	0.005	0.004	0.004	0.004	0.002	0.001	0.021	0.021	0.021	0.015	0.015	0.015	0.008	0.008	0.008
	11.1	High alloyed steel, and tool steel	Vc	32	32	32	32	29	29	29	29	26	26	10	48	48	48	48	48	48	43	43	43
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004
			RPM	50818	50818	50818	50818	45900	45900	45900	45900	40983	40654	15245	51365	51365	51365	51365	51365	51365	45900	45900	45900
			FEED	305	305	305	305	275	275	275	275	164	163	61	514	514	514	514	514	514	367	367	367
			Ap	0.018	0.018	0.013	0.013	0.007	0.007	0.005	0.005	0.005	0.003	0.001	0.027	0.027	0.027	0.020	0.020	0.020	0.011	0.011	0.011
	11.2		Vc	30	30	30	30	27	27	27	27	24	24	9	46	46	46	46	46	46	41	41	41
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			RPM	48277	48277	48277	48277	43605	43605	43605	43605	38934	38621	14483	48797	48797	48797	48797	48797	48797	43605	43605	43605
			FEED	259	259	259	259	234	234	234	234	139	139	52	437	437	437	437	437	437	312	312	312
			Ap	0.014	0.014	0.010	0.010	0.005	0.005	0.004	0.004	0.004	0.002	0.001	0.021	0.021	0.021	0.015	0.015	0.015	0.008	0.008	0.008
H	38.1	Hardened steel	Vc	27	27	27	27	24	24	24	24	21	21	8	40	40	40	40	40	40	36	36	36
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003
			RPM	42179	42179	42179	42179	38097	38097	38097	38097	34016	33743	12653	42633	42633	42633	42633	42633	42633	38097	38097	38097
			FEED	214	214	214	214	193	193	193	193	115	114	43	360	360	360	360	360	360	257	257	257
			Ap	0.010	0.010	0.007	0.007	0.004	0.004	0.003	0.003	0.003	0.002	0.001	0.015	0.015	0.015	0.011	0.011	0.011	0.006	0.006	0.006
	38.2		Vc	27	27	27	27	24	24	24	24	21	21	8	40	40	40	40	40	40	36	36	36
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003
			RPM	42179	42179	42179	42179	38097	38097	38097	38097	34016	33743	12653	42633	42633	42633	42633	42633	42633	38097	38097	38097
			FEED	214	214	214	214	193	193	193	193	115	114	43	360	360	360	360	360	360	257	257	257
			Ap	0.010	0.010	0.007	0.007	0.004	0.004	0.003	0.003	0.003	0.002	0.001	0.015	0.015	0.015	0.011	0.011	0.011	0.006	0.006	0.006
	40	Chilled Cast Iron	Vc	30	30	30	30	27	27	27	27	24	24	9	46	46	46	46	46	46	41	41	41
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			RPM	48277	48277	48277	48277	43605	43605	43605	43605	38934	38621	14483	48797	48797	48797	48797	48797	48797	43605	43605	43605
			FEED	259	259	259	259	234	234	234	234	139	139	52	437	437	437	437	437	437	312	312	312
			Ap	0.014	0.014	0.010	0.010	0.005	0.005	0.004	0.004	0.004	0.002	0.001	0.021	0.021	0.021	0.015	0.015	0.015	0.008	0.008	0.008
	41	Hardened Cast Iron	Vc	27	27	27	27	24	24	24	24	21	21	8	40	40	40	40	40	40	36	36	36
			fz	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003
			RPM	42179	42179	42179	42179	38097	38097	38097	38097	34016	33743	12653	42633	42633	42633	42633	42633	42633	38097	38097	38097
			FEED	214	214	214	214	193	193	193	193	115	114	43	360	360	360	360	360	360	257	257	257
			Ap	0.010	0.010	0.007	0.007	0.004	0.004	0.003	0.003	0.003	0.002	0.001	0.015	0.015	0.015	0.011	0.011	0.011	0.006	0.006	0.006

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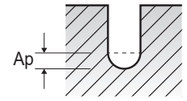
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																				
			0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
		LBS	2.5	3	3.5	4	5	7	0.5	0.8	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7	1	1.25	1.5
P	5	Vc	43	43	39	39	29	15	54	54	54	54	54	47	47	47	47	42	42	42	32	56	56	56
		fz	0.004	0.004	0.004	0.004	0.003	0.003	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.010	0.010	0.010
		RPM	45900	45900	41529	41529	30600	15409	42621	42621	42622	42622	42622	37704	37704	37704	37704	33606	33606	33606	25409	35409	35409	35409
		FEED	367	367	332	332	184	92	511	511	511	511	511	377	377	377	377	336	336	336	203	708	708	708
		Ap	0.008	0.008	0.008	0.005	0.003	0.002	0.036	0.036	0.036	0.026	0.026	0.014	0.014	0.010	0.010	0.010	0.010	0.006	0.004	0.045	0.045	0.045
	8	Vc	43	43	39	39	29	15	54	54	54	54	54	47	47	47	47	42	42	42	32	56	56	56
		fz	0.004	0.004	0.004	0.004	0.003	0.003	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.010	0.010	0.010
		RPM	45900	45900	41529	41529	30600	15409	42621	42621	42622	42622	42622	37704	37704	37704	37704	33606	33606	33606	25409	35409	35409	35409
		FEED	367	367	332	332	184	92	511	511	511	511	511	377	377	377	377	336	336	336	203	708	708	708
		Ap	0.008	0.008	0.008	0.005	0.003	0.002	0.036	0.036	0.036	0.026	0.026	0.014	0.014	0.010	0.010	0.010	0.010	0.006	0.004	0.045	0.045	0.045
	9	Vc	41	41	37	37	27	14	51	51	51	51	51	45	45	45	45	40	40	40	30	53	53	53
		fz	0.004	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.009	0.009	0.009
		RPM	43605	43605	39453	39453	29070	14639	40490	40490	40491	40491	40491	35819	35819	35819	35819	31926	31926	31926	24139	33639	33639	33639
		FEED	312	312	282	282	156	78	434	434	434	434	434	320	320	320	320	286	286	286	173	602	602	602
		Ap	0.006	0.006	0.006	0.004	0.002	0.001	0.028	0.028	0.028	0.020	0.020	0.011	0.011	0.008	0.008	0.008	0.008	0.005	0.003	0.035	0.035	0.035
	11.1	Vc	43	43	39	39	29	15	54	54	54	54	54	47	47	47	47	42	42	42	32	56	56	56
		fz	0.004	0.004	0.004	0.004	0.003	0.003	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.010	0.010	0.010
		RPM	45900	45900	41529	41529	30600	15409	42621	42621	42622	42622	42622	37704	37704	37704	37704	33606	33606	33606	25409	35409	35409	35409
		FEED	367	367	332	332	184	92	511	511	511	511	511	377	377	377	377	336	336	336	203	708	708	708
		Ap	0.008	0.008	0.008	0.005	0.003	0.002	0.036	0.036	0.036	0.026	0.026	0.014	0.014	0.010	0.010	0.010	0.010	0.006	0.004	0.045	0.045	0.045
	11.2	Vc	41	41	37	37	27	14	51	51	51	51	51	45	45	45	45	40	40	40	30	53	53	53
		fz	0.004	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.009	0.009	0.009
		RPM	43605	43605	39453	39453	29070	14639	40490	40490	40491	40491	40491	35819	35819	35819	35819	31926	31926	31926	24139	33639	33639	33639
		FEED	312	312	282	282	156	78	434	434	434	434	434	320	320	320	320	286	286	286	173	602	602	602
		Ap	0.006	0.006	0.006	0.004	0.002	0.001	0.028	0.028	0.028	0.020	0.020	0.011	0.011	0.008	0.008	0.008	0.008	0.005	0.003	0.035	0.035	0.035
H	38.1	Vc	36	36	32	32	24	12	44	44	44	44	44	39	39	39	39	35	35	35	27	46	46	46
		fz	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.008	0.008	0.008
		RPM	38097	38097	34469	34469	25398	12789	35375	35375	35376	35376	35376	31294	31294	31294	31294	27893	27893	27893	21089	29389	29389	29389
		FEED	257	257	232	232	129	64	358	358	358	358	358	264	264	264	264	235	235	235	142	496	496	496
		Ap	0.004	0.004	0.004	0.003	0.002	0.001	0.020	0.020	0.020	0.015	0.015	0.008	0.008	0.006	0.006	0.006	0.006	0.003	0.002	0.025	0.025	0.025
	38.2	Vc	36	36	32	32	24	12	44	44	44	44	44	39	39	39	39	35	35	35	27	46	46	46
		fz	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.008	0.008	0.008
		RPM	38097	38097	34469	34469	25398	12789	35375	35375	35376	35376	35376	31294	31294	31294	31294	27893	27893	27893	21089	29389	29389	29389
		FEED	257	257	232	232	129	64	358	358	358	358	358	264	264	264	264	235	235	235	142	496	496	496
		Ap	0.004	0.004	0.004	0.003	0.002	0.001	0.020	0.020	0.020	0.015	0.015	0.008	0.008	0.006	0.006	0.006	0.006	0.003	0.002	0.025	0.025	0.025
	40	Vc	41	41	37	37	27	14	51	51	51	51	51	45	45	45	45	40	40	40	30	53	53	53
		fz	0.004	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.009	0.009	0.009
		RPM	43605	43605	39453	39453	29070	14639	40490	40490	40491	40491	40491	35819	35819	35819	35819	31926	31926	31926	24139	33639	33639	33639
		FEED	312	312	282	282	156	78	434	434	434	434	434	320	320	320	320	286	286	286	173	602	602	602
		Ap	0.006	0.006	0.006	0.004	0.002	0.001	0.028	0.028	0.028	0.020	0.020	0.011	0.011	0.008	0.008	0.008	0.008	0.005	0.003	0.035	0.035	0.035
	41	Vc	36	36	32	32	24	12	44	44	44	44	44	39	39	39	39	35	35	35	27	46	46	46
		fz	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.008	0.008	0.008
		RPM	38097	38097	34469	34469	25398	12789	35375	35375	35376	35376	35376	31294	31294	31294	31294	27893	27893	27893	21089	29389	29389	29389
		FEED	257	257	232	232	129	64	358	358	358	358	358	264	264	264	264	235	235	235	142	496	496	496
		Ap	0.004	0.004	0.004	0.003	0.002	0.001	0.020	0.020	0.020	0.015	0.015	0.008	0.008	0.006	0.006	0.006	0.006	0.003	0.002	0.025	0.025	0.025

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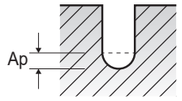
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																						
			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
			LBS	2	2.5	3	3.5	4	4.5	5	5.5	6	8	10	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
P	5	Vc	56	56	49	49	49	49	49	44	44	33	33	66	66	66	66	66	60	60	60	60	60	60	
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.015	0.015	0.015	0.015	0.015	0.013	0.013	0.013	0.013	0.013	0.013	
		RPM	35409	35409	31474	31474	31474	31475	31474	28196	28196	20983	20983	34972	34972	34972	34972	34972	31693	31693	31693	31693	31693	31693	
		FEED	708	708	567	567	567	567	567	451	451	294	294	1049	1049	1049	1049	1049	824	824	824	824	824	824	
		Ap	0.033	0.033	0.018	0.018	0.018	0.013	0.013	0.013	0.013	0.008	0.005	0.054	0.054	0.039	0.039	0.039	0.021	0.021	0.021	0.015	0.015	0.015	
	8	Vc	56	56	49	49	49	49	49	44	44	33	33	66	66	66	66	66	60	60	60	60	60	60	
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.015	0.015	0.015	0.015	0.015	0.013	0.013	0.013	0.013	0.013	0.013	
		RPM	35409	35409	31474	31474	31474	31475	31474	28196	28196	20983	20983	34972	34972	34972	34972	34972	31693	31693	31693	31693	31693	31693	
		FEED	708	708	567	567	567	567	567	451	451	294	294	1049	1049	1049	1049	1049	824	824	824	824	824	824	
		Ap	0.033	0.033	0.018	0.018	0.018	0.013	0.013	0.013	0.013	0.008	0.005	0.054	0.054	0.039	0.039	0.039	0.021	0.021	0.021	0.015	0.015	0.015	
	9	Vc	53	53	47	47	47	47	47	42	42	31	31	63	63	63	63	63	57	57	57	57	57	57	
		fz	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	
		RPM	33639	33639	29900	29900	29900	29901	29900	26786	26786	19934	19934	33223	33223	33223	33223	33223	30108	30108	30108	30108	30108	30108	
		FEED	602	602	482	482	482	482	482	383	383	250	250	892	892	892	892	892	700	700	700	700	700	700	
		Ap	0.025	0.025	0.014	0.014	0.014	0.010	0.010	0.010	0.010	0.006	0.004	0.042	0.042	0.030	0.030	0.030	0.016	0.016	0.016	0.012	0.012	0.012	
	11.1	Vc	56	56	49	49	49	49	49	44	44	33	33	66	66	66	66	66	60	60	60	60	60	60	
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.015	0.015	0.015	0.015	0.015	0.013	0.013	0.013	0.013	0.013	0.013	
		RPM	35409	35409	31474	31474	31474	31475	31474	28196	28196	20983	20983	34972	34972	34972	34972	34972	31693	31693	31693	31693	31693	31693	
		FEED	708	708	567	567	567	567	567	451	451	294	294	1049	1049	1049	1049	1049	824	824	824	824	824	824	
		Ap	0.033	0.033	0.018	0.018	0.018	0.013	0.013	0.013	0.013	0.008	0.005	0.054	0.054	0.039	0.039	0.039	0.021	0.021	0.021	0.015	0.015	0.015	
	11.2	Vc	53	53	47	47	47	47	47	42	42	31	31	63	63	63	63	63	57	57	57	57	57	57	
		fz	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	
		RPM	33639	33639	29900	29900	29900	29901	29900	26786	26786	19934	19934	33223	33223	33223	33223	33223	30108	30108	30108	30108	30108	30108	
		FEED	602	602	482	482	482	482	482	383	383	250	250	892	892	892	892	892	700	700	700	700	700	700	
		Ap	0.025	0.025	0.014	0.014	0.014	0.010	0.010	0.010	0.010	0.006	0.004	0.042	0.042	0.030	0.030	0.030	0.016	0.016	0.016	0.012	0.012	0.012	
H	38.1	Vc	46	46	41	41	41	41	41	37	37	27	27	55	55	55	55	55	50	50	50	50	50	50	
		fz	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.013	0.013	0.013	0.013	0.013	0.011	0.011	0.011	0.011	0.011	0.011	
		RPM	29389	29389	26123	26123	26123	26124	26123	23403	23403	17416	17416	29027	29027	29027	29027	29027	26305	26305	26305	26305	26305	26305	
		FEED	496	496	397	397	397	397	397	316	316	206	206	734	734	734	734	734	577	577	577	577	577	577	
		Ap	0.018	0.018	0.010	0.010	0.010	0.007	0.007	0.007	0.007	0.004	0.003	0.030	0.030	0.022	0.022	0.022	0.012	0.012	0.012	0.008	0.008	0.008	
	38.2	Vc	46	46	41	41	41	41	41	37	37	27	27	55	55	55	55	55	50	50	50	50	50	50	
		fz	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.013	0.013	0.013	0.013	0.013	0.011	0.011	0.011	0.011	0.011	0.011	
		RPM	29389	29389	26123	26123	26123	26124	26123	23403	23403	17416	17416	29027	29027	29027	29027	29027	26305	26305	26305	26305	26305	26305	
		FEED	496	496	397	397	397	397	397	316	316	206	206	734	734	734	734	734	577	577	577	577	577	577	
		Ap	0.018	0.018	0.010	0.010	0.010	0.007	0.007	0.007	0.007	0.004	0.003	0.030	0.030	0.022	0.022	0.022	0.012	0.012	0.012	0.008	0.008	0.008	
	40	Vc	53	53	47	47	47	47	47	42	42	31	31	63	63	63	63	63	57	57	57	57	57	57	
		fz	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	
		RPM	33639	33639	29900	29900	29900	29901	29900	26786	26786	19934	19934	33223	33223	33223	33223	33223	30108	30108	30108	30108	30108	30108	
		FEED	602	602	482	482	482	482	482	383	383	250	250	892	892	892	892	892	700	700	700	700	700	700	
		Ap	0.025	0.025	0.014	0.014	0.014	0.010	0.010	0.010	0.010	0.006	0.004	0.042	0.042	0.030	0.030	0.030	0.016	0.016	0.016	0.012	0.012	0.012	
	41	Vc	46	46	41	41	41	41	41	37	37	27	27	55	55	55	55	55	50	50	50	50	50	50	
		fz	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.013	0.013	0.013	0.013	0.013	0.011	0.011	0.011	0.011	0.011	0.011	
		RPM	29389	29389	26123	26123	26123	26124	26123	23403	23403	17416	17416	29027	29027	29027	29027	29027	26305	26305	26305	26305	26305	26305	
		FEED	496	496	397	397	397	397	397	316	316	206	206	734	734	734	734	734	577	577	577	577	577	577	
		Ap	0.018	0.018	0.010	0.010	0.010	0.007	0.007	0.007	0.007	0.004	0.003	0.030	0.030	0.022	0.022	0.022	0.012	0.012	0.012	0.008	0.008	0.008	

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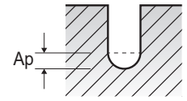
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																						
			0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	
			LBS	7	8	9	10	12	2	4	6	8	2	3	4	5	6	7	8	10	12	2	4	6	8
P	5	Vc	54	54	54	40	40	77	70	70	62	89	89	89	79	79	79	79	71	71	85	85	85	85	
		fz	0.012	0.012	0.012	0.010	0.010	0.017	0.015	0.015	0.013	0.018	0.018	0.018	0.016	0.016	0.016	0.016	0.014	0.014	0.019	0.019	0.019	0.019	
		RPM	28415	28414	28415	21311	21311	35128	31849	31849	28102	35245	35245	35245	31556	31556	31556	31556	28278	28278	30236	30236	30236	30236	
		FEED	682	682	682	426	426	1194	955	955	731	1269	1269	1269	1010	1010	1010	1010	792	792	1149	1149	1149	1149	
		Ap	0.015	0.009	0.009	0.006	0.006	0.063	0.025	0.018	0.018	0.072	0.052	0.052	0.028	0.028	0.020	0.020	0.020	0.012	0.081	0.059	0.032	0.023	
	8	Vc	54	54	54	40	40	77	70	70	62	89	89	89	79	79	79	79	71	71	85	85	85	85	
		fz	0.012	0.012	0.012	0.010	0.010	0.017	0.015	0.015	0.013	0.018	0.018	0.018	0.016	0.016	0.016	0.016	0.014	0.014	0.019	0.019	0.019	0.019	
		RPM	28415	28414	28415	21311	21311	35128	31849	31849	28102	35245	35245	35245	31556	31556	31556	31556	28278	28278	30236	30236	30236	30236	
		FEED	682	682	682	426	426	1194	955	955	731	1269	1269	1269	1010	1010	1010	1010	792	792	1149	1149	1149	1149	
		Ap	0.015	0.009	0.009	0.006	0.006	0.063	0.025	0.018	0.018	0.072	0.052	0.052	0.028	0.028	0.020	0.020	0.020	0.012	0.081	0.059	0.032	0.023	
	9	Vc	51	51	51	38	38	73	67	67	59	84	84	84	75	75	75	75	68	68	81	81	81	81	
		fz	0.011	0.011	0.011	0.009	0.009	0.015	0.013	0.013	0.012	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013	0.017	0.017	0.017	0.017	
		RPM	26994	26993	26994	20245	20245	33372	30257	30257	26697	33483	33483	33483	29978	29978	29978	29978	26864	26864	28724	28724	28724	28724	
		FEED	580	580	580	362	362	1015	812	812	621	1079	1079	1079	859	859	859	859	673	673	977	977	977	977	
		Ap	0.012	0.007	0.007	0.005	0.005	0.049	0.019	0.014	0.014	0.056	0.041	0.041	0.022	0.022	0.016	0.016	0.016	0.009	0.063	0.046	0.025	0.018	
	11.1	Vc	54	54	54	40	40	77	70	70	62	89	89	89	79	79	79	79	71	71	85	85	85	85	
		fz	0.012	0.012	0.012	0.010	0.010	0.017	0.015	0.015	0.013	0.018	0.018	0.018	0.016	0.016	0.016	0.016	0.014	0.014	0.019	0.019	0.019	0.019	
		RPM	28415	28414	28415	21311	21311	35128	31849	31849	28102	35245	35245	35245	31556	31556	31556	31556	28278	28278	30236	30236	30236	30236	
		FEED	682	682	682	426	426	1194	955	955	731	1269	1269	1269	1010	1010	1010	1010	792	792	1149	1149	1149	1149	
		Ap	0.015	0.009	0.009	0.006	0.006	0.063	0.025	0.018	0.018	0.072	0.052	0.052	0.028	0.028	0.020	0.020	0.020	0.012	0.081	0.059	0.032	0.023	
	11.2	Vc	51	51	51	38	38	73	67	67	59	84	84	84	75	75	75	75	68	68	81	81	81	81	
		fz	0.011	0.011	0.011	0.009	0.009	0.015	0.013	0.013	0.012	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013	0.017	0.017	0.017	0.017	
		RPM	26994	26993	26994	20245	20245	33372	30257	30257	26697	33483	33483	33483	29978	29978	29978	29978	26864	26864	28724	28724	28724	28724	
		FEED	580	580	580	362	362	1015	812	812	621	1079	1079	1079	859	859	859	859	673	673	977	977	977	977	
		Ap	0.012	0.007	0.007	0.005	0.005	0.049	0.019	0.014	0.014	0.056	0.041	0.041	0.022	0.022	0.016	0.016	0.016	0.009	0.063	0.046	0.025	0.018	
H	38.1	Vc	44	44	44	33	33	64	58	58	51	74	74	74	66	66	66	66	59	59	71	71	71	71	
		fz	0.010	0.010	0.010	0.008	0.008	0.014	0.013	0.013	0.011	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.012	0.012	0.016	0.016	0.016	0.016	
		RPM	23584	23584	23584	17688	17688	29156	26435	26435	23325	29253	29253	29253	26191	26191	26191	26191	23471	23471	25096	25096	25096	25096	
		FEED	477	477	477	298	298	836	669	669	512	888	888	888	707	707	707	707	554	554	804	804	804	804	
		Ap	0.008	0.005	0.005	0.003	0.003	0.035	0.014	0.010	0.010	0.040	0.029	0.029	0.016	0.016	0.011	0.011	0.011	0.007	0.045	0.033	0.018	0.013	
	38.2	Vc	44	44	44	33	33	64	58	58	51	74	74	74	66	66	66	66	59	59	71	71	71	71	
		fz	0.010	0.010	0.010	0.008	0.008	0.014	0.013	0.013	0.011	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.012	0.012	0.016	0.016	0.016	0.016	
		RPM	23584	23584	23584	17688	17688	29156	26435	26435	23325	29253	29253	29253	26191	26191	26191	26191	23471	23471	25096	25096	25096	25096	
		FEED	477	477	477	298	298	836	669	669	512	888	888	888	707	707	707	707	554	554	804	804	804	804	
		Ap	0.008	0.005	0.005	0.003	0.003	0.035	0.014	0.010	0.010	0.040	0.029	0.029	0.016	0.016	0.011	0.011	0.011	0.007	0.045	0.033	0.018	0.013	
	40	Vc	51	51	51	38	38	73	67	67	59	84	84	84	75	75	75	75	68	68	81	81	81	81	
		fz	0.011	0.011	0.011	0.009	0.009	0.015	0.013	0.013	0.012	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.013	0.013	0.017	0.017	0.017	0.017	
		RPM	26994	26993	26994	20245	20245	33372	30257	30257	26697	33483	33483	33483	29978	29978	29978	29978	26864	26864	28724	28724	28724	28724	
		FEED	580	580	580	362	362	1015	812	812	621	1079	1079	1079	859	859	859	859	673	673	977	977	977	977	
		Ap	0.012	0.007	0.007	0.005	0.005	0.049	0.019	0.014	0.014	0.056	0.041	0.041	0.022	0.022	0.016	0.016	0.016	0.009	0.063	0.046	0.025	0.018	
	41	Vc	44	44	44	33	33	64	58	58	51	74	74	74	66	66	66	66	59	59	71	71	71	71	
		fz	0.010	0.010	0.010	0.008	0.008	0.014	0.013	0.013	0.011	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.012	0.012	0.016	0.016	0.016	0.016	
		RPM	23584	23584	23584	17688	17688	29156	26435	26435	23325	29253	29253	29253	26191	26191	26191	26191	23471	23471	25096	25096	25096	25096	
		FEED	477	477	477	298	298	836	669	669	512	888	888	888	707	707	707	707	554	554	804	804	804	804	
		Ap	0.008	0.005	0.005	0.003	0.003	0.035	0.014	0.010	0.010	0.040	0.029	0.029	0.016	0.016	0.011	0.011	0.011	0.007	0.045	0.033	0.018	0.013	

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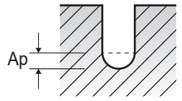
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1.2	1.2	
		LBS	2	2.5	3	4	5	6	7	8	9	10	12	13	14	16	18	20	22	25	30	2.4	4	6
P	5	Vc	100	100	100	100	100	90	90	90	90	90	79	79	79	60	60	60	30	30	30	102	102	102
		fz	0.025	0.025	0.025	0.025	0.025	0.022	0.022	0.022	0.022	0.022	0.020	0.020	0.020	0.017	0.017	0.017	0.015	0.015	0.015	0.026	0.026	0.026
		RPM	31802	31802	31802	31802	31802	28524	28524	28524	28524	28524	25245	25245	25245	19016	19016	19016	9508	9508	9508	27048	27048	27048
		FEED	1590	1590	1590	1590	1590	1255	1255	1255	1255	1255	1010	1010	1010	647	647	647	285	285	285	1407	1407	1407
		Ap	0.090	0.090	0.090	0.065	0.065	0.035	0.035	0.035	0.025	0.025	0.025	0.025	0.015	0.015	0.010	0.010	0.005	0.005	0.005	0.108	0.078	0.078
	8	Vc	100	100	100	100	100	90	90	90	90	90	79	79	79	60	60	60	30	30	30	102	102	102
		fz	0.025	0.025	0.025	0.025	0.025	0.022	0.022	0.022	0.022	0.022	0.020	0.020	0.020	0.017	0.017	0.017	0.015	0.015	0.015	0.026	0.026	0.026
		RPM	31802	31802	31802	31802	31802	28524	28524	28524	28524	28524	25245	25245	25245	19016	19016	19016	9508	9508	9508	27048	27048	27048
		FEED	1590	1590	1590	1590	1590	1255	1255	1255	1255	1255	1010	1010	1010	647	647	647	285	285	285	1407	1407	1407
		Ap	0.090	0.090	0.090	0.065	0.065	0.035	0.035	0.035	0.025	0.025	0.025	0.025	0.015	0.015	0.010	0.010	0.005	0.005	0.005	0.108	0.078	0.078
	9	Vc	95	95	95	95	95	85	85	85	85	85	75	75	75	57	57	57	28	28	28	97	97	97
		fz	0.022	0.022	0.022	0.022	0.022	0.020	0.020	0.020	0.020	0.020	0.018	0.018	0.018	0.015	0.015	0.015	0.013	0.013	0.013	0.023	0.023	0.023
		RPM	30212	30212	30212	30212	30212	27098	27098	27098	27098	27098	23983	23983	23983	18065	18065	18065	9033	9033	9033	25696	25696	25696
		FEED	1352	1352	1352	1352	1352	1067	1067	1067	1067	1067	859	859	859	550	550	550	242	242	242	1196	1196	1196
		Ap	0.070	0.070	0.070	0.051	0.051	0.027	0.027	0.027	0.020	0.020	0.020	0.020	0.012	0.012	0.008	0.008	0.004	0.004	0.004	0.084	0.061	0.061
	11.1	Vc	100	100	100	100	100	90	90	90	90	90	79	79	79	60	60	60	30	30	30	102	102	102
		fz	0.025	0.025	0.025	0.025	0.025	0.022	0.022	0.022	0.022	0.022	0.020	0.020	0.020	0.017	0.017	0.017	0.015	0.015	0.015	0.026	0.026	0.026
		RPM	31802	31802	31802	31802	31802	28524	28524	28524	28524	28524	25245	25245	25245	19016	19016	19016	9508	9508	9508	27048	27048	27048
		FEED	1590	1590	1590	1590	1590	1255	1255	1255	1255	1255	1010	1010	1010	647	647	647	285	285	285	1407	1407	1407
		Ap	0.090	0.090	0.090	0.065	0.065	0.035	0.035	0.035	0.025	0.025	0.025	0.025	0.015	0.015	0.010	0.010	0.005	0.005	0.005	0.108	0.078	0.078
	11.2	Vc	95	95	95	95	95	85	85	85	85	85	75	75	75	57	57	57	28	28	28	97	97	97
		fz	0.022	0.022	0.022	0.022	0.022	0.020	0.020	0.020	0.020	0.020	0.018	0.018	0.018	0.015	0.015	0.015	0.013	0.013	0.013	0.023	0.023	0.023
		RPM	30212	30212	30212	30212	30212	27098	27098	27098	27098	27098	23983	23983	23983	18065	18065	18065	9033	9033	9033	25696	25696	25696
		FEED	1352	1352	1352	1352	1352	1067	1067	1067	1067	1067	859	859	859	550	550	550	242	242	242	1196	1196	1196
		Ap	0.070	0.070	0.070	0.051	0.051	0.027	0.027	0.027	0.020	0.020	0.020	0.020	0.012	0.012	0.008	0.008	0.004	0.004	0.004	0.084	0.061	0.061
H	38.1	Vc	83	83	83	83	83	74	74	74	74	74	66	66	66	50	50	50	25	25	25	85	85	85
		fz	0.021	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.014	0.014	0.014	0.013	0.013	0.013	0.022	0.022	0.022
		RPM	26396	26396	26396	26396	26396	23675	23675	23675	23675	23675	20953	20953	20953	15783	15783	15783	7892	7892	7892	22450	22450	22450
		FEED	1113	1113	1113	1113	1113	879	879	879	879	879	707	707	707	453	453	453	200	200	200	985	985	985
		Ap	0.050	0.050	0.050	0.036	0.036	0.020	0.020	0.020	0.014	0.014	0.014	0.014	0.008	0.008	0.006	0.006	0.003	0.003	0.003	0.060	0.044	0.044
	38.2	Vc	83	83	83	83	83	74	74	74	74	74	66	66	66	50	50	50	25	25	25	85	85	85
		fz	0.021	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.014	0.014	0.014	0.013	0.013	0.013	0.022	0.022	0.022
		RPM	26396	26396	26396	26396	26396	23675	23675	23675	23675	23675	20953	20953	20953	15783	15783	15783	7892	7892	7892	22450	22450	22450
		FEED	1113	1113	1113	1113	1113	879	879	879	879	879	707	707	707	453	453	453	200	200	200	985	985	985
		Ap	0.050	0.050	0.050	0.036	0.036	0.020	0.020	0.020	0.014	0.014	0.014	0.014	0.008	0.008	0.006	0.006	0.003	0.003	0.003	0.060	0.044	0.044
	40	Vc	95	95	95	95	95	85	85	85	85	85	75	75	75	57	57	57	28	28	28	97	97	97
		fz	0.022	0.022	0.022	0.022	0.022	0.020	0.020	0.020	0.020	0.020	0.018	0.018	0.018	0.015	0.015	0.015	0.013	0.013	0.013	0.023	0.023	0.023
		RPM	30212	30212	30212	30212	30212	27098	27098	27098	27098	27098	23983	23983	23983	18065	18065	18065	9033	9033	9033	25696	25696	25696
		FEED	1352	1352	1352	1352	1352	1067	1067	1067	1067	1067	859	859	859	550	550	550	242	242	242	1196	1196	1196
		Ap	0.070	0.070	0.070	0.051	0.051	0.027	0.027	0.027	0.020	0.020	0.020	0.020	0.012	0.012	0.008	0.008	0.004	0.004	0.004	0.084	0.061	0.061
	41	Vc	83	83	83	83	83	74	74	74	74	74	66	66	66	50	50	50	25	25	25	85	85	85
		fz	0.021	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.014	0.014	0.014	0.013	0.013	0.013	0.022	0.022	0.022
		RPM	26396	26396	26396	26396	26396	23675	23675	23675	23675	23675	20953	20953	20953	15783	15783	15783	7892	7892	7892	22450	22450	22450
		FEED	1113	1113	1113	1113	1113	879	879	879	879	879	707	707	707	453	453	453	200	200	200	985	985	985
		Ap	0.050	0.050	0.050	0.036	0.036	0.020	0.020	0.020	0.014	0.014	0.014	0.014	0.008	0.008	0.006	0.006	0.003	0.003	0.003	0.060	0.044	0.044

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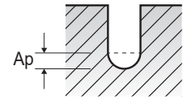
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			1.2	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
		LBS	8	10	12	14	16	8	12	16	3	3.75	3.8	4	6	8	10	12	14	15	16	18	20	22
P	5	Vc	92	92	92	81	81	88	88	78	116	116	116	116	116	104	104	104	104	104	93	93	93	93
		fz	0.024	0.024	0.024	0.021	0.021	0.027	0.027	0.024	0.033	0.033	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.030	0.026	0.026	0.026	0.026
		RPM	24316	24316	24316	21584	21584	19906	19906	17798	24699	24699	24699	24699	24699	22076	22076	22076	22076	22076	19672	19672	19672	19672
		FEED	1167	1167	1167	907	907	1075	1075	854	1630	1630	1630	1630	1630	1325	1325	1325	1325	1325	1023	1023	1023	1023
		Ap	0.042	0.030	0.030	0.030	0.018	0.049	0.035	0.035	0.135	0.135	0.135	0.135	0.098	0.053	0.053	0.053	0.038	0.038	0.038	0.038	0.023	0.023
	8	Vc	92	92	92	81	81	88	88	78	116	116	116	116	116	104	104	104	104	104	93	93	93	93
		fz	0.024	0.024	0.024	0.021	0.021	0.027	0.027	0.024	0.033	0.033	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.030	0.026	0.026	0.026	0.026
		RPM	24316	24316	24316	21584	21584	19906	19906	17798	24699	24699	24699	24699	24699	22076	22076	22076	22076	22076	19672	19672	19672	19672
		FEED	1167	1167	1167	907	907	1075	1075	854	1630	1630	1630	1630	1630	1325	1325	1325	1325	1325	1023	1023	1023	1023
		Ap	0.042	0.030	0.030	0.030	0.018	0.049	0.035	0.035	0.135	0.135	0.135	0.135	0.098	0.053	0.053	0.053	0.038	0.038	0.038	0.038	0.023	0.023
	9	Vc	87	87	87	77	77	83	83	74	111	111	111	111	111	99	99	99	99	99	88	88	88	88
		fz	0.021	0.021	0.021	0.019	0.019	0.024	0.024	0.021	0.030	0.030	0.030	0.030	0.030	0.027	0.027	0.027	0.027	0.027	0.023	0.023	0.023	0.023
		RPM	23100	23100	23100	20505	20505	18911	18911	16908	23464	23464	23464	23464	23464	20972	20972	20972	20972	20972	18688	18688	18688	18688
		FEED	992	992	992	771	771	914	914	726	1386	1386	1386	1386	1386	1126	1126	1126	1126	1126	870	870	870	870
		Ap	0.033	0.023	0.023	0.023	0.014	0.038	0.027	0.027	0.105	0.105	0.105	0.105	0.076	0.041	0.041	0.041	0.029	0.029	0.029	0.029	0.018	0.018
	11.1	Vc	92	92	92	81	81	88	88	78	116	116	116	116	116	104	104	104	104	104	93	93	93	93
		fz	0.024	0.024	0.024	0.021	0.021	0.027	0.027	0.024	0.033	0.033	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.030	0.026	0.026	0.026	0.026
		RPM	24316	24316	24316	21584	21584	19906	19906	17798	24699	24699	24699	24699	24699	22076	22076	22076	22076	22076	19672	19672	19672	19672
		FEED	1167	1167	1167	907	907	1075	1075	854	1630	1630	1630	1630	1630	1325	1325	1325	1325	1325	1023	1023	1023	1023
		Ap	0.042	0.030	0.030	0.030	0.018	0.049	0.035	0.035	0.135	0.135	0.135	0.135	0.098	0.053	0.053	0.053	0.038	0.038	0.038	0.038	0.023	0.023
	11.2	Vc	87	87	87	77	77	83	83	74	111	111	111	111	111	99	99	99	99	99	88	88	88	88
		fz	0.021	0.021	0.021	0.019	0.019	0.024	0.024	0.021	0.030	0.030	0.030	0.030	0.030	0.027	0.027	0.027	0.027	0.027	0.023	0.023	0.023	0.023
		RPM	23100	23100	23100	20505	20505	18911	18911	16908	23464	23464	23464	23464	23464	20972	20972	20972	20972	20972	18688	18688	18688	18688
		FEED	992	992	992	771	771	914	914	726	1386	1386	1386	1386	1386	1126	1126	1126	1126	1126	870	870	870	870
		Ap	0.033	0.023	0.023	0.023	0.014	0.038	0.027	0.027	0.105	0.105	0.105	0.105	0.076	0.041	0.041	0.041	0.029	0.029	0.029	0.029	0.018	0.018
H	38.1	Vc	76	76	76	68	68	73	73	65	97	97	97	97	97	86	86	86	86	86	77	77	77	77
		fz	0.020	0.020	0.020	0.018	0.018	0.023	0.023	0.020	0.028	0.028	0.028	0.028	0.028	0.025	0.025	0.025	0.025	0.025	0.022	0.022	0.022	0.022
		RPM	20182	20182	20182	17915	17915	16522	16522	14772	20500	20500	20500	20500	20500	18323	18323	18323	18323	18323	16328	16328	16328	16328
		FEED	817	817	817	635	635	753	753	598	1141	1141	1141	1141	1141	928	928	928	928	928	716	716	716	716
		Ap	0.024	0.017	0.017	0.017	0.010	0.027	0.020	0.020	0.076	0.076	0.076	0.076	0.055	0.029	0.029	0.029	0.021	0.021	0.021	0.021	0.013	0.013
	38.2	Vc	76	76	76	68	68	73	73	65	97	97	97	97	97	86	86	86	86	86	77	77	77	77
		fz	0.020	0.020	0.020	0.018	0.018	0.023	0.023	0.020	0.028	0.028	0.028	0.028	0.028	0.025	0.025	0.025	0.025	0.025	0.022	0.022	0.022	0.022
		RPM	20182	20182	20182	17915	17915	16522	16522	14772	20500	20500	20500	20500	20500	18323	18323	18323	18323	18323	16328	16328	16328	16328
		FEED	817	817	817	635	635	753	753	598	1141	1141	1141	1141	1141	928	928	928	928	928	716	716	716	716
		Ap	0.024	0.017	0.017	0.017	0.010	0.027	0.020	0.020	0.076	0.076	0.076	0.076	0.055	0.029	0.029	0.029	0.021	0.021	0.021	0.021	0.013	0.013
	40	Vc	87	87	87	77	77	83	83	74	111	111	111	111	111	99	99	99	99	99	88	88	88	88
		fz	0.021	0.021	0.021	0.019	0.019	0.024	0.024	0.021	0.030	0.030	0.030	0.030	0.030	0.027	0.027	0.027	0.027	0.027	0.023	0.023	0.023	0.023
		RPM	23100	23100	23100	20505	20505	18911	18911	16908	23464	23464	23464	23464	23464	20972	20972	20972	20972	20972	18688	18688	18688	18688
		FEED	992	992	992	771	771	914	914	726	1386	1386	1386	1386	1386	1126	1126	1126	1126	1126	870	870	870	870
		Ap	0.033	0.023	0.023	0.023	0.014	0.038	0.027	0.027	0.105	0.105	0.105	0.105	0.076	0.041	0.041	0.041	0.029	0.029	0.029	0.029	0.018	0.018
	41	Vc	76	76	76	68	68	73	73	65	97	97	97	97	97	86	86	86	86	86	77	77	77	77
		fz	0.020	0.020	0.020	0.018	0.018	0.023	0.023	0.020	0.028	0.028	0.028	0.028	0.028	0.025	0.025	0.025	0.025	0.025	0.022	0.022	0.022	0.022
		RPM	20182	20182	20182	17915	17915	16522	16522	14772	20500	20500	20500	20500	20500	18323	18323	18323	18323	18323	16328	16328	16328	16328
		FEED	817	817	817	635	635	753	753	598	1141	1141	1141	1141	1141	928	928	928	928	928	716	716	716	716
		Ap	0.024	0.017	0.017	0.017	0.010	0.027	0.020	0.020	0.076	0.076	0.076	0.076	0.055	0.029	0.029	0.029	0.021	0.021	0.021	0.021	0.013	0.013

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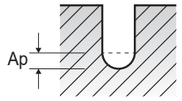
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			1.5	1.5	1.6	1.6	1.6	1.6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
			LBS	25	30	8	12	16	20	3	4	5	6	8	10	12	13	14	16	18	20	22	25	30	35
P	5	Vc	70	70	115	103	103	92	116	116	116	116	116	116	105	105	105	105	105	105	93	93	93	70
		fz	0.023	0.023	0.035	0.032	0.032	0.028	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	14863	14863	22950	20491	20491	18237	18524	18524	18524	18524	18524	18524	16721	16721	16721	16721	16721	16721	14754	14754	14754	11147
		FEED	684	684	1607	1311	1311	1021	1852	1852	1852	1852	1852	1852	1505	1505	1505	1505	1505	1505	1180	1180	1180	780
		Ap	0.015	0.015	0.104	0.056	0.040	0.040	0.180	0.180	0.180	0.180	0.130	0.130	0.070	0.070	0.070	0.070	0.050	0.050	0.050	0.050	0.030	0.020
	8	Vc	70	70	115	103	103	92	116	116	116	116	116	116	105	105	105	105	105	105	93	93	93	70
		fz	0.023	0.023	0.035	0.032	0.032	0.028	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	14863	14863	22950	20491	20491	18237	18524	18524	18524	18524	18524	18524	16721	16721	16721	16721	16721	16721	14754	14754	14754	11147
		FEED	684	684	1607	1311	1311	1021	1852	1852	1852	1852	1852	1852	1505	1505	1505	1505	1505	1505	1180	1180	1180	780
		Ap	0.015	0.015	0.104	0.056	0.040	0.040	0.180	0.180	0.180	0.180	0.130	0.130	0.070	0.070	0.070	0.070	0.050	0.050	0.050	0.050	0.030	0.020
	9	Vc	67	67	110	98	98	87	111	111	111	111	111	111	100	100	100	100	100	100	88	88	88	67
		fz	0.021	0.021	0.031	0.029	0.029	0.025	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.040	0.040	0.040	0.036	0.036	0.036	0.031
		RPM	14120	14120	21803	19466	19466	17325	17598	17598	17598	17598	17598	17598	15885	15885	15885	15885	15885	15885	14016	14016	14016	10590
		FEED	581	581	1366	1114	1114	868	1574	1574	1574	1574	1574	1574	1279	1279	1279	1279	1279	1279	1003	1003	1003	663
		Ap	0.012	0.012	0.081	0.044	0.031	0.031	0.140	0.140	0.140	0.140	0.101	0.101	0.055	0.055	0.055	0.055	0.039	0.039	0.039	0.039	0.023	0.016
	11.1	Vc	70	70	115	103	103	92	116	116	116	116	116	116	105	105	105	105	105	105	93	93	93	70
		fz	0.023	0.023	0.035	0.032	0.032	0.028	0.050	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.035
		RPM	14863	14863	22950	20491	20491	18237	18524	18524	18524	18524	18524	18524	16721	16721	16721	16721	16721	16721	14754	14754	14754	11147
		FEED	684	684	1607	1311	1311	1021	1852	1852	1852	1852	1852	1852	1505	1505	1505	1505	1505	1505	1180	1180	1180	780
		Ap	0.015	0.015	0.104	0.056	0.040	0.040	0.180	0.180	0.180	0.180	0.130	0.130	0.070	0.070	0.070	0.070	0.050	0.050	0.050	0.050	0.030	0.020
	11.2	Vc	67	67	110	98	98	87	111	111	111	111	111	111	100	100	100	100	100	100	88	88	88	67
		fz	0.021	0.021	0.031	0.029	0.029	0.025	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.040	0.040	0.040	0.036	0.036	0.036	0.031
		RPM	14120	14120	21803	19466	19466	17325	17598	17598	17598	17598	17598	17598	15885	15885	15885	15885	15885	15885	14016	14016	14016	10590
		FEED	581	581	1366	1114	1114	868	1574	1574	1574	1574	1574	1574	1279	1279	1279	1279	1279	1279	1003	1003	1003	663
		Ap	0.012	0.012	0.081	0.044	0.031	0.031	0.140	0.140	0.140	0.140	0.101	0.101	0.055	0.055	0.055	0.055	0.039	0.039	0.039	0.039	0.023	0.016
H	38.1	Vc	58	58	96	85	85	76	97	97	97	97	97	97	87	87	87	87	87	87	77	77	77	58
		fz	0.019	0.019	0.030	0.027	0.027	0.024	0.042	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.030
		RPM	12336	12336	19049	17008	17008	15137	15375	15375	15375	15375	15375	15375	13878	13878	13878	13878	13878	13878	12246	12246	12246	9252
		FEED	479	479	1125	918	918	715	1296	1296	1296	1296	1296	1296	1054	1054	1054	1054	1054	1054	826	826	826	546
		Ap	0.008	0.008	0.058	0.031	0.022	0.022	0.101	0.101	0.101	0.101	0.073	0.073	0.039	0.039	0.039	0.039	0.028	0.028	0.028	0.028	0.017	0.011
	38.2	Vc	58	58	96	85	85	76	97	97	97	97	97	97	87	87	87	87	87	87	77	77	77	58
		fz	0.019	0.019	0.030	0.027	0.027	0.024	0.042	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.030
		RPM	12336	12336	19049	17008	17008	15137	15375	15375	15375	15375	15375	15375	13878	13878	13878	13878	13878	13878	12246	12246	12246	9252
		FEED	479	479	1125	918	918	715	1296	1296	1296	1296	1296	1296	1054	1054	1054	1054	1054	1054	826	826	826	546
		Ap	0.008	0.008	0.058	0.031	0.022	0.022	0.101	0.101	0.101	0.101	0.073	0.073	0.039	0.039	0.039	0.039	0.028	0.028	0.028	0.028	0.017	0.011
	40	Vc	67	67	110	98	98	87	111	111	111	111	111	111	100	100	100	100	100	100	88	88	88	67
		fz	0.021	0.021	0.031	0.029	0.029	0.025	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.040	0.040	0.040	0.036	0.036	0.036	0.031
		RPM	14120	14120	21803	19466	19466	17325	17598	17598	17598	17598	17598	17598	15885	15885	15885	15885	15885	15885	14016	14016	14016	10590
		FEED	581	581	1366	1114	1114	868	1574	1574	1574	1574	1574	1574	1279	1279	1279	1279	1279	1279	1003	1003	1003	663
		Ap	0.012	0.012	0.081	0.044	0.031	0.031	0.140	0.140	0.140	0.140	0.101	0.101	0.055	0.055	0.055	0.055	0.039	0.039	0.039	0.039	0.023	0.016
	41	Vc	58	58	96	85	85	76	97	97	97	97	97	97	87	87	87	87	87	87	77	77	77	58
		fz	0.019	0.019	0.030	0.027	0.027	0.024	0.042	0.042	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.030
		RPM	12336	12336	19049	17008	17008	15137	15375	15375	15375	15375	15375	15375	13878	13878	13878	13878	13878	13878	12246	12246	12246	9252
		FEED	479	479	1125	918	918	715	1296	1296	1296	1296	1296	1296	1054	1054	1054	1054	1054	1054	826	826	826	546
		Ap	0.008	0.008	0.058	0.031	0.022	0.022	0.101	0.101	0.101	0.101	0.073	0.073	0.039	0.039	0.039	0.039	0.028	0.028	0.028	0.028	0.017	0.011

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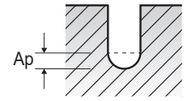
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	3	3	3	3	3	3
			LBS	40	50	6	6.25	8	10	15	20	25	30	35	6	7.5	8	10	12	14	15	16	20	25	30
P	5	Vc	70	35	128	128	128	128	115	115	115	102	102	133	133	133	133	133	133	133	119	119	119	119
		fz	0.035	0.030	0.061	0.061	0.061	0.061	0.055	0.055	0.055	0.049	0.049	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.067	0.067	0.067	0.067
		RPM	11147	5574	16262	16262	16262	16262	14688	14688	14688	12983	12983	14098	14098	14098	14098	14098	14098	14098	12677	12677	12677	12677
		FEED	780	334	1984	1984	1984	1984	1616	1616	1616	1272	1272	2115	2115	2115	2115	2115	2115	2115	1699	1699	1699	1699
		Ap	0.020	0.010	0.225	0.225	0.163	0.163	0.088	0.088	0.063	0.063	0.038	0.270	0.270	0.270	0.195	0.195	0.195	0.195	0.105	0.105	0.075	0.075
	8	Vc	70	35	128	128	128	128	115	115	115	102	102	133	133	133	133	133	133	133	119	119	119	119
		fz	0.035	0.030	0.061	0.061	0.061	0.061	0.055	0.055	0.055	0.049	0.049	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.067	0.067	0.067	0.067
		RPM	11147	5574	16262	16262	16262	16262	14688	14688	14688	12983	12983	14098	14098	14098	14098	14098	14098	14098	12677	12677	12677	12677
		FEED	780	334	1984	1984	1984	1984	1616	1616	1616	1272	1272	2115	2115	2115	2115	2115	2115	2115	1699	1699	1699	1699
		Ap	0.020	0.010	0.225	0.225	0.163	0.163	0.088	0.088	0.063	0.063	0.038	0.270	0.270	0.270	0.195	0.195	0.195	0.195	0.105	0.105	0.075	0.075
	9	Vc	67	33	121	121	121	121	110	110	110	97	97	126	126	126	126	126	126	126	114	114	114	114
		fz	0.031	0.027	0.055	0.055	0.055	0.055	0.049	0.049	0.049	0.044	0.044	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.060	0.060	0.060	0.060
		RPM	10590	5295	15449	15449	15449	15449	13954	13954	13954	12334	12334	13393	13393	13393	13393	13393	13393	13393	12043	12043	12043	12043
		FEED	663	284	1686	1686	1686	1686	1374	1374	1374	1081	1081	1798	1798	1798	1798	1798	1798	1798	1444	1444	1444	1444
		Ap	0.016	0.008	0.176	0.176	0.127	0.127	0.068	0.068	0.049	0.049	0.029	0.211	0.211	0.211	0.152	0.152	0.152	0.152	0.082	0.082	0.059	0.059
	11.1	Vc	70	35	128	128	128	128	115	115	115	102	102	133	133	133	133	133	133	133	119	119	119	119
		fz	0.035	0.030	0.061	0.061	0.061	0.061	0.055	0.055	0.055	0.049	0.049	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.067	0.067	0.067	0.067
		RPM	11147	5574	16262	16262	16262	16262	14688	14688	14688	12983	12983	14098	14098	14098	14098	14098	14098	14098	12677	12677	12677	12677
		FEED	780	334	1984	1984	1984	1984	1616	1616	1616	1272	1272	2115	2115	2115	2115	2115	2115	2115	1699	1699	1699	1699
		Ap	0.020	0.010	0.225	0.225	0.163	0.163	0.088	0.088	0.063	0.063	0.038	0.270	0.270	0.270	0.195	0.195	0.195	0.195	0.105	0.105	0.075	0.075
	11.2	Vc	67	33	121	121	121	121	110	110	110	97	97	126	126	126	126	126	126	126	114	114	114	114
		fz	0.031	0.027	0.055	0.055	0.055	0.055	0.049	0.049	0.049	0.044	0.044	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.060	0.060	0.060	0.060
		RPM	10590	5295	15449	15449	15449	15449	13954	13954	13954	12334	12334	13393	13393	13393	13393	13393	13393	13393	12043	12043	12043	12043
		FEED	663	284	1686	1686	1686	1686	1374	1374	1374	1081	1081	1798	1798	1798	1798	1798	1798	1798	1444	1444	1444	1444
		Ap	0.016	0.008	0.176	0.176	0.127	0.127	0.068	0.068	0.049	0.049	0.029	0.211	0.211	0.211	0.152	0.152	0.152	0.152	0.082	0.082	0.059	0.059
H	38.1	Vc	58	29	106	106	106	106	96	96	96	85	85	110	110	110	110	110	110	110	99	99	99	99
		fz	0.030	0.025	0.051	0.051	0.051	0.051	0.046	0.046	0.046	0.041	0.041	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.057	0.057	0.057	0.057
		RPM	9252	4626	13497	13497	13497	13497	12191	12191	12191	10776	10776	11701	11701	11701	11701	11701	11701	11701	10522	10522	10522	10522
		FEED	546	234	1389	1389	1389	1389	1131	1131	1131	890	890	1481	1481	1481	1481	1481	1481	1481	1189	1189	1189	1189
		Ap	0.011	0.006	0.126	0.126	0.091	0.091	0.049	0.049	0.035	0.035	0.021	0.151	0.151	0.151	0.109	0.109	0.109	0.109	0.059	0.059	0.042	0.042
	38.2	Vc	58	29	106	106	106	106	96	96	96	85	85	110	110	110	110	110	110	110	99	99	99	99
		fz	0.030	0.025	0.051	0.051	0.051	0.051	0.046	0.046	0.046	0.041	0.041	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.057	0.057	0.057	0.057
		RPM	9252	4626	13497	13497	13497	13497	12191	12191	12191	10776	10776	11701	11701	11701	11701	11701	11701	11701	10522	10522	10522	10522
		FEED	546	234	1389	1389	1389	1389	1131	1131	1131	890	890	1481	1481	1481	1481	1481	1481	1481	1189	1189	1189	1189
		Ap	0.011	0.006	0.126	0.126	0.091	0.091	0.049	0.049	0.035	0.035	0.021	0.151	0.151	0.151	0.109	0.109	0.109	0.109	0.059	0.059	0.042	0.042
	40	Vc	67	33	121	121	121	121	110	110	110	97	97	126	126	126	126	126	126	126	114	114	114	114
		fz	0.031	0.027	0.055	0.055	0.055	0.055	0.049	0.049	0.049	0.044	0.044	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.060	0.060	0.060	0.060
		RPM	10590	5295	15449	15449	15449	15449	13954	13954	13954	12334	12334	13393	13393	13393	13393	13393	13393	13393	12043	12043	12043	12043
		FEED	663	284	1686	1686	1686	1686	1374	1374	1374	1081	1081	1798	1798	1798	1798	1798	1798	1798	1444	1444	1444	1444
		Ap	0.016	0.008	0.176	0.176	0.127	0.127	0.068	0.068	0.049	0.049	0.029	0.211	0.211	0.211	0.152	0.152	0.152	0.152	0.082	0.082	0.059	0.059
	41	Vc	58	29	106	106	106	106	96	96	96	85	85	110	110	110	110	110	110	110	99	99	99	99
		fz	0.030	0.025	0.051	0.051	0.051	0.051	0.046	0.046	0.046	0.041	0.041	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.057	0.057	0.057	0.057
		RPM	9252	4626	13497	13497	13497	13497	12191	12191	12191	10776	10776	11701	11701	11701	11701	11701	11701	11701	10522	10522	10522	10522
		FEED	546	234	1389	1389	1389	1389	1131	1131	1131	890	890	1481	1481	1481	1481	1481	1481	1481	1189	1189	1189	1189
		Ap	0.011	0.006	0.126	0.126	0.091	0.091	0.049	0.049	0.035	0.035	0.021	0.151	0.151	0.151	0.109	0.109	0.109	0.109	0.059	0.059	0.042	0.042

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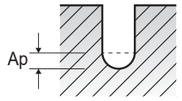
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																						
			3	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4	4	4	4	4	4
			LBS	35	40	50	8.75	15	20	25	30	35	40	45	8	10	12	14	15	20	25	30	35	40	45
P	5	Vc	106	106	106	79	130	130	116	116	116	116	103	103	127	127	127	127	127	127	114	114	114	114	102
		fz	0.060	0.060	0.060	0.052	0.088	0.088	0.079	0.079	0.071	0.071	0.070	0.070	0.100	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.090	0.090	0.080
		RPM	11256	11256	11256	8415	11803	11803	10585	10585	10585	10585	9367	9367	10082	10082	10082	10082	10082	10082	9098	9098	9098	9098	8115
		FEED	1351	1351	1351	875	2077	2077	1677	1677	1509	1509	1319	1319	2016	2016	2016	2016	2016	2016	1638	1638	1638	1638	1298
		Ap	0.075	0.045	0.045	0.030	0.315	0.228	0.123	0.123	0.088	0.088	0.088	0.088	0.360	0.360	0.360	0.260	0.260	0.260	0.140	0.140	0.100	0.100	0.100
	8	Vc	106	106	106	79	130	130	116	116	116	116	103	103	127	127	127	127	127	127	114	114	114	114	102
		fz	0.060	0.060	0.060	0.052	0.088	0.088	0.079	0.079	0.071	0.071	0.070	0.070	0.100	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.090	0.090	0.080
		RPM	11256	11256	11256	8415	11803	11803	10585	10585	10585	10585	9367	9367	10082	10082	10082	10082	10082	10082	9098	9098	9098	9098	8115
		FEED	1351	1351	1351	875	2077	2077	1677	1677	1509	1509	1319	1319	2016	2016	2016	2016	2016	2016	1638	1638	1638	1638	1298
		Ap	0.075	0.045	0.045	0.030	0.315	0.228	0.123	0.123	0.088	0.088	0.088	0.088	0.360	0.360	0.360	0.260	0.260	0.260	0.140	0.140	0.100	0.100	0.100
	9	Vc	101	101	101	75	123	123	111	111	111	111	111	98	98	120	120	120	120	120	120	120	109	109	109	109	97
		fz	0.054	0.054	0.054	0.047	0.079	0.079	0.071	0.071	0.064	0.064	0.063	0.063	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.081	0.081	0.081	0.081	0.072
		RPM	10693	10693	10693	7994	11213	11213	10056	10056	10056	10056	8899	8899	9578	9578	9578	9578	9578	9578	9578	8643	8643	8643	8643	7709
		FEED	1148	1148	1148	744	1765	1765	1425	1425	1283	1283	1121	1121	1714	1714	1714	1714	1714	1714	1714	1392	1392	1392	1392	1103
		Ap	0.059	0.035	0.035	0.023	0.246	0.177	0.096	0.096	0.068	0.068	0.068	0.068	0.281	0.281	0.281	0.203	0.203	0.203	0.109	0.109	0.078	0.078	0.078
	11.1	Vc	106	106	106	79	130	130	116	116	116	116	103	103	127	127	127	127	127	127	114	114	114	114	102
		fz	0.060	0.060	0.060	0.052	0.088	0.088	0.079	0.079	0.071	0.071	0.070	0.070	0.100	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.090	0.090	0.080
		RPM	11256	11256	11256	8415	11803	11803	10585	10585	10585	10585	9367	9367	10082	10082	10082	10082	10082	10082	9098	9098	9098	9098	8115
		FEED	1351	1351	1351	875	2077	2077	1677	1677	1509	1509	1319	1319	2016	2016	2016	2016	2016	2016	1638	1638	1638	1638	1298
		Ap	0.075	0.045	0.045	0.030	0.315	0.228	0.123	0.123	0.088	0.088	0.088	0.088	0.360	0.360	0.360	0.260	0.260	0.260	0.140	0.140	0.100	0.100	0.100
	11.2	Vc	101	101	101	75	123	123	111	111	111	111	111	98	98	120	120	120	120	120	120	120	109	109	109	109	97
		fz	0.054	0.054	0.054	0.047	0.079	0.079	0.071	0.071	0.064	0.064	0.063	0.063	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.081	0.081	0.081	0.081	0.072
		RPM	10693	10693	10693	7994	11213	11213	10056	10056	10056	10056	8899	8899	9578	9578	9578	9578	9578	9578	9578	8643	8643	8643	8643	7709
		FEED	1148	1148	1148	744	1765	1765	1425	1425	1283	1283	1121	1121	1714	1714	1714	1714	1714	1714	1714	1392	1392	1392	1392	1103
		Ap	0.059	0.035	0.035	0.023	0.246	0.177	0.096	0.096	0.068	0.068	0.068	0.068	0.281	0.281	0.281	0.203	0.203	0.203	0.109	0.109	0.078	0.078	0.078
H	38.1	Vc	88	88	88	66	108	108	97	97	97	97	85	85	105	105	105	105	105	105	95	95	95	95	85
		fz	0.051	0.051	0.051	0.044	0.074	0.074	0.067	0.067	0.060	0.060	0.059	0.059	0.084	0.084	0.084	0.084	0.084	0.084	0.076	0.076	0.076	0.076	0.067
		RPM	9342	9342	9342	6984	9796	9796	8786	8786	8786	8786	7775	7775	8368	8368	8368	8368	8368	8368	7551	7551	7551	7551	6735
		FEED	946	946	946	613	1454	1454	1174	1174	1056	1056	923	923	1411	1411	1411	1411	1411	1411	1147	1147	1147	1147	909
		Ap	0.042	0.025	0.025	0.017	0.176	0.127	0.069	0.069	0.049	0.049	0.049	0.049	0.202	0.202	0.202	0.146	0.146	0.146	0.078	0.078	0.056	0.056	0.056
	38.2	Vc	88	88	88	66	108	108	97	97	97	97	85	85	105	105	105	105	105	105	95	95	95	95	85
		fz	0.051	0.051	0.051	0.044	0.074	0.074	0.067	0.067	0.060	0.060	0.059	0.059	0.084	0.084	0.084	0.084	0.084	0.084	0.076	0.076	0.076	0.076	0.067
		RPM	9342	9342	9342	6984	9796	9796	8786	8786	8786	8786	7775	7775	8368	8368	8368	8368	8368	8368	7551	7551	7551	7551	6735
		FEED	946	946	946	613	1454	1454	1174	1174	1056	1056	923	923	1411	1411	1411	1411	1411	1411	1147	1147	1147	1147	909
		Ap	0.042	0.025	0.025	0.017	0.176	0.127	0.069	0.069	0.049	0.049	0.049	0.049	0.202	0.202	0.202	0.146	0.146	0.146	0.078	0.078	0.056	0.056	0.056
	40	Vc	101	101	101	75	123	123	111	111	111	111	111	98	98	120	120	120	120	120	120	120	109	109	109	109	97
		fz	0.054	0.054	0.054	0.047	0.079	0.079	0.071	0.071	0.064	0.064	0.063	0.063	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.081	0.081	0.081	0.081	0.072
		RPM	10693	10693	10693	7994	11213	11213	10056	10056	10056	10056	8899	8899	9578	9578	9578	9578	9578	9578	9578	8643	8643	8643	8643	7709
		FEED	1148	1148	1148	744	1765	1765	1425	1425	1283	1283	1121	1121	1714	1714	1714	1714	1714	1714	1714	1392	1392	1392	1392	1103
		Ap	0.059	0.035	0.035	0.023	0.246	0.177	0.096	0.096	0.068	0.068	0.068	0.068	0.281	0.281	0.281	0.203	0.203	0.203	0.109	0.109	0.078	0.078	0.078
	41	Vc	88	88	88	66	108	108	97	97	97	97	85	85	105	105	105	105	105	105	95	95	95	95	85
		fz	0.051	0.051	0.051	0.044	0.074	0.074	0.067	0.067	0.060	0.060	0.059	0.059	0.084	0.084	0.084	0.084	0.084	0.084	0.076	0.076	0.076	0.076	0.067
		RPM	9342	9342	9342	6984	9796	9796	8786	8786	8786	8786	7775	7775	8368	8368	8368	8368	8368	8368	7551	7551	7551	7551	6735
		FEED	946	946	946	613	1454	1454	1174	1174	1056	1056	923	923	1411	1411	1411	1411	1411	1411	1147	1147	1147	1147	909
		Ap	0.042	0.025	0.025	0.017	0.176	0.127	0.069	0.069	0.049	0.049	0.049	0.049	0.202	0.202	0.202	0.146	0.146	0.146	0.078	0.078	0.056	0.056	0.056

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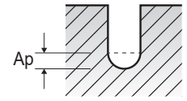
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



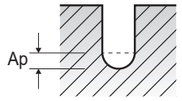
Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																						
			4	4	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6
			LBS	50	61.1	10	12	12.5	15	20	25	30	40	10	15	20	25	30	35	40	50	60	70	80	90
P	5	Vc	102	76	125	125	125	125	125	125	112	112	127	127	127	127	127	114	114	114	114	102	102	102	102
		fz	0.080	0.070	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.146	0.146	0.146	0.146	0.146	0.131	0.131	0.131	0.131	0.131	0.131	0.131	0.131
		RPM	8115	6049	7934	7934	7934	7934	7934	7934	7147	7147	6721	6721	6721	6721	6721	6049	6049	6049	6049	6049	6049	6049	6049
		FEED	1298	847	1904	1904	1904	1904	1904	1904	1544	1544	1963	1963	1963	1963	1963	1590	1590	1590	1590	1590	1590	1590	1590
		Ap	0.100	0.060	0.450	0.450	0.450	0.450	0.325	0.325	0.175	0.175	0.540	0.540	0.390	0.390	0.390	0.210	0.210	0.150	0.150	0.150	0.150	0.150	0.150
	8	Vc	102	76	125	125	125	125	125	125	112	112	127	127	127	127	127	114	114	114	114	102	102	102	102
		fz	0.080	0.070	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.146	0.146	0.146	0.146	0.146	0.131	0.131	0.131	0.131	0.131	0.131	0.131	0.131
		RPM	8115	6049	7934	7934	7934	7934	7934	7934	7147	7147	6721	6721	6721	6721	6721	6049	6049	6049	6049	6049	6049	6049	6049
		FEED	1298	847	1904	1904	1904	1904	1904	1904	1544	1544	1963	1963	1963	1963	1963	1590	1590	1590	1590	1590	1590	1590	1590
		Ap	0.100	0.060	0.450	0.450	0.450	0.450	0.325	0.325	0.175	0.175	0.540	0.540	0.390	0.390	0.390	0.210	0.210	0.150	0.150	0.150	0.150	0.150	0.150
	9	Vc	97	72	118	118	118	118	118	118	107	107	120	120	120	120	120	108	108	108	108	108	108	108	108
		fz	0.072	0.063	0.107	0.107	0.107	0.107	0.107	0.107	0.097	0.097	0.131	0.131	0.131	0.131	0.131	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118
		RPM	7709	5747	7537	7537	7537	7537	7537	7537	6790	6790	6385	6385	6385	6385	6385	5747	5747	5747	5747	5747	5747	5747	5747
		FEED	1103	720	1618	1618	1618	1618	1618	1618	1312	1312	1669	1669	1669	1669	1669	1352	1352	1352	1352	1352	1352	1352	1352
		Ap	0.078	0.047	0.351	0.351	0.351	0.351	0.254	0.254	0.137	0.137	0.421	0.421	0.304	0.304	0.304	0.164	0.164	0.117	0.117	0.117	0.117	0.117	0.117
	11.1	Vc	102	76	125	125	125	125	125	125	112	112	127	127	127	127	127	114	114	114	114	102	102	102	102
		fz	0.080	0.070	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.146	0.146	0.146	0.146	0.146	0.131	0.131	0.131	0.131	0.131	0.131	0.131	0.131
		RPM	8115	6049	7934	7934	7934	7934	7934	7934	7147	7147	6721	6721	6721	6721	6721	6049	6049	6049	6049	6049	6049	6049	6049
		FEED	1298	847	1904	1904	1904	1904	1904	1904	1544	1544	1963	1963	1963	1963	1963	1590	1590	1590	1590	1590	1590	1590	1590
		Ap	0.100	0.060	0.450	0.450	0.450	0.450	0.325	0.325	0.175	0.175	0.540	0.540	0.390	0.390	0.390	0.210	0.210	0.150	0.150	0.150	0.150	0.150	0.150
	11.2	Vc	97	72	118	118	118	118	118	118	107	107	120	120	120	120	120	108	108	108	108	108	108	108	108
		fz	0.072	0.063	0.107	0.107	0.107	0.107	0.107	0.107	0.097	0.097	0.131	0.131	0.131	0.131	0.131	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118
		RPM	7709	5747	7537	7537	7537	7537	7537	7537	6790	6790	6385	6385	6385	6385	6385	5747	5747	5747	5747	5747	5747	5747	5747
		FEED	1103	720	1618	1618	1618	1618	1618	1618	1312	1312	1669	1669	1669	1669	1669	1352	1352	1352	1352	1352	1352	1352	1352
		Ap	0.078	0.047	0.351	0.351	0.351	0.351	0.254	0.254	0.137	0.137	0.421	0.421	0.304	0.304	0.304	0.164	0.164	0.117	0.117	0.117	0.117	0.117	0.117
H	38.1	Vc	85	63	103	103	103	103	103	103	93	93	105	105	105	105	105	95	95	95	95	95	95	95	95
		fz	0.067	0.059	0.101	0.101	0.101	0.101	0.101	0.101	0.091	0.091	0.123	0.123	0.123	0.123	0.123	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
		RPM	6735	5021	6585	6585	6585	6585	6585	6585	5932	5932	5578	5578	5578	5578	5578	5021	5021	5021	5021	5021	5021	5021	5021
		FEED	909	593	1333	1333	1333	1333	1333	1333	1081	1081	1374	1374	1374	1374	1374	1113	1113	1113	1113	1113	1113	1113	1113
		Ap	0.056	0.034	0.252	0.252	0.252	0.252	0.182	0.182	0.098	0.098	0.302	0.302	0.218	0.218	0.218	0.118	0.118	0.084	0.084	0.084	0.084	0.084	0.084
	38.2	Vc	85	63	103	103	103	103	103	103	93	93	105	105	105	105	105	95	95	95	95	95	95	95	95
		fz	0.067	0.059	0.101	0.101	0.101	0.101	0.101	0.101	0.091	0.091	0.123	0.123	0.123	0.123	0.123	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
		RPM	6735	5021	6585	6585	6585	6585	6585	6585	5932	5932	5578	5578	5578	5578	5578	5021	5021	5021	5021	5021	5021	5021	5021
		FEED	909	593	1333	1333	1333	1333	1333	1333	1081	1081	1374	1374	1374	1374	1374	1113	1113	1113	1113	1113	1113	1113	1113
		Ap	0.056	0.034	0.252	0.252	0.252	0.252	0.182	0.182	0.098	0.098	0.302	0.302	0.218	0.218	0.218	0.118	0.118	0.084	0.084	0.084	0.084	0.084	0.084
	40	Vc	97	72	118	118	118	118	118	118	107	107	120	120	120	120	120	108	108	108	108	108	108	108	108
		fz	0.072	0.063	0.107	0.107	0.107	0.107	0.107	0.107	0.097	0.097	0.131	0.131	0.131	0.131	0.131	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118
		RPM	7709	5747	7537	7537	7537	7537	7537	7537	6790	6790	6385	6385	6385	6385	6385	5747	5747	5747	5747	5747	5747	5747	5747
		FEED	1103	720	1618	1618	1618	1618	1618	1618	1312	1312	1669	1669	1669	1669	1669	1352	1352	1352	1352	1352	1352	1352	1352
		Ap	0.078	0.047	0.351	0.351	0.351	0.351	0.254	0.254	0.137	0.137	0.421	0.421	0.304	0.304	0.304	0.164	0.164	0.117	0.117	0.117	0.117	0.117	0.117
	41	Vc	85	63	103	103	103	103	103	103	93	93	105	105	105	105	105	95	95	95	95	95	95	95	95
		fz	0.067	0.059	0.101	0.101	0.101	0.101	0.101	0.101	0.091	0.091	0.123	0.123	0.123	0.123	0.123	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
		RPM	6735	5021	6585	6585	6585	6585	6585	6585	5932	5932	5578	5578	5578	5578	5578	5021	5021	5021	5021	5021	5021	5021	5021
		FEED	909	593	1333	1333	1333	1333	1333	1333	1081	1081	1374	1374	1374	1374	1374	1113	1113	1113	1113	1113	1113	1113	1113
		Ap	0.056	0.034	0.252	0.252	0.252	0.252	0.182	0.182	0.098	0.098	0.302	0.302	0.218	0.218	0.218	0.118	0.118	0.084	0.084	0.084	0.084	0.084	0.084

NEXT PAGE ▶

HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																
			7	7	7	8	8	8	8	8	8	8	8	8	8	10	10	10	10
		LBS	40	45	60	20	24	35	50	55	60	70	80	98	120	25	30	35	55
P	5	Vc	113	113	113	126	126	126	113	113	113	113	113	101	101	125	125	125	112
		fz	0.149	0.149	0.149	0.186	0.186	0.186	0.167	0.167	0.167	0.167	0.167	0.149	0.149	0.214	0.214	0.214	0.193
		RPM	5152	5152	5152	5000	5000	5000	4500	4500	4500	4500	4500	4000	4000	3967	3967	3967	3570
		FEED	1535	1535	1535	1860	1860	1860	1507	1507	1507	1507	1507	1190	1190	1698	1698	1698	1375
		Ap	0.245	0.245	0.175	0.720	0.720	0.520	0.280	0.280	0.280	0.200	0.200	0.200	0.120	0.900	0.900	0.650	0.350
	8	Vc	113	113	113	126	126	126	113	113	113	113	113	101	101	125	125	125	112
		fz	0.149	0.149	0.149	0.186	0.186	0.186	0.167	0.167	0.167	0.167	0.167	0.149	0.149	0.214	0.214	0.214	0.193
		RPM	5152	5152	5152	5000	5000	5000	4500	4500	4500	4500	4500	4000	4000	3967	3967	3967	3570
		FEED	1535	1535	1535	1860	1860	1860	1507	1507	1507	1507	1507	1190	1190	1698	1698	1698	1375
		Ap	0.245	0.245	0.175	0.720	0.720	0.520	0.280	0.280	0.280	0.200	0.200	0.200	0.120	0.900	0.900	0.650	0.350
	9	Vc	108	108	108	119	119	119	107	107	107	107	107	96	96	118	118	118	107
		fz	0.133	0.133	0.133	0.166	0.166	0.166	0.150	0.150	0.150	0.150	0.150	0.133	0.133	0.191	0.191	0.191	0.172
		RPM	4894	4894	4894	4750	4750	4750	4275	4275	4275	4275	4275	3800	3800	3769	3769	3769	3392
		FEED	1305	1305	1305	1581	1581	1581	1281	1281	1281	1281	1281	1012	1012	1443	1443	1443	1169
		Ap	0.191	0.191	0.137	0.562	0.562	0.406	0.218	0.218	0.218	0.156	0.156	0.156	0.094	0.702	0.702	0.507	0.273
	11.1	Vc	113	113	113	126	126	126	113	113	113	113	113	101	101	125	125	125	112
		fz	0.149	0.149	0.149	0.186	0.186	0.186	0.167	0.167	0.167	0.167	0.167	0.149	0.149	0.214	0.214	0.214	0.193
		RPM	5152	5152	5152	5000	5000	5000	4500	4500	4500	4500	4500	4000	4000	3967	3967	3967	3570
		FEED	1535	1535	1535	1860	1860	1860	1507	1507	1507	1507	1507	1190	1190	1698	1698	1698	1375
		Ap	0.245	0.245	0.175	0.720	0.720	0.520	0.280	0.280	0.280	0.200	0.200	0.200	0.120	0.900	0.900	0.650	0.350
	11.2	Vc	108	108	108	119	119	119	107	107	107	107	107	96	96	118	118	118	107
		fz	0.133	0.133	0.133	0.166	0.166	0.166	0.150	0.150	0.150	0.150	0.150	0.133	0.133	0.191	0.191	0.191	0.172
		RPM	4894	4894	4894	4750	4750	4750	4275	4275	4275	4275	4275	3800	3800	3769	3769	3769	3392
		FEED	1305	1305	1305	1581	1581	1581	1281	1281	1281	1281	1281	1012	1012	1443	1443	1443	1169
		Ap	0.191	0.191	0.137	0.562	0.562	0.406	0.218	0.218	0.218	0.156	0.156	0.156	0.094	0.702	0.702	0.507	0.273
H	38.1	Vc	94	94	94	104	104	104	94	94	94	94	94	83	83	103	103	103	93
		fz	0.126	0.126	0.126	0.157	0.157	0.157	0.141	0.141	0.141	0.141	0.141	0.125	0.125	0.181	0.181	0.181	0.162
		RPM	4276	4276	4276	4150	4150	4150	3735	3735	3735	3735	3735	3320	3320	3293	3293	3293	2963
		FEED	1075	1075	1075	1302	1302	1302	1055	1055	1055	1055	1055	833	833	1189	1189	1189	963
		Ap	0.137	0.137	0.098	0.403	0.403	0.291	0.157	0.157	0.157	0.112	0.112	0.112	0.067	0.504	0.504	0.364	0.196
	38.2	Vc	94	94	94	104	104	104	94	94	94	94	94	83	83	103	103	103	93
		fz	0.126	0.126	0.126	0.157	0.157	0.157	0.141	0.141	0.141	0.141	0.141	0.125	0.125	0.181	0.181	0.181	0.162
		RPM	4276	4276	4276	4150	4150	4150	3735	3735	3735	3735	3735	3320	3320	3293	3293	3293	2963
		FEED	1075	1075	1075	1302	1302	1302	1055	1055	1055	1055	1055	833	833	1189	1189	1189	963
		Ap	0.137	0.137	0.098	0.403	0.403	0.291	0.157	0.157	0.157	0.112	0.112	0.112	0.067	0.504	0.504	0.364	0.196
	40	Vc	108	108	108	119	119	119	107	107	107	107	107	96	96	118	118	118	107
		fz	0.133	0.133	0.133	0.166	0.166	0.166	0.150	0.150	0.150	0.150	0.150	0.133	0.133	0.191	0.191	0.191	0.172
		RPM	4894	4894	4894	4750	4750	4750	4275	4275	4275	4275	4275	3800	3800	3769	3769	3769	3392
		FEED	1305	1305	1305	1581	1581	1581	1281	1281	1281	1281	1281	1012	1012	1443	1443	1443	1169
		Ap	0.191	0.191	0.137	0.562	0.562	0.406	0.218	0.218	0.218	0.156	0.156	0.156	0.094	0.702	0.702	0.507	0.273
	41	Vc	94	94	94	104	104	104	94	94	94	94	94	83	83	103	103	103	93
		fz	0.126	0.126	0.126	0.157	0.157	0.157	0.141	0.141	0.141	0.141	0.141	0.125	0.125	0.181	0.181	0.181	0.162
		RPM	4276	4276	4276	4150	4150	4150	3735	3735	3735	3735	3735	3320	3320	3293	3293	3293	2963
		FEED	1075	1075	1075	1302	1302	1302	1055	1055	1055	1055	1055	833	833	1189	1189	1189	963
		Ap	0.137	0.137	0.098	0.403	0.403	0.291	0.157	0.157	0.157	0.112	0.112	0.112	0.067	0.504	0.504	0.364	0.196

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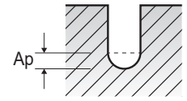
HPK45, HPK46, HPK47 SERIES

2 FLUTE BALL NOSE for RIB PROCESSING

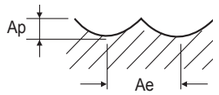


Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																
			10	10	10	10	10	12	12	12	12	12	12	14	16	18	20	25	
		LBS	60	65	75	86	120	30	36	60	80	106	120	28	32	36	40	50	
P	5	Vc	112	112	112	112	100	125	125	103	112	109	97	128	130	132	130	129	
		fz	0.193	0.193	0.193	0.193	0.171	0.238	0.238	0.151	0.214	0.238	0.238	0.238	0.238	0.250	0.264	0.270	
		RPM	3570	3570	3570	3570	3174	3306	3306	2732	2975	2904	2582	2904	2582	2331	2066	1639	
		FEED	1375	1375	1375	1375	1087	1574	1574	825	1275	1382	1229	1382	1229	1166	1091	885	
		Ap	0.350	0.350	0.350	0.250	0.250	1.080	1.080	0.780	0.420	0.300	0.300	1.260	1.440	1.620	1.800	2.250	
	8	Vc	112	112	112	112	100	125	125	103	112	109	97	128	130	132	130	129	
		fz	0.193	0.193	0.193	0.193	0.171	0.238	0.238	0.151	0.214	0.238	0.238	0.238	0.238	0.250	0.264	0.270	
		RPM	3570	3570	3570	3570	3174	3306	3306	2732	2975	2904	2582	2904	2582	2331	2066	1639	
		FEED	1375	1375	1375	1375	1087	1574	1574	825	1275	1382	1229	1382	1229	1166	1091	885	
		Ap	0.350	0.350	0.350	0.250	0.250	1.080	1.080	0.780	0.420	0.300	0.300	1.260	1.440	1.620	1.800	2.250	
	9	Vc	107	107	107	107	95	118	118	98	107	104	92	121	123	125	123	122	
		fz	0.172	0.172	0.172	0.172	0.153	0.213	0.213	0.135	0.192	0.213	0.213	0.213	0.213	0.224	0.236	0.242	
		RPM	3392	3392	3392	3392	3015	3141	3141	2595	2826	2759	2453	2759	2453	2214	1963	1557	
		FEED	1169	1169	1169	1169	924	1338	1338	701	1084	1175	1045	1175	1045	991	927	752	
		Ap	0.273	0.273	0.273	0.195	0.195	0.842	0.842	0.608	0.328	0.234	0.234	0.983	1.123	1.264	1.404	1.755	
	11.1	Vc	112	112	112	112	100	125	125	103	112	109	97	128	130	132	130	129	
		fz	0.193	0.193	0.193	0.193	0.171	0.238	0.238	0.151	0.214	0.238	0.238	0.238	0.238	0.250	0.264	0.270	
		RPM	3570	3570	3570	3570	3174	3306	3306	2732	2975	2904	2582	2904	2582	2331	2066	1639	
		FEED	1375	1375	1375	1375	1087	1574	1574	825	1275	1382	1229	1382	1229	1166	1091	885	
		Ap	0.350	0.350	0.350	0.250	0.250	1.080	1.080	0.780	0.420	0.300	0.300	1.260	1.440	1.620	1.800	2.250	
	11.2	Vc	107	107	107	107	95	118	118	98	107	104	92	121	123	125	123	122	
		fz	0.172	0.172	0.172	0.172	0.153	0.213	0.213	0.135	0.192	0.213	0.213	0.213	0.213	0.224	0.236	0.242	
		RPM	3392	3392	3392	3392	3015	3141	3141	2595	2826	2759	2453	2759	2453	2214	1963	1557	
		FEED	1169	1169	1169	1169	924	1338	1338	701	1084	1175	1045	1175	1045	991	927	752	
		Ap	0.273	0.273	0.273	0.195	0.195	0.842	0.842	0.608	0.328	0.234	0.234	0.983	1.123	1.264	1.404	1.755	
H	38.1	Vc	93	93	93	93	83	103	103	85	93	91	81	106	108	109	108	107	
		fz	0.162	0.162	0.162	0.162	0.144	0.201	0.201	0.127	0.181	0.201	0.201	0.201	0.201	0.211	0.223	0.228	
		RPM	2963	2963	2963	2963	2634	2744	2744	2268	2469	2410	2143	2410	2143	1935	1715	1360	
		FEED	963	963	963	963	761	1102	1102	578	893	967	860	967	860	816	764	620	
		Ap	0.196	0.196	0.196	0.140	0.140	0.605	0.605	0.437	0.235	0.168	0.168	0.706	0.806	0.907	1.008	1.260	
	38.2	Vc	93	93	93	93	83	103	103	85	93	91	81	106	108	109	108	107	
		fz	0.162	0.162	0.162	0.162	0.144	0.201	0.201	0.127	0.181	0.201	0.201	0.201	0.201	0.211	0.223	0.228	
		RPM	2963	2963	2963	2963	2634	2744	2744	2268	2469	2410	2143	2410	2143	1935	1715	1360	
		FEED	963	963	963	963	761	1102	1102	578	893	967	860	967	860	816	764	620	
		Ap	0.196	0.196	0.196	0.140	0.140	0.605	0.605	0.437	0.235	0.168	0.168	0.706	0.806	0.907	1.008	1.260	
	40	Vc	107	107	107	107	95	118	118	98	107	104	92	121	123	125	123	122	
		fz	0.172	0.172	0.172	0.172	0.153	0.213	0.213	0.135	0.192	0.213	0.213	0.213	0.213	0.224	0.236	0.242	
		RPM	3392	3392	3392	3392	3015	3141	3141	2595	2826	2759	2453	2759	2453	2214	1963	1557	
		FEED	1169	1169	1169	1169	924	1338	1338	701	1084	1175	1045	1175	1045	991	927	752	
		Ap	0.273	0.273	0.273	0.195	0.195	0.842	0.842	0.608	0.328	0.234	0.234	0.983	1.123	1.264	1.404	1.755	
	41	Vc	93	93	93	93	83	103	103	85	93	91	81	106	108	109	108	107	
		fz	0.162	0.162	0.162	0.162	0.144	0.201	0.201	0.127	0.181	0.201	0.201	0.201	0.201	0.211	0.223	0.228	
		RPM	2963	2963	2963	2963	2634	2744	2744	2268	2469	2410	2143	2410	2143	1935	1715	1360	
		FEED	963	963	963	963	761	1102	1102	578	893	967	860	967	860	816	764	620	
		Ap	0.196	0.196	0.196	0.140	0.140	0.605	0.605	0.437	0.235	0.168	0.168	0.706	0.806	0.907	1.008	1.260	

HPK11 SERIES

3 FLUTE BALL NOSE - PLANE

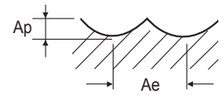


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Ae	Ap	Para-meter	Diameter (Ø)								
						3	4	5	6	8	10	12	16	20
P	5	Non-alloy steel	0.05D	0.02D	Vc	309	314	324	350	350	350	350	345	350
					fz	0.090	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
					RPM	32786	24999	20656	18579	13934	11148	9290	6865	5573
					FEED	8852	8025	7497	8862	7566	6755	6271	4716	3712
	8	Low alloy steel	0.05D	0.02D	Vc	309	314	324	350	350	350	350	345	350
					fz	0.090	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
					RPM	32786	24999	20656	18579	13934	11148	9290	6865	5573
					FEED	8852	8025	7497	8862	7566	6755	6271	4716	3712
	9		0.05D	0.02D	Vc	309	314	324	350	350	350	350	345	350
					fz	0.090	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
					RPM	32786	24999	20656	18579	13934	11148	9290	6865	5573
					FEED	8852	8025	7497	8862	7566	6755	6271	4716	3712
	11.1	High alloyed steel, and tool steel	0.05D	0.02D	Vc	309	314	324	350	350	350	350	345	350
					fz	0.090	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
					RPM	32786	24999	20656	18579	13934	11148	9290	6865	5573
					FEED	8852	8025	7497	8862	7566	6755	6271	4716	3712
	11.2		0.05D	0.02D	Vc	309	314	324	350	350	350	350	345	350
					fz	0.090	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
					RPM	32786	24999	20656	18579	13934	11148	9290	6865	5573
					FEED	8852	8025	7497	8862	7566	6755	6271	4716	3712
H	38.1	Hardened steel	0.05D	0.02D	Vc	263	263	273	294	294	294	294	294	294
					fz	0.072	0.090	0.108	0.136	0.155	0.168	0.187	0.190	0.192
					RPM	27868	20901	17376	15574	11680	9344	7787	5840	4672
					FEED	6019	5643	5630	6354	5431	4709	4368	3329	2691
	38.2		0.05D	0.02D	Vc	263	263	273	294	294	294	294	294	294
					fz	0.072	0.090	0.108	0.136	0.155	0.168	0.187	0.190	0.192
					RPM	27868	20901	17376	15574	11680	9344	7787	5840	4672
					FEED	6019	5643	5630	6354	5431	4709	4368	3329	2691
	39.1		0.05D	0.02D	Vc	191	191	201	237	237	237	237	237	237
					fz	0.072	0.087	0.099	0.123	0.144	0.156	0.173	0.180	0.180
					RPM	20218	15164	12786	12568	9426	7541	6284	4713	3771
					FEED	4367	3957	3798	4637	4072	3529	3261	2545	2036
	39.2		0.05D	0.02D	Vc	180	185	191	216	216	216	216	216	211
					fz	0.072	0.086	0.099	0.115	0.134	0.144	0.145	0.144	0.145
					RPM	19125	14754	12130	11475	8607	6886	5737	4303	3361
					FEED	4131	3807	3603	3959	3460	2975	2496	1859	1462
	39.3		0.05D	0.02D	Vc	124	124	129	149	149	149	149	149	149
					fz	0.072	0.087	0.099	0.108	0.125	0.144	0.144	0.144	0.143
					RPM	13114	9835	8197	7923	5942	4753	3961	2972	2377
					FEED	2833	2567	2434	2567	2229	2054	1712	1283	1020
	40	Chilled Cast Iron	0.05D	0.02D	Vc	309	314	324	350	350	350	350	345	350
					fz	0.090	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
					RPM	32786	24999	20656	18579	13934	11148	9290	6865	5573
					FEED	8852	8025	7497	8862	7566	6755	6271	4716	3712
	41	Hardened Cast Iron	0.05D	0.02D	Vc	263	263	273	294	294	294	294	294	294
					fz	0.072	0.090	0.108	0.136	0.155	0.168	0.187	0.190	0.192
					RPM	27868	20901	17376	15574	11680	9344	7787	5840	4672
					FEED	6019	5643	5630	6354	5431	4709	4368	3329	2691

HPK12, HPK13 SERIES

4 FLUTE BALL NOSE - PLANE

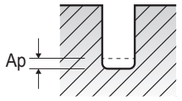


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Ae	Ap	Para-meter	Diameter (Ø)												
						1	1.5	2	2.5	3	4	5	6	8	10	12	16	20
P	5	Non-alloy steel	0.05D	0.02D	Vc	188	283	350	350	350	350	350	350	350	350	350	350	350
					fz	0.048	0.053	0.059	0.065	0.071	0.080	0.090	0.101	0.116	0.128	0.145	0.144	0.144
					RPM	60000	60000	55723	44599	37157	27868	22294	18579	13934	11148	9290	6967	5573
					FEED	11520	12720	13151	11596	10552	8918	8026	7506	6465	5707	5388	4013	3211
	8	Low alloy steel	0.05D	0.02D	Vc	188	283	350	350	350	350	350	350	350	350	350	350	350
					fz	0.048	0.053	0.059	0.065	0.071	0.080	0.090	0.101	0.116	0.128	0.145	0.144	0.144
					RPM	60000	60000	55723	44599	37157	27868	22294	18579	13934	11148	9290	6967	5573
					FEED	11520	12720	13151	11596	10552	8918	8026	7506	6465	5707	5388	4013	3211
	9		0.05D	0.02D	Vc	188	283	350	350	350	350	350	350	350	350	350	350	350
					fz	0.048	0.053	0.059	0.065	0.071	0.080	0.090	0.101	0.116	0.128	0.145	0.144	0.144
					RPM	60000	60000	55723	44599	37157	27868	22294	18579	13934	11148	9290	6967	5573
					FEED	11520	12720	13151	11596	10552	8918	8026	7506	6465	5707	5388	4013	3211
	11.1	High alloyed steel, and tool steel	0.05D	0.02D	Vc	188	283	350	350	350	350	350	350	350	350	350	350	350
					fz	0.048	0.053	0.059	0.065	0.071	0.080	0.090	0.101	0.116	0.128	0.145	0.144	0.144
					RPM	60000	60000	55723	44599	37157	27868	22294	18579	13934	11148	9290	6967	5573
					FEED	11520	12720	13151	11596	10552	8918	8026	7506	6465	5707	5388	4013	3211
	11.2		0.05D	0.02D	Vc	188	283	350	350	350	350	350	350	350	350	350	350	350
					fz	0.048	0.053	0.059	0.065	0.071	0.080	0.090	0.101	0.116	0.128	0.145	0.144	0.144
					RPM	60000	60000	55723	44599	37157	27868	22294	18579	13934	11148	9290	6967	5573
					FEED	11520	12720	13151	11596	10552	8918	8026	7506	6465	5707	5388	4013	3211
H	38.1	Hardened steel	0.05D	0.02D	Vc	188	283	294	294	294	294	288	294	294	294	294	294	294
					fz	0.042	0.047	0.051	0.055	0.060	0.070	0.081	0.092	0.103	0.111	0.125	0.129	0.126
					RPM	60000	60000	46762	37389	31146	23360	18360	15574	11680	9344	7787	5840	4672
					FEED	10080	11280	9540	8226	7475	6541	5948	5731	4812	4149	3893	3014	2355
	38.2		0.05D	0.02D	Vc	188	283	294	294	294	294	288	294	294	294	294	294	294
					fz	0.042	0.047	0.051	0.055	0.060	0.070	0.081	0.092	0.103	0.111	0.125	0.129	0.126
					RPM	60000	60000	46762	37389	31146	23360	18360	15574	11680	9344	7787	5840	4672
					FEED	10080	11280	9540	8226	7475	6541	5948	5731	4812	4149	3893	3014	2355
	39.1		0.05D	0.02D	Vc	188	237	237	237	237	237	237	237	237	237	237	237	237
					fz	0.038	0.041	0.044	0.047	0.050	0.060	0.071	0.082	0.096	0.104	0.115	0.119	0.119
					RPM	60000	50367	37698	30179	25136	18852	15081	12568	9426	7541	6284	4713	3771
					FEED	9120	8261	6635	5673	5027	4525	4283	4122	3619	3137	2890	2243	1795
	39.2		0.05D	0.02D	Vc	188	216	217	216	216	216	216	216	216	216	216	216	211
					fz	0.037	0.039	0.041	0.043	0.045	0.055	0.067	0.077	0.089	0.095	0.097	0.096	0.096
					RPM	60000	45835	34505	27501	22950	17212	13770	11475	8607	6886	5737	4303	3361
					FEED	8880	7150	5659	4730	4131	3786	3690	3534	3064	2616	2226	1652	1291
	39.3		0.05D	0.02D	Vc	149	149	149	150	149	149	149	149	149	149	149	149	144
					fz	0.033	0.035	0.036	0.038	0.040	0.050	0.062	0.072	0.082	0.096	0.094	0.096	0.097
					RPM	47380	31621	23690	19055	15847	11885	9508	7923	5942	4753	3961	2972	2295
					FEED	6254	4427	3411	2896	2536	2377	2358	2281	1949	1825	1489	1141	890
	40	Chilled Cast Iron	0.05D	0.02D	Vc	188	283	350	350	350	350	350	350	350	350	350	350	350
					fz	0.048	0.053	0.059	0.065	0.071	0.080	0.090	0.101	0.116	0.128	0.145	0.144	0.144
					RPM	60000	60000	55723	44599	37157	27868	22294	18579	13934	11148	9290	6967	5573
					FEED	11520	12720	13151	11596	10552	8918	8026	7506	6465	5707	5388	4013	3211
	41	Hardened Cast Iron	0.05D	0.02D	Vc	188	283	294	294	294	294	288	294	294	294	294	294	294
					fz	0.042	0.047	0.051	0.055	0.060	0.070	0.081	0.092	0.103	0.111	0.125	0.129	0.126
					RPM	60000	60000	46762	37389	31146	23360	18360	15574	11680	9344	7787	5840	4672
					FEED	10080	11280	9540	8226	7475	6541	5948	5731	4812	4149	3893	3014	2355

HPI89, HPK15 SERIES

2 FLUTE CORNER RADIUS - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Material Description	Slotting	Para-meter	Diameter (Ø)																
					0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
			Ae	LBS	0.5	1	1.5	2	1	1.5	2	2.5	3	1	1.5	2	2.5	3	4	1	1.5
P	5	Non-alloy steel	1.0D	Vc	31	31	28	28	46	46	42	42	42	67	67	67	60	60	60	82	82
				fz	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.004
				RPM	49178	49178	44260	44260	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949	52458	52458
				FEED	98	98	89	89	197	197	177	177	177	213	213	213	192	192	192	420	420
				Ap	0.010	0.009	0.008	0.007	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016	0.014	0.025	0.025
	8	Low alloy steel	1.0D	Vc	31	31	28	28	46	46	42	42	42	67	67	67	60	60	60	82	82
				fz	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.004
				RPM	49178	49178	44260	44260	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949	52458	52458
				FEED	98	98	89	89	197	197	177	177	177	213	213	213	192	192	192	420	420
				Ap	0.010	0.009	0.008	0.007	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016	0.014	0.025	0.025
	9		1.0D	Vc	31	31	28	28	46	46	42	42	42	67	67	67	60	60	60	82	82
				fz	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.004
				RPM	49178	49178	44260	44260	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949	52458	52458
				FEED	98	98	89	89	197	197	177	177	177	213	213	213	192	192	192	420	420
				Ap	0.010	0.009	0.008	0.007	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016	0.014	0.025	0.025
	11.1	High alloyed steel, and tool steel	1.0D	Vc	31	31	28	28	46	46	42	42	42	67	67	67	60	60	60	82	82
				fz	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.004
				RPM	49178	49178	44260	44260	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949	52458	52458
				FEED	98	98	89	89	197	197	177	177	177	213	213	213	192	192	192	420	420
				Ap	0.010	0.009	0.008	0.007	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016	0.014	0.025	0.025
	11.2		1.0D	Vc	31	31	28	28	41	41	37	37	37	57	57	57	51	51	51	72	72
				fz	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003
				RPM	49178	49178	44260	44260	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573	45900	45900
				FEED	98	98	89	89	175	175	157	157	157	180	180	180	162	162	162	275	275
				Ap	0.009	0.008	0.007	0.006	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014	0.012	0.021	0.021
H	38.1	Hardened steel	1.0D	Vc	31	31	28	28	41	41	37	37	37	57	57	57	51	51	51	72	72
				fz	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003
				RPM	49178	49178	44260	44260	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573	45900	45900
				FEED	98	98	89	89	175	175	157	157	157	180	180	180	162	162	162	275	275
				Ap	0.009	0.008	0.007	0.006	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014	0.012	0.021	0.021
	38.2		1.0D	Vc	26	26	23	23	41	41	37	37	37	52	52	52	46	46	46	67	67
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003
				RPM	40983	40983	36885	36885	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885	36885	42621	42621
				FEED	82	82	74	74	87	87	79	79	79	164	164	164	148	148	148	256	256
				Ap	0.009	0.008	0.007	0.006	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014	0.012	0.021	0.021
	39.1		1.0D	Vc	21	21	19	19	31	31	28	28	28	41	41	41	37	37	37	52	52
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
				RPM	32786	32786	29507	29507	32786	32786	29507	29507	29507	32786	32786	32786	29507	29507	29507	32786	32786
				FEED	66	66	59	59	66	66	59	59	59	66	66	66	59	59	59	131	131
				Ap	0.008	0.007	0.006	0.006	0.011	0.011	0.010	0.008	0.008	0.016	0.014	0.014	0.013	0.013	0.011	0.020	0.020
	39.2		1.0D	Vc	21	21	19	19	26	26	23	23	23	31	31	31	28	28	28	41	41
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
				RPM	32786	32786	29507	29507	27322	27322	24590	24590	24590	24589	24589	24589	22130	22130	22130	26229	26229
				FEED	66	66	59	59	55	55	49	49	49	49	49	49	44	44	44	105	105
				Ap	0.008	0.007	0.006	0.006	0.011	0.011	0.010	0.008	0.008	0.016	0.014	0.014	0.013	0.013	0.011	0.020	0.020
	39.3		1.0D	Vc	15	15	14	14	21	21	19	19	19	26	26	26	23	23	23	31	31
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
				RPM	24589	24589	22130	22130	21858	21858	19672	19672	19672	20491	20491	20491	18442	18442	18442	19672	19672
				FEED	49	49	44	44	44	44	39	39	39	41	41	41	37	37	37	79	79
				Ap	0.007	0.006	0.005	0.005	0.009	0.009	0.008	0.007	0.007	0.013	0.012	0.012	0.010	0.010	0.009	0.016	0.016
	40	Chilled Cast Iron	1.0D	Vc	31	31	28	28	41	41	37	37	37	57	57	57	51	51	51	72	72
				fz	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003
				RPM	49178	49178	44260	44260	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573	45900	45900
				FEED	98	98	89	89	175	175	157	157	157	180	180	180	162	162	162	275	275
				Ap	0.009	0.008	0.007	0.006	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014	0.012	0.021	0.021
	41	Hardened Cast Iron	1.0D	Vc	26	26	23	23	41	41	37	37	37	52	52	52	46	46	46	67	67
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003
				RPM	40983	40983	36885	36885	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885	36885	42621	42621
				FEED	82	82	74	74	87	87	79	79	79	164	164	164	148	148	148	256	256
				Ap	0.009	0.008	0.007	0.006	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014	0.012	0.021	0.021

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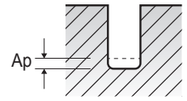
HPI89, HPK15 SERIES

2 FLUTE CORNER RADIUS - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																
			0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8
		LBS	2	3	4	5	6	2	4	6	8	10	2	4	6	2	4	6	8
P	5	Vc	82	74	74	74	66	98	88	88	78	59	113	102	102	129	129	116	116
		fz	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005	0.005
		RPM	52458	47212	47212	47212	41966	51911	46720	46720	41529	31147	51569	46412	46412	51228	51228	46105	46105
		FEED	420	378	378	378	252	519	467	467	332	249	619	464	464	615	615	461	461
		Ap	0.023	0.020	0.020	0.018	0.018	0.027	0.024	0.021	0.018	0.015	0.035	0.028	0.025	0.040	0.036	0.032	0.028
	8	Vc	82	74	74	74	66	98	88	88	78	59	113	102	102	129	129	116	116
		fz	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005	0.005
		RPM	52458	47212	47212	47212	41966	51911	46720	46720	41529	31147	51569	46412	46412	51228	51228	46105	46105
		FEED	420	378	378	378	252	519	467	467	332	249	619	464	464	615	615	461	461
		Ap	0.023	0.020	0.020	0.018	0.018	0.027	0.024	0.021	0.018	0.015	0.035	0.028	0.025	0.040	0.036	0.032	0.028
	9	Vc	82	74	74	74	66	98	88	88	78	59	113	102	102	129	129	116	116
		fz	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005	0.005
		RPM	52458	47212	47212	47212	41966	51911	46720	46720	41529	31147	51569	46412	46412	51228	51228	46105	46105
		FEED	420	378	378	378	252	519	467	467	332	249	619	464	464	615	615	461	461
		Ap	0.023	0.020	0.020	0.018	0.018	0.027	0.024	0.021	0.018	0.015	0.035	0.028	0.025	0.040	0.036	0.032	0.028
	11.1	Vc	82	74	74	74	66	98	88	88	78	59	113	102	102	129	129	116	116
		fz	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005	0.005
		RPM	52458	47212	47212	47212	41966	51911	46720	46720	41529	31147	51569	46412	46412	51228	51228	46105	46105
		FEED	420	378	378	378	252	519	467	467	332	249	619	464	464	615	615	461	461
		Ap	0.023	0.020	0.020	0.018	0.018	0.027	0.024	0.021	0.018	0.015	0.035	0.028	0.025	0.040	0.036	0.032	0.028
	11.2	Vc	72	65	65	65	58	88	79	79	70	53	93	84	84	103	103	93	93
		fz	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005
		RPM	45900	41310	41310	41310	36720	46447	41802	41802	37158	27868	42230	38007	38007	40983	40983	36885	36885
		FEED	275	248	248	248	147	372	334	334	223	167	422	380	380	492	492	369	369
		Ap	0.019	0.017	0.017	0.015	0.015	0.023	0.020	0.018	0.015	0.013	0.030	0.024	0.021	0.034	0.031	0.027	0.024
H	38.1	Vc	72	65	65	65	58	88	79	79	70	53	93	84	84	103	103	93	93
		fz	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005
		RPM	45900	41310	41310	41310	36720	46447	41802	41802	37158	27868	42230	38007	38007	40983	40983	36885	36885
		FEED	275	248	248	248	147	372	334	334	223	167	422	380	380	492	492	369	369
		Ap	0.019	0.017	0.017	0.015	0.015	0.023	0.020	0.018	0.015	0.013	0.030	0.024	0.021	0.034	0.031	0.027	0.024
	38.2	Vc	67	60	60	60	54	77	70	70	62	46	77	69	69	77	77	70	70
		fz	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.004	0.004	0.005	0.005	0.005	0.005
		RPM	42621	38359	38359	38359	34097	40983	36885	36885	32786	24590	35020	31518	31518	30737	30737	27663	27663
		FEED	256	230	230	230	136	328	295	295	197	148	350	252	252	307	307	277	277
		Ap	0.019	0.017	0.017	0.015	0.015	0.023	0.020	0.018	0.015	0.013	0.030	0.024	0.021	0.034	0.031	0.027	0.024
	39.1	Vc	52	46	46	46	41	57	51	51	45	34	62	56	56	67	67	60	60
		fz	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.002	0.004	0.003	0.003	0.004	0.004	0.004	0.004
		RPM	32786	29507	29507	29507	26229	30053	27048	27048	24042	18032	28335	25502	25502	26639	26639	23975	23975
		FEED	131	118	118	118	105	180	162	162	96	72	227	153	153	213	213	192	192
		Ap	0.018	0.016	0.016	0.014	0.014	0.022	0.019	0.017	0.014	0.012	0.028	0.022	0.020	0.032	0.029	0.026	0.022
	39.2	Vc	41	37	37	37	33	46	42	42	37	28	46	42	42	51	51	46	46
		fz	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.001	0.003	0.002	0.002	0.003	0.003	0.003	0.003
		RPM	26229	23606	23606	23606	20983	24589	22130	22130	19671	14753	21115	19004	19004	20491	20491	18442	18442
		FEED	105	94	94	94	42	98	89	89	79	30	127	76	76	123	123	111	111
		Ap	0.018	0.016	0.016	0.014	0.014	0.022	0.019	0.017	0.014	0.012	0.028	0.022	0.020	0.032	0.029	0.026	0.022
	39.3	Vc	31	28	28	28	25	41	37	37	33	25	42	38	38	41	41	37	37
		fz	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.003	0.003	0.002	0.002
		RPM	19672	17705	17705	17705	15738	21858	19672	19672	17486	13115	18952	17057	17057	16392	16392	14753	14753
		FEED	79	35	35	35	31	87	79	79	70	26	76	68	68	98	98	59	59
		Ap	0.015	0.013	0.013	0.011	0.011	0.018	0.016	0.014	0.012	0.010	0.023	0.018	0.016	0.026	0.023	0.021	0.018
	40	Vc	72	65	65	65	58	88	79	79	70	53	93	84	84	103	103	93	93
		fz	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005
		RPM	45900	41310	41310	41310	36720	46447	41802	41802	37158	27868	42230	38007	38007	40983	40983	36885	36885
		FEED	275	248	248	248	147	372	334	334	223	167	422	380	380	492	492	369	369
		Ap	0.019	0.017	0.017	0.015	0.015	0.023	0.020	0.018	0.015	0.013	0.030	0.024	0.021	0.034	0.031	0.027	0.024
	41	Vc	67	60	60	60	54	77	70	70	62	46	77	69	69	77	77	70	70
		fz	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.004	0.004	0.005	0.005	0.005	0.005
		RPM	42621	38359	38359	38359	34097	40983	36885	36885	32786	24590	35020	31518	31518	30737	30737	27663	27663
		FEED	256	230	230	230	136	328	295	295	197	148	350	252	252	307	307	277	277
		Ap	0.019	0.017	0.017	0.015	0.015	0.023	0.020	0.018	0.015	0.013	0.030	0.024	0.021	0.034	0.031	0.027	0.024

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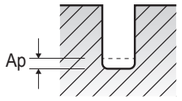
HPI89, HPK15 SERIES

2 FLUTE CORNER RADIUS - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			0.8	0.9	0.9	0.9	1	1	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5	2	2	2
			LBS																			
P	5	Vc	103	144	144	130	154	154	139	139	139	124	93	93	196	176	176	176	157	216	216	195
		fz	0.005	0.007	0.007	0.006	0.010	0.010	0.009	0.009	0.009	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012
		RPM	40982	51000	51000	45900	49178	49178	44260	44260	44260	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983
		FEED	410	714	714	551	984	984	797	797	797	629	413	413	915	748	748	748	599	895	895	744
		Ap	0.024	0.041	0.041	0.032	0.050	0.045	0.040	0.040	0.035	0.035	0.030	0.025	0.075	0.060	0.060	0.053	0.045	0.100	0.090	0.080
	8	Vc	103	144	144	130	154	154	139	139	139	124	93	93	196	176	176	176	157	216	216	195
		fz	0.005	0.007	0.007	0.006	0.010	0.010	0.009	0.009	0.009	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012
		RPM	40982	51000	51000	45900	49178	49178	44260	44260	44260	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983
		FEED	410	714	714	551	984	984	797	797	797	629	413	413	915	748	748	748	599	895	895	744
		Ap	0.024	0.041	0.041	0.032	0.050	0.045	0.040	0.040	0.035	0.035	0.030	0.025	0.075	0.060	0.060	0.053	0.045	0.100	0.090	0.080
	9	Vc	103	144	144	130	154	154	139	139	139	124	93	93	196	176	176	176	157	216	216	195
		fz	0.005	0.007	0.007	0.006	0.010	0.010	0.009	0.009	0.009	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012
		RPM	40982	51000	51000	45900	49178	49178	44260	44260	44260	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983
		FEED	410	714	714	551	984	984	797	797	797	629	413	413	915	748	748	748	599	895	895	744
		Ap	0.024	0.041	0.041	0.032	0.050	0.045	0.040	0.040	0.035	0.035	0.030	0.025	0.075	0.060	0.060	0.053	0.045	0.100	0.090	0.080
	11.1	Vc	103	144	144	130	154	154	139	139	139	124	93	93	196	176	176	176	157	216	216	195
		fz	0.005	0.007	0.007	0.006	0.010	0.010	0.009	0.009	0.009	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012
		RPM	40982	51000	51000	45900	49178	49178	44260	44260	44260	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983
		FEED	410	714	714	551	984	984	797	797	797	629	413	413	915	748	748	748	599	895	895	744
		Ap	0.024	0.041	0.041	0.032	0.050	0.045	0.040	0.040	0.035	0.035	0.030	0.025	0.075	0.060	0.060	0.053	0.045	0.100	0.090	0.080
	11.2	Vc	82	113	113	102	124	124	111	111	111	99	74	74	154	139	139	139	123	170	170	153
		fz	0.005	0.007	0.007	0.006	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.010	0.009	0.009	0.009	0.008	0.013	0.013	0.012
		RPM	32786	40072	40072	36065	39343	39343	35409	35409	35409	31474	23606	23606	32754	29479	29479	29479	26203	27049	27049	24344
		FEED	328	561	561	433	629	629	496	496	496	378	283	283	655	531	531	531	419	703	703	584
		Ap	0.020	0.034	0.034	0.027	0.043	0.038	0.034	0.034	0.030	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068
H	38.1	Vc	82	113	113	102	124	124	111	111	111	99	74	74	154	139	139	139	123	170	170	153
		fz	0.005	0.007	0.007	0.006	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.010	0.009	0.009	0.009	0.008	0.013	0.013	0.012
		RPM	32786	40072	40072	36065	39343	39343	35409	35409	35409	31474	23606	23606	32754	29479	29479	29479	26203	27049	27049	24344
		FEED	328	561	561	433	629	629	496	496	496	378	283	283	655	531	531	531	419	703	703	584
		Ap	0.020	0.034	0.034	0.027	0.043	0.038	0.034	0.034	0.030	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068
	38.2	Vc	62	82	82	74	82	82	74	74	74	66	49	49	103	93	93	93	83	113	113	102
		fz	0.004	0.006	0.006	0.005	0.007	0.007	0.006	0.006	0.006	0.006	0.005	0.005	0.009	0.008	0.008	0.008	0.007	0.012	0.012	0.011
		RPM	24590	29143	29143	26229	26229	26229	23606	23606	23606	20983	15737	15737	21939	19745	19745	19745	17551	18032	18032	16229
		FEED	197	350	350	262	367	367	283	283	283	252	157	157	395	316	316	316	246	433	433	357
		Ap	0.020	0.034	0.034	0.027	0.043	0.038	0.034	0.034	0.030	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068
	39.1	Vc	54	67	67	60	67	67	60	60	60	54	40	40	83	74	74	74	66	93	93	83
		fz	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.007	0.006	0.006	0.006	0.005	0.009	0.009	0.008
		RPM	21311	23679	23679	21311	21311	21311	19180	19180	19180	17049	12787	12787	17510	15759	15759	15759	14008	14754	14754	13279
		FEED	128	237	237	213	213	213	192	192	192	136	102	102	245	189	189	189	140	266	266	212
		Ap	0.019	0.032	0.032	0.025	0.040	0.036	0.032	0.032	0.028	0.028	0.024	0.020	0.060	0.048	0.048	0.042	0.036	0.080	0.072	0.064
	39.2	Vc	41	52	52	46	51	51	46	46	46	41	31	31	62	56	56	56	50	72	72	65
		fz	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.006	0.005	0.005	0.005	0.004	0.007	0.007	0.006
		RPM	16393	18215	18215	16394	16392	16392	14753	14753	14753	13114	9835	9835	13184	11866	11866	11866	10547	11475	11475	10328
		FEED	66	146	146	131	131	131	118	118	118	79	59	59	158	119	119	119	84	161	161	124
		Ap	0.019	0.032	0.032	0.025	0.040	0.036	0.032	0.032	0.028	0.028	0.024	0.020	0.060	0.048	0.048	0.042	0.036	0.080	0.072	0.064
	39.3	Vc	33	41	41	37	41	41	37	37	37	33	25	25	52	47	47	47	42	62	62	56
		fz	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.005	0.004	0.004	0.004	0.004	0.006	0.006	0.005
		RPM	13114	14571	14571	13114	13114	13114	11803	11803	11803	10491	7868	7868	11021	9919	9919	9919	8817	9835	9835	8852
		FEED	52	87	87	79	79	79	71	71	71	63	31	31	110	79	79	79	71	118	118	89
		Ap	0.016	0.026	0.026	0.020	0.033	0.029	0.026	0.026	0.023	0.023	0.020	0.016	0.049	0.039	0.039	0.034	0.029	0.065	0.059	0.052
	40	Vc	82	113	113	102	124	124	111	111	111	99	74	74	154	139	139	139	123	170	170	153
		fz	0.005	0.007	0.007	0.006	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.010	0.009	0.009	0.009	0.008	0.013	0.013	0.012
		RPM	32786	40072	40072	36065	39343	39343	35409	35409	35409	31474	23606	23606	32754	29479	29479	29479	26203	27049	27049	24344
		FEED	328	561	561	433	629	629	496	496	496	378	283	283	655	531	531	531	419	703	703	584
		Ap	0.020	0.034	0.034	0.027	0.043	0.038	0.034	0.034	0.030	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068
	41	Vc	62	82	82	74	82	82	74	74	74	66	49	49	103	93	93	93	83	113	113	102
		fz	0.004	0.006	0.006	0.005	0.007	0.007	0.006	0.006	0.006	0.006	0.005	0.005	0.009	0.008	0.008	0.008	0.007	0.012	0.012	0.011
		RPM	24590	29143	29143	26229	26229	26229	23606	23606	23606	20983	15737	15737	21939	19745	19745	19745	17551	18032	18032	16229
		FEED	197	350	350	262	367	367	283	283	283	252	157	157	395	316	316	316	246	433	433	357
		Ap	0.020	0.034	0.034	0.027	0.043	0.038	0.034	0.034	0.030	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068

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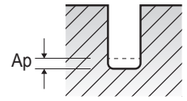
HPI89, HPK15 SERIES

2 FLUTE CORNER RADIUS - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			2	2	2	2	2.5	3	3	3	3	3	3	3	3.5	4	4	4	4			
			LBS																			
P	5	Vc	195	195	173	173	217	211	211	211	190	190	190	169	216	216	216	216	216			
		fz	0.012	0.012	0.010	0.010	0.016	0.019	0.019	0.019	0.017	0.017	0.017	0.015	0.022	0.026	0.026	0.026	0.026			
		RPM	30983	30983	27541	27541	27604	22404	22404	22404	20164	20164	20164	17923	19673	17212	17212	17212	17212			
		FEED	744	744	551	551	873	851	851	851	686	686	686	538	866	895	895	895	895			
		Ap	0.080	0.070	0.070	0.060	0.125	0.150	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200	0.200	0.180			
	8	Vc	195	195	173	173	217	211	211	211	190	190	190	169	216	216	216	216	216			
		fz	0.012	0.012	0.010	0.010	0.016	0.019	0.019	0.019	0.017	0.017	0.017	0.015	0.022	0.026	0.026	0.026	0.026			
		RPM	30983	30983	27541	27541	27604	22404	22404	22404	20164	20164	20164	17923	19673	17212	17212	17212	17212			
		FEED	744	744	551	551	873	851	851	851	686	686	686	538	866	895	895	895	895			
		Ap	0.080	0.070	0.070	0.060	0.125	0.150	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200	0.200	0.180			
	9	Vc	195	195	173	173	217	211	211	211	190	190	190	169	216	216	216	216	216			
		fz	0.012	0.012	0.010	0.010	0.016	0.019	0.019	0.019	0.017	0.017	0.017	0.015	0.022	0.026	0.026	0.026	0.026			
		RPM	30983	30983	27541	27541	27604	22404	22404	22404	20164	20164	20164	17923	19673	17212	17212	17212	17212			
		FEED	744	744	551	551	873	851	851	851	686	686	686	538	866	895	895	895	895			
		Ap	0.080	0.070	0.070	0.060	0.125	0.150	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200	0.200	0.180			
	11.1	Vc	195	195	173	173	217	211	211	211	190	190	190	169	216	216	216	216	216			
		fz	0.012	0.012	0.010	0.010	0.016	0.019	0.019	0.019	0.017	0.017	0.017	0.015	0.022	0.026	0.026	0.026	0.026			
		RPM	30983	30983	27541	27541	27604	22404	22404	22404	20164	20164	20164	17923	19673	17212	17212	17212	17212			
		FEED	744	744	551	551	873	851	851	851	686	686	686	538	866	895	895	895	895			
		Ap	0.080	0.070	0.070	0.060	0.125	0.150	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200	0.200	0.180			
	11.2	Vc	153	153	136	136	170	170	170	170	153	153	153	136	170	170	170	170	170			
		fz	0.012	0.012	0.010	0.010	0.016	0.020	0.020	0.020	0.018	0.018	0.018	0.016	0.023	0.027	0.027	0.027	0.027			
		RPM	24344	24344	21639	21639	21630	18032	18032	18032	16229	16229	16229	14426	15502	13524	13524	13524	13524			
		FEED	584	584	433	433	712	721	721	721	584	584	584	462	713	730	730	730	730			
		Ap	0.068	0.060	0.060	0.051	0.106	0.128	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170	0.170	0.153			
H	38.1	Vc	153	153	136	136	170	170	170	170	153	153	153	136	170	170	170	170	170			
		fz	0.012	0.012	0.010	0.010	0.016	0.020	0.020	0.020	0.018	0.018	0.018	0.016	0.023	0.027	0.027	0.027	0.027			
		RPM	24344	24344	21639	21639	21630	18032	18032	18032	16229	16229	16229	14426	15502	13524	13524	13524	13524			
		FEED	584	584	433	433	712	721	721	721	584	584	584	462	713	730	730	730	730			
		Ap	0.068	0.060	0.060	0.051	0.106	0.128	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170	0.170	0.153			
	38.2	Vc	102	102	91	91	113	113	113	113	102	102	102	91	113	113	113	113	113			
		fz	0.011	0.011	0.010	0.010	0.015	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.021	0.025	0.025	0.025	0.025			
		RPM	16229	16229	14426	14426	14420	12021	12021	12021	10819	10819	10819	9617	10321	9017	9017	9017	9017			
		FEED	357	357	289	289	433	433	433	433	346	346	346	269	433	451	451	451	451			
		Ap	0.068	0.060	0.060	0.051	0.106	0.128	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170	0.170	0.153			
	39.1	Vc	83	83	74	74	93	93	93	93	83	83	83	74	93	93	93	93	93			
		fz	0.008	0.008	0.007	0.007	0.011	0.014	0.014	0.014	0.013	0.013	0.013	0.011	0.016	0.019	0.019	0.019	0.019			
		RPM	13279	13279	11803	11803	11845	9835	9835	9835	8852	8852	8852	7868	8446	7377	7377	7377	7377			
		FEED	212	212	165	165	270	275	275	275	230	230	230	173	270	280	280	280	280			
		Ap	0.064	0.056	0.056	0.048	0.100	0.120	0.120	0.108	0.096	0.096	0.084	0.084	0.140	0.160	0.160	0.160	0.144			
	39.2	Vc	65	65	58	58	72	72	72	72	65	65	65	58	72	72	72	72	72			
		fz	0.006	0.006	0.006	0.006	0.009	0.011	0.011	0.011	0.010	0.010	0.010	0.009	0.013	0.015	0.015	0.015	0.015			
		RPM	10328	10328	9180	9180	9167	7650	7650	7650	6885	6885	6885	6120	6592	5737	5737	5737	5737			
		FEED	124	124	110	110	164	168	168	168	138	138	138	110	171	172	172	172	172			
		Ap	0.064	0.056	0.056	0.048	0.100	0.120	0.120	0.108	0.096	0.096	0.084	0.084	0.140	0.160	0.160	0.160	0.144			
	39.3	Vc	56	56	49	49	62	62	62	62	56	56	56	49	62	62	62	62	62			
		fz	0.005	0.005	0.005	0.005	0.008	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.011	0.012	0.012	0.012	0.012			
		RPM	8852	8852	7868	7868	7931	6557	6557	6557	5901	5901	5901	5246	5614	4918	4918	4918	4918			
		FEED	89	89	79	79	119	118	118	118	94	94	94	73	124	118	118	118	118			
		Ap	0.052	0.046	0.046	0.039	0.081	0.098	0.098	0.088	0.078	0.078	0.068	0.068	0.114	0.130	0.130	0.130	0.117			
	40	Vc	153	153	136	136	170	170	170	170	153	153	153	136	170	170	170	170	170			
		fz	0.012	0.012	0.010	0.010	0.016	0.020	0.020	0.020	0.018	0.018	0.018	0.016	0.023	0.027	0.027	0.027	0.027			
		RPM	24344	24344	21639	21639	21630	18032	18032	18032	16229	16229	16229	14426	15502	13524	13524	13524	13524			
		FEED	584	584	433	433	712	721	721	721	584	584	584	462	713	730	730	730	730			
		Ap	0.068	0.060	0.060	0.051	0.106	0.128	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170	0.170	0.153			
	41	Vc	102	102	91	91	113	113	113	113	102	102	102	91	113	113	113	113	113			
		fz	0.011	0.011	0.010	0.010	0.015	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.021	0.025	0.025	0.025	0.025			
		RPM	16229	16229	14426	14426	14420	12021	12021	12021	10819	10819	10819	9617	10321	9017	9017	9017	9017			
		FEED	357	357	289	289	433	433	433	433	346	346	346	269	433	451	451	451	451			
		Ap	0.068	0.060	0.060	0.051	0.106	0.128	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170	0.170	0.153			

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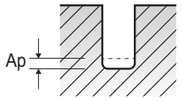
HPI89, HPK15 SERIES

2 FLUTE CORNER RADIUS - SLOTTING

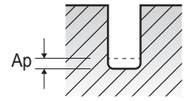


Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																					
			4	4	4	4	4.5	5	5	5	6	6	6	6	6	6	8	8	10	10	12	12	16	20
			LBS	20	30	35	45	10	11	20	40	12	14	18	24	35	55	18	25	25	32	30	38	38	45
P	5	Vc	216	195	195	173	237	252	252	227	252	252	252	252	227	227	257	257	252	252	257	257	252	252
		fz	0.026	0.023	0.023	0.021	0.029	0.032	0.032	0.029	0.036	0.036	0.036	0.036	0.032	0.032	0.047	0.047	0.054	0.054	0.064	0.064	0.074	0.085
		RPM	17212	15491	15491	13770	16789	16065	16065	14459	13388	13388	13388	13388	12049	12049	10245	10245	8033	8033	6830	6830	5020	4016
		FEED	895	713	713	578	961	1028	1028	839	964	964	964	964	771	771	963	963	868	868	874	874	743	683
		Ap	0.180	0.160	0.140	0.140	0.225	0.250	0.225	0.200	0.300	0.300	0.300	0.270	0.240	0.210	0.400	0.360	0.500	0.450	0.600	0.540	0.800	1.000
	8	Vc	216	195	195	173	237	252	252	227	252	252	252	252	227	227	257	257	252	252	257	257	252	252
		fz	0.026	0.023	0.023	0.021	0.029	0.032	0.032	0.029	0.036	0.036	0.036	0.036	0.032	0.032	0.047	0.047	0.054	0.054	0.064	0.064	0.074	0.085
		RPM	17212	15491	15491	13770	16789	16065	16065	14459	13388	13388	13388	13388	12049	12049	10245	10245	8033	8033	6830	6830	5020	4016
		FEED	895	713	713	578	961	1028	1028	839	964	964	964	964	771	771	963	963	868	868	874	874	743	683
		Ap	0.180	0.160	0.140	0.140	0.225	0.250	0.225	0.200	0.300	0.300	0.300	0.270	0.240	0.210	0.400	0.360	0.500	0.450	0.600	0.540	0.800	1.000
	9	Vc	216	195	195	173	237	252	252	227	252	252	252	252	227	227	257	257	252	252	257	257	252	252
		fz	0.026	0.023	0.023	0.021	0.029	0.032	0.032	0.029	0.036	0.036	0.036	0.036	0.032	0.032	0.047	0.047	0.054	0.054	0.064	0.064	0.074	0.085
		RPM	17212	15491	15491	13770	16789	16065	16065	14459	13388	13388	13388	13388	12049	12049	10245	10245	8033	8033	6830	6830	5020	4016
		FEED	895	713	713	578	961	1028	1028	839	964	964	964	964	771	771	963	963	868	868	874	874	743	683
		Ap	0.180	0.160	0.140	0.140	0.225	0.250	0.225	0.200	0.300	0.300	0.300	0.270	0.240	0.210	0.400	0.360	0.500	0.450	0.600	0.540	0.800	1.000
	11.1	Vc	216	195	195	173	237	252	252	227	252	252	252	252	227	227	257	257	252	252	257	257	252	252
		fz	0.026	0.023	0.023	0.021	0.029	0.032	0.032	0.029	0.036	0.036	0.036	0.036	0.032	0.032	0.047	0.047	0.054	0.054	0.064	0.064	0.074	0.085
		RPM	17212	15491	15491	13770	16789	16065	16065	14459	13388	13388	13388	13388	12049	12049	10245	10245	8033	8033	6830	6830	5020	4016
		FEED	895	713	713	578	961	1028	1028	839	964	964	964	964	771	771	963	963	868	868	874	874	743	683
		Ap	0.180	0.160	0.140	0.140	0.225	0.250	0.225	0.200	0.300	0.300	0.300	0.270	0.240	0.210	0.400	0.360	0.500	0.450	0.600	0.540	0.800	1.000
	11.2	Vc	170	153	153	136	181	201	201	181	201	201	201	201	181	181	201	201	201	201	206	206	201	201
		fz	0.027	0.024	0.024	0.022	0.030	0.032	0.032	0.029	0.037	0.037	0.037	0.037	0.033	0.033	0.046	0.046	0.055	0.055	0.065	0.065	0.074	0.085
		RPM	13524	12172	12172	10819	12786	12786	12786	11507	10655	10655	10655	10655	9590	9590	7992	7992	6393	6393	5464	5464	3995	3197
		FEED	730	584	584	476	774	818	818	667	788	788	788	788	633	633	735	735	703	703	710	710	591	544
		Ap	0.153	0.136	0.119	0.119	0.191	0.213	0.191	0.170	0.255	0.255	0.255	0.230	0.204	0.179	0.340	0.306	0.425	0.383	0.510	0.459	0.680	0.850
H	38.1	Vc	170	153	153	136	181	201	201	181	201	201	201	201	181	181	201	201	201	201	206	206	201	201
		fz	0.027	0.024	0.024	0.022	0.030	0.032	0.032	0.029	0.037	0.037	0.037	0.037	0.033	0.033	0.046	0.046	0.055	0.055	0.065	0.065	0.074	0.085
		RPM	13524	12172	12172	10819	12786	12786	12786	11507	10655	10655	10655	10655	9590	9590	7992	7992	6393	6393	5464	5464	3995	3197
		FEED	730	584	584	476	774	818	818	667	788	788	788	788	633	633	735	735	703	703	710	710	591	544
		Ap	0.153	0.136	0.119	0.119	0.191	0.213	0.191	0.170	0.255	0.255	0.255	0.230	0.204	0.179	0.340	0.306	0.425	0.383	0.510	0.459	0.680	0.850
	38.2	Vc	113	102	102	91	124	134	134	121	134	134	134	134	121	121	134	134	134	134	134	134	134	134
		fz	0.025	0.023	0.023	0.020	0.027	0.030	0.030	0.027	0.035	0.035	0.035	0.035	0.032	0.032	0.043	0.043	0.051	0.051	0.059	0.059	0.070	0.082
		RPM	9017	8115	8115	7214	8770	8524	8524	7672	7104	7104	7104	7104	6394	6394	5328	5328	4262	4262	3551	3551	2664	2131
		FEED	451	373	373	289	481	511	511	414	497	497	497	497	409	409	458	458	435	435	419	419	373	349
		Ap	0.153	0.136	0.119	0.119	0.191	0.213	0.191	0.170	0.255	0.255	0.255	0.230	0.204	0.179	0.340	0.306	0.425	0.383	0.510	0.459	0.680	0.850
	39.1	Vc	93	83	83	74	98	103	103	93	103	103	103	103	93	93	103	103	103	103	103	103	103	103
		fz	0.019	0.017	0.017	0.015	0.020	0.022	0.022	0.020	0.026	0.026	0.026	0.026	0.023	0.023	0.032	0.032	0.038	0.038	0.045	0.045	0.053	0.061
		RPM	7377	6639	6639	5902	6953	6557	6557	5901	5464	5464	5464	5464	4918	4918	4098	4098	3278	3278	2733	2733	2049	1640
		FEED	280	226	226	177	284	289	289	236	284	284	284	284	226	226	262	262	249	249	246	246	217	200
		Ap	0.144	0.128	0.112	0.112	0.180	0.200	0.180	0.160	0.240	0.240	0.240	0.216	0.192	0.168	0.320	0.288	0.400	0.360	0.480	0.432	0.640	0.800
	39.2	Vc	72	65	65	58	78	82	82	74	82	82	82	82	74	74	82	82	82	82	82	82	82	82
		fz	0.015	0.014	0.014	0.012	0.016	0.018	0.018	0.016	0.021	0.021	0.021	0.021	0.019	0.019	0.026	0.026	0.030	0.030	0.037	0.037	0.042	0.048
		RPM	5737	5163	5163	4590	5491	5246	5246	4721	4371	4371	4371	4371	3934	3934	3278	3278	2622	2622	2186	2186	1640	1311
		FEED	172	145	145	110	180	189	189	151	184	184	184	184	149	149	170	170	157	157	162	162	138	126
		Ap	0.144	0.128	0.112	0.112	0.180	0.200	0.180	0.160	0.240	0.240	0.240	0.216	0.192	0.168	0.320	0.288	0.400	0.360	0.480	0.432	0.640	0.800
	39.3	Vc	62	56	56	49	67	72	72	65	72	72	72	72	65	65	72	72	72	72	72	72	72	72
		fz	0.012	0.011	0.011	0.010	0.014	0.015	0.015	0.013	0.018	0.018	0.018	0.018	0.016	0.016	0.021	0.021	0.026	0.026	0.030	0.030	0.034	0.039
		RPM	4918	4426	4426	3934	4753	4590	4590	4131	3825	3825	3825	3825	3443	3443	2869	2869	2295	2295	1913	1913	1435	1147
		FEED	118	97	97	79	129	138	138	107	138	138	138	138	110	110	120	120	119	119	115	115	97	89
		Ap	0.117	0.104	0.091	0.091	0.146	0.163	0.146	0.130	0.195	0.195	0.195	0.176	0.156	0.137	0.260	0.234	0.325	0.293	0.390	0.351	0.520	0.650
	40	Vc	170	153	153	136	181	201	201	181	201	201	201	201	181	181	201	201	201	201	206	206	201	201
		fz	0.027	0.024	0.024	0.022	0.030	0.032	0.032	0.029	0.037	0.037	0.037	0.037	0.033	0.033	0.046	0.046	0.055	0.055	0.065	0.065	0.074	0.085
		RPM	13524	12172	12172	10819	12786	12786	12786	11507	10655	10655	10655	10655	9590	9590	7992	7992	6393	6393	5464	5464	3995	3197
		FEED	730	584	584	476	774	818	818	667	788	788	788	788	633	633	735	735	703	703	710	710	591	544
		Ap	0.153	0.136	0.119	0.119	0.191	0.213	0.191	0.170	0.255	0.255	0.255	0.230	0.204	0.179	0.340	0.306	0.425	0.383	0.510	0.459	0.680	0.850
	41	Vc	113	102	102	91	124	134	134	121	134	134	134	134	121	121	134	134	134	134	134	134	134	134
		fz	0.025	0.023	0.023	0.020	0.027	0.030	0.030	0.027	0.035	0.035	0.035	0.035	0.032	0.032	0.043	0.043	0.051	0.051	0.059	0.059	0.070	0.082
		RPM	9017	8115	8115	7214	8770	8524	8524	7672	7104	7104	7104	7104	6394	6394	5328	5328	4262	4262	3551	3551	2664	2131
		FEED	451	373	373	289	481	511	511	414	497	497	497	497	409	409	458	458	435	435	419	419	373	349
		Ap	0.153	0.136	0.119	0.119	0.191	0.213	0.191	0.170	0.255	0.255	0.255	0.230	0.204	0.179	0.340	0.306	0.425	0.383	0.510	0.459	0.680	0.850

HPK14 SERIES

2 FLUTE MINIATURE CORNER RADIUS - SLOTTING

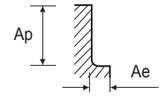


Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min.

ISO	VDI 3323	Material Description	Slotting		Para-meter	Diameter (Ø)								
			Ae	Ap		0.3	0.4	0.5	0.6	0.8	1	1.2	1.5	2
P	5	Non-alloy steel	1D	0.05D	Vc	46	67	82	98	129	154	175	196	216
					fz	0.002	0.002	0.004	0.005	0.006	0.010	0.010	0.011	0.013
					RPM	49178	53277	52458	51911	51228	49178	46350	41581	34426
					FEED	197	213	419	519	615	984	958	939	895
	8	Low alloy steel	1D	0.05D	Vc	46	67	82	98	129	154	175	196	216
					fz	0.002	0.002	0.004	0.005	0.006	0.010	0.010	0.011	0.013
					RPM	49178	53277	52458	51911	51228	49178	46350	41581	34426
					FEED	197	213	419	519	615	984	958	939	895
	9		1D	0.05D	Vc	46	67	82	98	129	154	175	196	216
					fz	0.002	0.002	0.004	0.005	0.006	0.010	0.010	0.011	0.013
					RPM	49178	53277	52458	51911	51228	49178	46350	41581	34426
					FEED	197	213	419	519	615	984	958	939	895
	11.1	High alloyed steel, and tool steel	1D	0.05D	Vc	46	67	82	98	129	154	175	196	216
					fz	0.002	0.002	0.004	0.005	0.006	0.010	0.010	0.011	0.013
					RPM	49178	53277	52458	51911	51228	49178	46350	41581	34426
					FEED	197	213	419	519	615	984	958	939	895
	11.2		1D	0.05D	Vc	46	67	82	98	129	154	175	196	216
					fz	0.002	0.002	0.004	0.005	0.006	0.010	0.010	0.011	0.013
					RPM	49178	53277	52458	51911	51228	49178	46350	41581	34426
					FEED	197	213	419	519	615	984	958	939	895
H	38.1	Hardened steel	1D	0.05D	Vc	41	57	72	88	103	124	139	154	170
					fz	0.002	0.002	0.003	0.004	0.006	0.008	0.009	0.010	0.013
					RPM	43714	45081	45900	46447	40983	39343	36874	32754	27049
					FEED	175	180	275	372	491	629	644	666	703
	38.2		1D	0.05D	Vc	41	52	67	77	77	82	92	103	113
					fz	0.001	0.002	0.003	0.004	0.005	0.007	0.008	0.009	0.012
					RPM	43714	40983	42621	40983	30737	26229	24514	21939	18032
					FEED	88	164	255	328	307	368	371	400	433
	39.1		1D	0.02D	Vc	31	41	52	57	67	67	72	83	93
					fz	0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.009
					RPM	32786	32786	32786	30053	26639	21311	19055	17510	14754
					FEED	66	66	131	180	213	213	216	239	266
	39.2		1D	0.02D	Vc	26	31	41	46	51	51	56	62	72
					fz	0.001	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
					RPM	27322	24589	26229	24589	20491	16392	14935	13184	11475
					FEED	55	49	105	98	123	131	134	145	161
	39.3		1D	0.02D	Vc	21	26	31	41	41	41	47	52	62
					fz	0.001	0.001	0.002	0.002	0.003	0.003	0.004	0.005	0.006
					RPM	21858	20491	19672	21858	16392	13114	12360	11021	9835
					FEED	39	41	59	83	85	90	98	104	119
	40	Chilled Cast Iron	1D	0.05D	Vc	41	57	72	88	103	124	139	154	170
					fz	0.002	0.002	0.003	0.004	0.006	0.008	0.009	0.010	0.013
					RPM	43714	45081	45900	46447	40983	39343	36874	32754	27049
					FEED	175	180	275	372	491	629	644	666	703
	41	Hardened Cast Iron	1D	0.05D	Vc	41	52	67	77	77	82	92	103	113
					fz	0.001	0.002	0.003	0.004	0.005	0.007	0.008	0.009	0.012
					RPM	43714	40983	42621	40983	30737	26229	24514	21939	18032
					FEED	88	164	255	328	307	368	371	400	433

HPK16, HPK17 SERIES

4 FLUTE CORNER RADIUS - SIDE CUTTING



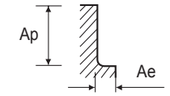
Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Side Cutting Ae	Side Cutting Ap	Para-meter	Diameter (Ø) 0.5	0.6	0.7	0.8	1	1.2	1.5	1.8	2	2.5
P	5	Non-alloy steel	0.03D	0.8D	Vc	82	117	159	206	154	176	196	206	216	217
					fz	0.005	0.006	0.006	0.007	0.008	0.009	0.010	0.012	0.013	0.016
					RPM	52458	62293	72129	81964	49178	46556	41612	36462	34426	27604
					FEED	1050	1371	1731	2295	1574	1602	1682	1730	1790	1792
	8	Low alloy steel	0.03D	0.8D	Vc	82	117	159	206	154	176	196	206	216	217
					fz	0.005	0.006	0.006	0.007	0.008	0.009	0.010	0.012	0.013	0.016
					RPM	52458	62293	72129	81964	49178	46556	41612	36462	34426	27604
					FEED	1050	1371	1731	2295	1574	1602	1682	1730	1790	1792
	9		0.03D	0.8D	Vc	82	117	159	206	154	176	196	206	216	217
					fz	0.005	0.006	0.006	0.007	0.008	0.009	0.010	0.012	0.013	0.016
					RPM	52458	62293	72129	81964	49178	46556	41612	36462	34426	27604
					FEED	1050	1371	1731	2295	1574	1602	1682	1730	1790	1792
	11.1	High alloyed steel, and tool steel	0.03D	0.8D	Vc	82	117	159	206	154	176	196	206	216	217
					fz	0.005	0.006	0.006	0.007	0.008	0.009	0.010	0.012	0.013	0.016
					RPM	52458	62293	72129	81964	49178	46556	41612	36462	34426	27604
					FEED	1050	1371	1731	2295	1574	1602	1682	1730	1790	1792
	11.2		0.03D	0.8D	Vc	72	105	130	165	124	139	154	165	170	170
					fz	0.004	0.005	0.005	0.006	0.007	0.008	0.008	0.010	0.012	0.015
					RPM	45900	55736	59015	65572	39343	36977	32754	29149	27049	21630
					FEED	734	1003	1180	1574	1102	1102	1102	1133	1299	1299
H	38.1	Hardened steel	0.03D	0.8D	Vc	72	105	130	165	124	139	154	165	170	170
					fz	0.004	0.005	0.005	0.006	0.007	0.008	0.008	0.010	0.012	0.015
					RPM	45900	55736	59015	65572	39343	36977	32754	29149	27049	21630
					FEED	734	1003	1180	1574	1102	1102	1102	1133	1299	1299
	38.2		0.03D	0.8D	Vc	67	93	108	124	82	93	103	108	113	113
					fz	0.004	0.005	0.005	0.006	0.007	0.008	0.009	0.011	0.012	0.015
					RPM	42621	49178	49178	49178	26229	24720	21939	19055	18032	14420
					FEED	682	885	984	1180	734	773	799	824	865	865
	39.1		0.03D	0.8D	Vc	52	68	87	107	67	72	82	87	93	93
					fz	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.008	0.009	0.011
					RPM	32786	36064	39343	42621	21311	19055	17407	15450	14754	11845
					FEED	393	505	629	767	426	443	479	494	531	541
	39.2		0.03D	0.8D	Vc	41	56	65	82	51	56	62	67	72	72
					fz	0.003	0.004	0.004	0.004	0.004	0.005	0.006	0.006	0.007	0.009
					RPM	26229	29507	29507	32786	16392	14935	13184	11845	11475	9167
					FEED	315	413	472	524	263	268	294	299	321	329
	39.3		0.03D	0.8D	Vc	31	49	58	66	41	46	51	57	62	61
					fz	0.002	0.003	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008
					RPM	19672	26229	26229	26229	13114	12257	10918	10094	9835	7828
					FEED	158	263	315	368	210	227	242	252	275	255
	40	Chilled Cast Iron	0.03D	0.8D	Vc	72	105	130	165	124	139	154	165	170	170
					fz	0.004	0.005	0.005	0.006	0.007	0.008	0.008	0.010	0.012	0.015
					RPM	45900	55736	59015	65572	39343	36977	32754	29149	27049	21630
					FEED	734	1003	1180	1574	1102	1102	1102	1133	1299	1299
	41	Hardened Cast Iron	0.03D	0.8D	Vc	67	93	108	124	82	93	103	108	113	113
					fz	0.004	0.005	0.005	0.006	0.007	0.008	0.009	0.011	0.012	0.015
					RPM	42621	49178	49178	49178	26229	24720	21939	19055	18032	14420
					FEED	682	885	984	1180	734	773	799	824	865	865

NEXT PAGE ▶

HPK16, HPK17 SERIES

4 FLUTE CORNER RADIUS - SIDE CUTTING

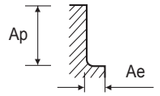


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Para-meter	Diameter (Ø) 3	3.5	4	4.5	5	6	8	10	12	16	20
P	5	Vc	211	216	216	237	252	252	257	252	257	252	252
		fz	0.020	0.023	0.027	0.029	0.032	0.037	0.048	0.056	0.066	0.077	0.083
		RPM	22404	19673	17212	16789	16065	13388	10245	8033	6830	5020	4016
		FEED	1792	1825	1859	1957	2056	1982	1967	1799	1804	1546	1333
	8	Vc	211	216	216	237	252	252	257	252	257	252	252
		fz	0.020	0.023	0.027	0.029	0.032	0.037	0.048	0.056	0.066	0.077	0.083
		RPM	22404	19673	17212	16789	16065	13388	10245	8033	6830	5020	4016
		FEED	1792	1825	1859	1957	2056	1982	1967	1799	1804	1546	1333
	9	Vc	211	216	216	237	252	252	257	252	257	252	252
		fz	0.020	0.023	0.027	0.029	0.032	0.037	0.048	0.056	0.066	0.077	0.083
		RPM	22404	19673	17212	16789	16065	13388	10245	8033	6830	5020	4016
		FEED	1792	1825	1859	1957	2056	1982	1967	1799	1804	1546	1333
	11.1	Vc	211	216	216	237	252	252	257	252	257	252	252
		fz	0.020	0.023	0.027	0.029	0.032	0.037	0.048	0.056	0.066	0.077	0.083
		RPM	22404	19673	17212	16789	16065	13388	10245	8033	6830	5020	4016
		FEED	1792	1825	1859	1957	2056	1982	1967	1799	1804	1546	1333
	11.2	Vc	170	170	170	181	201	201	201	201	206	201	201
		fz	0.018	0.022	0.025	0.028	0.030	0.034	0.043	0.051	0.060	0.071	0.078
		RPM	18032	15450	13524	12786	12786	10655	7992	6393	5464	3995	3197
		FEED	1299	1326	1352	1443	1535	1449	1375	1304	1311	1135	997
H	38.1	Vc	170	170	170	181	201	201	201	201	206	201	201
		fz	0.018	0.022	0.025	0.028	0.030	0.034	0.043	0.051	0.060	0.071	0.078
		RPM	18032	15450	13524	12786	12786	10655	7992	6393	5464	3995	3197
		FEED	1299	1326	1352	1443	1535	1449	1375	1304	1311	1135	997
	38.2	Vc	113	113	113	124	134	134	134	134	134	134	134
		fz	0.018	0.021	0.025	0.027	0.030	0.034	0.043	0.051	0.060	0.070	0.079
		RPM	12021	10300	9017	8776	8524	7104	5328	4262	3551	2664	2131
		FEED	865	883	901	962	1023	966	917	869	853	746	674
	39.1	Vc	93	93	93	98	103	103	103	103	103	103	103
		fz	0.014	0.017	0.019	0.021	0.023	0.026	0.033	0.038	0.045	0.053	0.059
		RPM	9835	8446	7377	6953	6557	5464	4098	3278	2733	2049	1640
		FEED	551	556	560	582	604	569	541	499	492	435	387
	39.2	Vc	72	72	72	77	82	82	82	82	82	82	82
		fz	0.011	0.013	0.015	0.017	0.018	0.021	0.026	0.030	0.036	0.042	0.048
		RPM	7650	6592	5737	5459	5246	4371	3278	2622	2186	1640	1311
		FEED	337	340	344	361	378	367	341	315	315	275	251
	39.3	Vc	62	62	62	67	72	72	72	72	72	72	72
		fz	0.009	0.011	0.013	0.015	0.016	0.018	0.022	0.025	0.030	0.036	0.041
		RPM	6557	5665	4918	4738	4590	3825	2869	2295	1913	1435	1147
		FEED	236	245	255	274	294	275	252	230	230	207	188
	40	Vc	170	170	170	181	201	201	201	201	206	201	201
		fz	0.018	0.022	0.025	0.028	0.030	0.034	0.043	0.051	0.060	0.071	0.078
		RPM	18032	15450	13524	12786	12786	10655	7992	6393	5464	3995	3197
		FEED	1299	1326	1352	1443	1535	1449	1375	1304	1311	1135	997
	41	Vc	113	113	113	124	134	134	134	134	134	134	134
		fz	0.018	0.021	0.025	0.027	0.030	0.034	0.043	0.051	0.060	0.070	0.079
		RPM	12021	10300	9017	8776	8524	7104	5328	4262	3551	2664	2131
		FEED	865	883	901	962	1023	966	917	869	853	746	674

HPK18 SERIES

6 FLUTE CORNER RADIUS - SIDE CUTTING

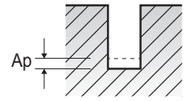


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Side Cutting Ae	Side Cutting Ap	Para-meter	Diameter (Ø) 6	8	10	12	16	20
P	5	Non-alloy steel	0.05D	1.0D	Vc	124	125	125	126	125	125
					fz	0.039	0.052	0.063	0.070	0.090	0.079
					RPM	6557	4958	3968	3333	2479	1984
					FEED	1535	1547	1500	1400	1339	940
	8	Low alloy steel	0.05D	1.0D	Vc	124	125	125	126	125	125
					fz	0.039	0.052	0.063	0.070	0.090	0.079
					RPM	6557	4958	3968	3333	2479	1984
					FEED	1535	1547	1500	1400	1339	940
	9		0.05D	1.0D	Vc	124	125	125	126	125	125
					fz	0.039	0.052	0.063	0.070	0.090	0.079
					RPM	6557	4958	3968	3333	2479	1984
					FEED	1535	1547	1500	1400	1339	940
	11.1	High alloyed steel, and tool steel	0.05D	1.0D	Vc	124	125	125	126	125	125
					fz	0.039	0.052	0.063	0.070	0.090	0.079
					RPM	6557	4958	3968	3333	2479	1984
					FEED	1535	1547	1500	1400	1339	940
	11.2		0.05D	1.0D	Vc	109	111	109	109	111	113
					fz	0.036	0.049	0.058	0.065	0.083	0.095
					RPM	5792	4426	3475	2896	2213	1804
					FEED	1251	1301	1209	1130	1102	1028
H	38.1	Hardened steel	0.05D	1.0D	Vc	109	111	109	109	111	113
					fz	0.036	0.049	0.058	0.065	0.083	0.095
					RPM	5792	4426	3475	2896	2213	1804
					FEED	1251	1301	1209	1130	1102	1028
	38.2		0.05D	1.0D	Vc	98	100	97	98	100	101
					fz	0.035	0.046	0.055	0.062	0.079	0.091
					RPM	5191	3976	3082	2596	1988	1607
					FEED	1090	1097	1017	965	942	878
	39.1		0.03D	1.0D	Vc	85	85	84	86	86	90
					fz	0.033	0.044	0.053	0.059	0.076	0.072
					RPM	4535	3401	2688	2268	1701	1427
					FEED	898	898	855	803	776	616
	39.2		0.03D	1.0D	Vc	74	74	74	74	74	77
					fz	0.031	0.042	0.050	0.056	0.072	0.069
					RPM	3935	2951	2361	1967	1475	1230
					FEED	732	744	709	661	638	509
	39.3		0.03D	1.0D	Vc	49	49	50	51	49	46
					fz	0.028	0.037	0.045	0.050	0.064	0.071
					RPM	2622	1967	1607	1366	984	737
					FEED	441	437	434	410	378	314
	40	Chilled Cast Iron	0.05D	1.0D	Vc	109	111	109	109	111	113
					fz	0.036	0.049	0.058	0.065	0.083	0.095
					RPM	5792	4426	3475	2896	2213	1804
					FEED	1251	1301	1209	1130	1102	1028
	41	Hardened Cast Iron	0.05D	1.0D	Vc	98	100	97	98	100	101
					fz	0.035	0.046	0.055	0.062	0.079	0.091
					RPM	5191	3976	3082	2596	1988	1607
					FEED	1090	1097	1017	965	942	878

HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING



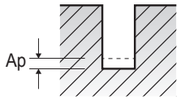
Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Material Description	Slotting Ae	Para-meter	Diameter (Ø) 0.2 LBS 0.5	0.2 0.75	0.2 1	0.2 1.5	0.2 2	0.2 2.5	0.2 3	0.3 1	0.3 1.5	0.3 2	0.3 2.5	0.3 3	0.4 1	0.4 1.5	0.4 2	0.4 2.5	0.4 3
P	5	Non-alloy steel	1.0D	Vc	31	31	31	28	28	25	25	46	46	42	42	42	67	67	67	60	60
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
				RPM	49178	49178	49178	44260	44260	39342	39342	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949
				FEED	98	98	98	89	89	79	79	197	197	177	177	177	213	213	213	192	192
				Ap	0.010	0.009	0.009	0.008	0.007	0.007	0.006	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016
	8	Low alloy steel	1.0D	Vc	31	31	31	28	28	25	25	46	46	42	42	42	67	67	67	60	60
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
				RPM	49178	49178	49178	44260	44260	39342	39342	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949
				FEED	98	98	98	89	89	79	79	197	197	177	177	177	213	213	213	192	192
				Ap	0.010	0.009	0.009	0.008	0.007	0.007	0.006	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016
	9		1.0D	Vc	31	31	31	28	28	25	25	46	46	42	42	42	67	67	67	60	60
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
				RPM	49178	49178	49178	44260	44260	39342	39342	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949
				FEED	98	98	98	89	89	79	79	197	197	177	177	177	213	213	213	192	192
				Ap	0.010	0.009	0.009	0.008	0.007	0.007	0.006	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016
	11.1	High alloyed steel, and tool steel	1.0D	Vc	31	31	31	28	28	25	25	46	46	42	42	42	67	67	67	60	60
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
				RPM	49178	49178	49178	44260	44260	39342	39342	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949
				FEED	98	98	98	89	89	79	79	197	197	177	177	177	213	213	213	192	192
				Ap	0.010	0.009	0.009	0.008	0.007	0.007	0.006	0.014	0.014	0.012	0.011	0.011	0.020	0.018	0.018	0.016	0.016
	11.2		1.0D	Vc	31	31	31	28	28	25	25	41	41	37	37	37	57	57	57	51	51
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
				RPM	49178	49178	49178	44260	44260	39342	39342	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573
				FEED	98	98	98	89	89	79	79	175	175	157	157	157	180	180	180	162	162
				Ap	0.009	0.008	0.008	0.007	0.006	0.006	0.005	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014
H	38.1	Hardened steel	1.0D	Vc	31	31	31	28	28	25	25	41	41	37	37	37	57	57	57	51	51
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
				RPM	49178	49178	49178	44260	44260	39342	39342	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573
				FEED	98	98	98	89	89	79	79	175	175	157	157	157	180	180	180	162	162
				Ap	0.009	0.008	0.008	0.007	0.006	0.006	0.005	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014
	38.2		1.0D	Vc	26	26	26	23	23	21	21	41	41	37	37	37	52	52	52	46	46
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
				RPM	40983	40983	40983	36885	36885	32786	32786	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885
				FEED	82	82	82	74	74	66	66	87	87	79	79	79	164	164	164	148	148
				Ap	0.009	0.008	0.008	0.007	0.006	0.006	0.005	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014
	39.1		1.0D	Vc	21	21	21	19	19	16	16	31	31	28	28	28	41	41	41	37	37
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
				RPM	32786	32786	32786	29507	29507	26229	26229	32786	32786	29507	29507	29507	32786	32786	32786	29507	29507
				FEED	66	66	66	59	59	52	52	66	66	59	59	59	66	66	66	59	59
				Ap	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.011	0.011	0.010	0.008	0.008	0.016	0.014	0.014	0.013	0.013
	39.2		1.0D	Vc	21	21	21	19	19	16	16	26	26	23	23	23	31	31	31	28	28
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
				RPM	32786	32786	32786	29507	29507	26229	26229	27322	27322	24590	24590	24590	24589	24589	24589	22130	22130
				FEED	66	66	66	59	59	52	52	55	55	49	49	49	49	49	49	44	44
				Ap	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.011	0.011	0.010	0.008	0.008	0.016	0.014	0.014	0.013	0.013
	39.3		1.0D	Vc	15	15	15	14	14	12	12	21	21	19	19	19	26	26	26	23	23
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
				RPM	24589	24589	24589	22130	22130	19099	19099	21858	21858	19672	19672	19672	20491	20491	20491	18442	18442
				FEED	49	49	49	44	44	38	38	44	44	39	39	39	41	41	41	37	37
				Ap	0.007	0.006	0.006	0.005	0.005	0.005	0.004	0.009	0.009	0.008	0.007	0.007	0.013	0.012	0.012	0.010	0.010
	40	Chilled Cast Iron	1.0D	Vc	31	31	31	28	28	25	25	41	41	37	37	37	57	57	57	51	51
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
				RPM	49178	49178	49178	44260	44260	39342	39342	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573
				FEED	98	98	98	89	89	79	79	175	175	157	157	157	180	180	180	162	162
				Ap	0.009	0.008	0.008	0.007	0.006	0.006	0.005	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014
	41	Hardened Cast Iron	1.0D	Vc	26	26	26	23	23	21	21	41	41	37	37	37	52	52	52	46	46
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
				RPM	40983	40983	40983	36885	36885	32786	32786	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885
				FEED	82	82	82	74	74	66	66	87	87	79	79	79	164	164	164	148	148
				Ap	0.009	0.008	0.008	0.007	0.006	0.006	0.005	0.011	0.011	0.010	0.009	0.009	0.017	0.015	0.015	0.014	0.014

NEXT PAGE ▶

HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		LBS	3.5	4	5	6	8	10	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7	8	9	10
P	5	Vc	60	60	54	54	40	20	82	82	82	82	74	74	74	74	74	66	66	49	49	49
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003
		RPM	47949	47949	42622	42622	31966	15983	52458	52458	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	31475
		FEED	192	192	170	170	64	32	420	420	420	420	378	378	378	378	378	252	252	189	189	189
		Ap	0.014	0.014	0.014	0.012	0.010	0.008	0.025	0.025	0.023	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.015	0.015	0.013	0.013
	8	Vc	60	60	54	54	40	20	82	82	82	82	74	74	74	74	74	66	66	49	49	49
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003
		RPM	47949	47949	42622	42622	31966	15983	52458	52458	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	31475
		FEED	192	192	170	170	64	32	420	420	420	420	378	378	378	378	378	252	252	189	189	189
		Ap	0.014	0.014	0.014	0.012	0.010	0.008	0.025	0.025	0.023	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.015	0.015	0.013	0.013
	9	Vc	60	60	54	54	40	20	82	82	82	82	74	74	74	74	74	66	66	49	49	49
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003
		RPM	47949	47949	42622	42622	31966	15983	52458	52458	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	31475
		FEED	192	192	170	170	64	32	420	420	420	420	378	378	378	378	378	252	252	189	189	189
		Ap	0.014	0.014	0.014	0.012	0.010	0.008	0.025	0.025	0.023	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.015	0.015	0.013	0.013
	11.1	Vc	60	60	54	54	40	20	82	82	82	82	74	74	74	74	74	66	66	49	49	49
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003
		RPM	47949	47949	42622	42622	31966	15983	52458	52458	52458	52458	47212	47212	47212	47212	47212	41966	41966	31475	31475	31475
		FEED	192	192	170	170	64	32	420	420	420	420	378	378	378	378	378	252	252	189	189	189
		Ap	0.014	0.014	0.014	0.012	0.010	0.008	0.025	0.025	0.023	0.023	0.020	0.020	0.020	0.018	0.018	0.018	0.015	0.015	0.013	0.013
	11.2	Vc	51	51	45	45	34	17	72	72	72	72	65	65	65	65	65	58	58	43	43	43
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002
		RPM	40573	40573	36065	36065	27049	13524	45900	45900	45900	45900	41310	41310	41310	41310	41310	36720	36720	27540	27540	27540
		FEED	162	162	144	144	54	27	275	275	275	275	248	248	248	248	248	147	147	110	110	110
		Ap	0.012	0.012	0.012	0.010	0.009	0.007	0.021	0.021	0.019	0.019	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.013	0.011	0.011
H	38.1	Vc	51	51	45	45	34	17	72	72	72	72	65	65	65	65	65	58	58	43	43	43
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002
		RPM	40573	40573	36065	36065	27049	13524	45900	45900	45900	45900	41310	41310	41310	41310	41310	36720	36720	27540	27540	27540
		FEED	162	162	144	144	54	27	275	275	275	275	248	248	248	248	248	147	147	110	110	110
		Ap	0.012	0.012	0.012	0.010	0.009	0.007	0.021	0.021	0.019	0.019	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.013	0.011	0.011
	38.2	Vc	46	46	41	41	31	15	67	67	67	67	60	60	60	60	60	54	54	40	40	40
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002
		RPM	36885	36885	32786	32786	24590	12295	42621	42621	42621	42621	38359	38359	38359	38359	38359	34097	34097	25573	25573	25573
		FEED	148	148	131	131	49	25	256	256	256	256	230	230	230	230	230	136	136	102	102	102
		Ap	0.012	0.012	0.012	0.010	0.009	0.007	0.021	0.021	0.019	0.019	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.013	0.011	0.011
	39.1	Vc	37	37	33	33	25	12	52	52	52	52	46	46	46	46	46	41	41	31	31	31
		fz	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001
		RPM	29507	29507	26229	26229	19672	9836	32786	32786	32786	32786	29507	29507	29507	29507	29507	26229	26229	19672	19672	19672
		FEED	59	59	52	52	39	20	131	131	131	131	118	118	118	118	118	105	105	39	39	39
		Ap	0.011	0.011	0.011	0.010	0.008	0.006	0.020	0.020	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.012	0.012	0.010	0.010
	39.2	Vc	28	28	25	25	19	9	41	41	41	41	37	37	37	37	37	33	33	25	25	25
		fz	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001
		RPM	22130	22130	19671	19671	14753	7377	26229	26229	26229	26229	23606	23606	23606	23606	23606	20983	20983	15737	15737	15737
		FEED	44	44	39	39	30	15	105	105	105	105	94	94	94	94	94	42	42	31	31	31
		Ap	0.011	0.011	0.011	0.010	0.008	0.006	0.020	0.020	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.012	0.012	0.010	0.010
	39.3	Vc	23	23	21	21	15	8	31	31	31	31	28	28	28	28	28	25	25	19	19	19
		fz	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
		RPM	18442	18442	16393	16393	12295	6147	19672	19672	19672	19672	17705	17705	17705	17705	17705	15738	15738	11803	11803	11803
		FEED	37	37	33	33	25	12	79	79	79	79	35	35	35	35	35	31	31	24	24	24
		Ap	0.009	0.009	0.009	0.008	0.007	0.005	0.016	0.016	0.015	0.015	0.013	0.013	0.013	0.011	0.011	0.011	0.010	0.010	0.008	0.008
	40	Vc	51	51	45	45	34	17	72	72	72	72	65	65	65	65	65	58	58	43	43	43
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002
		RPM	40573	40573	36065	36065	27049	13524	45900	45900	45900	45900	41310	41310	41310	41310	41310	36720	36720	27540	27540	27540
		FEED	162	162	144	144	54	27	275	275	275	275	248	248	248	248	248	147	147	110	110	110
		Ap	0.012	0.012	0.012	0.010	0.009	0.007	0.021	0.021	0.019	0.019	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.013	0.011	0.011
	41	Vc	46	46	41	41	31	15	67	67	67	67	60	60	60	60	60	54	54	40	40	40
		fz	0.002	0.002	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002
		RPM	36885	36885	32786	32786	24590	12295	42621	42621	42621	42621	38359	38359	38359	38359	38359	34097	34097	25573	25573	25573
		FEED	148	148	131	131	49	25	256	256	256	256	230	230	230	230	230	136	136	102	102	102
		Ap	0.012	0.012	0.012	0.010	0.009	0.007	0.021	0.021	0.019	0.019	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.013	0.011	0.011

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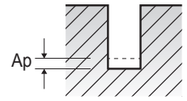
HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8			
		LBS	1.5	2	3	4	5	6	2	4	6	8	10	3	4	5	6	8	10			
P	5	Vc	98	98	98	88	88	88	113	102	102	91	91	129	129	116	116	116	103			
		fz	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005			
		RPM	51911	51911	51911	46720	46720	46720	51569	46412	46412	41255	41255	51228	51228	46105	46105	46105	40982			
		FEED	519	519	519	467	467	467	619	464	464	330	330	615	615	461	461	461	410			
		Ap	0.030	0.027	0.027	0.024	0.021	0.021	0.035	0.028	0.025	0.025	0.021	0.036	0.036	0.032	0.032	0.028	0.028			
	8	Vc	98	98	98	88	88	88	113	102	102	91	91	129	129	116	116	116	103			
		fz	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005			
		RPM	51911	51911	51911	46720	46720	46720	51569	46412	46412	41255	41255	51228	51228	46105	46105	46105	40982			
		FEED	519	519	519	467	467	467	619	464	464	330	330	615	615	461	461	461	410			
		Ap	0.030	0.027	0.027	0.024	0.021	0.021	0.035	0.028	0.025	0.025	0.021	0.036	0.036	0.032	0.032	0.028	0.028			
	9	Vc	98	98	98	88	88	88	113	102	102	91	91	129	129	116	116	116	103			
		fz	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005			
		RPM	51911	51911	51911	46720	46720	46720	51569	46412	46412	41255	41255	51228	51228	46105	46105	46105	40982			
		FEED	519	519	519	467	467	467	619	464	464	330	330	615	615	461	461	461	410			
		Ap	0.030	0.027	0.027	0.024	0.021	0.021	0.035	0.028	0.025	0.025	0.021	0.036	0.036	0.032	0.032	0.028	0.028			
	11.1	Vc	98	98	98	88	88	88	113	102	102	91	91	129	129	116	116	116	103			
		fz	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005			
		RPM	51911	51911	51911	46720	46720	46720	51569	46412	46412	41255	41255	51228	51228	46105	46105	46105	40982			
		FEED	519	519	519	467	467	467	619	464	464	330	330	615	615	461	461	461	410			
		Ap	0.030	0.027	0.027	0.024	0.021	0.021	0.035	0.028	0.025	0.025	0.021	0.036	0.036	0.032	0.032	0.028	0.028			
	11.2	Vc	88	88	88	79	79	79	93	84	84	74	74	103	103	93	93	93	82			
		fz	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005			
		RPM	46447	46447	46447	41802	41802	41802	42230	38007	38007	33784	33784	40983	40983	36885	36885	36885	32786			
		FEED	372	372	372	334	334	334	422	380	380	270	270	492	492	369	369	369	328			
		Ap	0.026	0.023	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024			
H	38.1	Vc	88	88	88	79	79	79	93	84	84	74	74	103	103	93	93	93	82			
		fz	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005			
		RPM	46447	46447	46447	41802	41802	41802	42230	38007	38007	33784	33784	40983	40983	36885	36885	36885	32786			
		FEED	372	372	372	334	334	334	422	380	380	270	270	492	492	369	369	369	328			
		Ap	0.026	0.023	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024			
	38.2	Vc	77	77	77	70	70	70	77	69	69	62	62	77	77	70	70	70	62			
		fz	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.004			
		RPM	40983	40983	40983	36885	36885	36885	35020	31518	31518	28016	28016	30737	30737	27663	27663	27663	24590			
		FEED	328	328	328	295	295	295	350	252	252	224	224	307	307	277	277	277	197			
		Ap	0.026	0.023	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024			
	39.1	Vc	57	57	57	51	51	51	62	56	56	50	50	67	67	60	60	60	54			
		fz	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003			
		RPM	30053	30053	30053	27048	27048	27048	28335	25502	25502	22668	22668	26639	26639	23975	23975	23975	21311			
		FEED	180	180	180	162	162	162	227	153	153	136	136	213	213	192	192	192	128			
		Ap	0.024	0.022	0.022	0.019	0.017	0.017	0.028	0.022	0.020	0.020	0.017	0.029	0.029	0.026	0.026	0.022	0.022			
	39.2	Vc	46	46	46	42	42	42	46	42	42	37	37	51	51	46	46	46	41			
		fz	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002			
		RPM	24589	24589	24589	22130	22130	22130	21115	19004	19004	16892	16892	20491	20491	18442	18442	18442	16393			
		FEED	98	98	98	89	89	89	127	76	76	68	68	123	123	111	111	111	66			
		Ap	0.024	0.022	0.022	0.019	0.017	0.017	0.028	0.022	0.020	0.020	0.017	0.029	0.029	0.026	0.026	0.022	0.022			
	39.3	Vc	41	41	41	37	37	37	42	38	38	33	33	41	41	37	37	37	33			
		fz	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.002			
		RPM	21858	21858	21858	19672	19672	19672	18952	17057	17057	15162	15162	16392	16392	14753	14753	14753	13114			
		FEED	87	87	87	79	79	79	76	68	68	61	61	98	98	59	59	59	52			
		Ap	0.020	0.018	0.018	0.016	0.014	0.014	0.023	0.018	0.016	0.016	0.014	0.023	0.023	0.021	0.021	0.018	0.018			
	40	Vc	88	88	88	79	79	79	93	84	84	74	74	103	103	93	93	93	82			
		fz	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005			
		RPM	46447	46447	46447	41802	41802	41802	42230	38007	38007	33784	33784	40983	40983	36885	36885	36885	32786			
		FEED	372	372	372	334	334	334	422	380	380	270	270	492	492	369	369	369	328			
		Ap	0.026	0.023	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024			
	41	Vc	77	77	77	70	70	70	77	69	69	62	62	77	77	70	70	70	62			
		fz	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.004			
		RPM	40983	40983	40983	36885	36885	36885	35020	31518	31518	28016	28016	30737	30737	27663	27663	27663	24590			
		FEED	328	328	328	295	295	295	350	252	252	224	224	307	307	277	277	277	197			
		Ap	0.026	0.023	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024			

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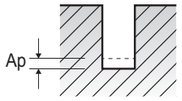
HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			0.8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1.2	1.2	1.2
			12	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	6	8	10	12
P	5	Vc	103	154	154	154	154	139	139	139	139	139	124	124	93	93	93	46	170	153	153	153
		fz	0.005	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.007	0.006	0.011	0.009	0.009	0.009
		RPM	40982	49178	49178	49178	49178	44260	44260	44260	44260	44260	39342	39342	29507	29507	29507	14753	45081	40573	40573	40573
		FEED	410	984	984	984	984	797	797	797	797	797	629	629	413	413	413	177	992	730	730	730
		Ap	0.024	0.050	0.050	0.045	0.045	0.040	0.040	0.040	0.035	0.035	0.035	0.030	0.030	0.025	0.025	0.020	0.054	0.048	0.042	0.042
	8	Vc	103	154	154	154	154	139	139	139	139	139	124	124	93	93	93	46	170	153	153	153
		fz	0.005	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.007	0.006	0.011	0.009	0.009	0.009
		RPM	40982	49178	49178	49178	49178	44260	44260	44260	44260	44260	39342	39342	29507	29507	29507	14753	45081	40573	40573	40573
		FEED	410	984	984	984	984	797	797	797	797	797	629	629	413	413	413	177	992	730	730	730
		Ap	0.024	0.050	0.050	0.045	0.045	0.040	0.040	0.040	0.035	0.035	0.035	0.030	0.030	0.025	0.025	0.020	0.054	0.048	0.042	0.042
	9	Vc	103	154	154	154	154	139	139	139	139	139	124	124	93	93	93	46	170	153	153	153
		fz	0.005	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.007	0.006	0.011	0.009	0.009	0.009
		RPM	40982	49178	49178	49178	49178	44260	44260	44260	44260	44260	39342	39342	29507	29507	29507	14753	45081	40573	40573	40573
		FEED	410	984	984	984	984	797	797	797	797	797	629	629	413	413	413	177	992	730	730	730
		Ap	0.024	0.050	0.050	0.045	0.045	0.040	0.040	0.040	0.035	0.035	0.035	0.030	0.030	0.025	0.025	0.020	0.054	0.048	0.042	0.042
	11.1	Vc	103	154	154	154	154	139	139	139	139	139	124	124	93	93	93	46	170	153	153	153
		fz	0.005	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.007	0.006	0.011	0.009	0.009	0.009
		RPM	40982	49178	49178	49178	49178	44260	44260	44260	44260	44260	39342	39342	29507	29507	29507	14753	45081	40573	40573	40573
		FEED	410	984	984	984	984	797	797	797	797	797	629	629	413	413	413	177	992	730	730	730
		Ap	0.024	0.050	0.050	0.045	0.045	0.040	0.040	0.040	0.035	0.035	0.035	0.030	0.030	0.025	0.025	0.020	0.054	0.048	0.042	0.042
	11.2	Vc	82	124	124	124	124	111	111	111	111	111	99	99	74	74	74	37	139	125	125	125
		fz	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005	0.009	0.008	0.008	0.008
		RPM	32786	39343	39343	39343	39343	35409	35409	35409	35409	35409	31474	31474	23606	23606	23606	11803	36884	33196	33196	33196
		FEED	328	629	629	629	629	496	496	496	496	496	378	378	283	283	283	118	664	538	538	538
		Ap	0.020	0.043	0.043	0.038	0.038	0.034	0.034	0.034	0.030	0.030	0.030	0.026	0.026	0.021	0.021	0.017	0.046	0.041	0.036	0.036
H	38.1	Vc	82	124	124	124	124	111	111	111	111	111	99	99	74	74	74	37	139	125	125	125
		fz	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005	0.009	0.008	0.008	0.008
		RPM	32786	39343	39343	39343	39343	35409	35409	35409	35409	35409	31474	31474	23606	23606	23606	11803	36884	33196	33196	33196
		FEED	328	629	629	629	629	496	496	496	496	496	378	378	283	283	283	118	664	538	538	538
		Ap	0.020	0.043	0.043	0.038	0.038	0.034	0.034	0.034	0.030	0.030	0.030	0.026	0.026	0.021	0.021	0.017	0.046	0.041	0.036	0.036
	38.2	Vc	62	82	82	82	82	74	74	74	74	74	66	66	49	49	49	25	93	83	83	83
		fz	0.004	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.004	0.008	0.007	0.007	0.007
		RPM	24590	26229	26229	26229	26229	23606	23606	23606	23606	23606	20983	20983	15737	15737	15737	7869	24589	22130	22130	22130
		FEED	197	367	367	367	367	283	283	283	283	283	252	252	157	157	157	63	393	310	310	310
		Ap	0.020	0.043	0.043	0.038	0.038	0.034	0.034	0.034	0.030	0.030	0.030	0.026	0.026	0.021	0.021	0.017	0.046	0.041	0.036	0.036
	39.1	Vc	54	67	67	67	67	60	60	60	60	60	54	54	40	40	40	20	75	68	68	68
		fz	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.006	0.005	0.005	0.005
		RPM	21311	21311	21311	21311	21311	19180	19180	19180	19180	19180	17049	17049	12787	12787	12787	6393	19945	17951	17951	17951
		FEED	128	213	213	213	213	192	192	192	192	192	136	136	102	102	102	38	239	180	180	180
		Ap	0.019	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.028	0.028	0.028	0.024	0.024	0.020	0.020	0.016	0.043	0.038	0.034	0.034
	39.2	Vc	41	51	51	51	51	46	46	46	46	46	41	41	31	31	31	15	57	51	51	51
		fz	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.002	0.005	0.005	0.005	0.005
		RPM	16393	16392	16392	16392	16392	14753	14753	14753	14753	14753	13114	13114	9835	9835	9835	4918	15027	13524	13524	13524
		FEED	66	131	131	131	131	118	118	118	118	118	79	79	59	59	59	20	150	135	135	135
		Ap	0.019	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.028	0.028	0.028	0.024	0.024	0.020	0.020	0.016	0.043	0.038	0.034	0.034
	39.3	Vc	33	41	41	41	41	37	37	37	37	37	33	33	25	25	25	12	46	42	42	42
		fz	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.004
		RPM	13114	13114	13114	13114	13114	11803	11803	11803	11803	11803	10491	10491	7868	7868	7868	3934	12295	11066	11066	11066
		FEED	52	79	79	79	79	71	71	71	71	71	63	63	31	31	31	16	98	89	89	89
		Ap	0.016	0.033	0.033	0.029	0.029	0.026	0.026	0.026	0.023	0.023	0.023	0.020	0.020	0.016	0.016	0.013	0.035	0.031	0.027	0.027
	40	Vc	82	124	124	124	124	111	111	111	111	111	99	99	74	74	74	37	139	125	125	125
		fz	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005	0.009	0.008	0.008	0.008
		RPM	32786	39343	39343	39343	39343	35409	35409	35409	35409	35409	31474	31474	23606	23606	23606	11803	36884	33196	33196	33196
		FEED	328	629	629	629	629	496	496	496	496	496	378	378	283	283	283	118	664	538	538	538
		Ap	0.020	0.043	0.043	0.038	0.038	0.034	0.034	0.034	0.030	0.030	0.030	0.026	0.026	0.021	0.021	0.017	0.046	0.041	0.036	0.036
	41	Vc	62	82	82	82	82	74	74	74	74	74	66	66	49	49	49	25	93	83	83	83
		fz	0.004	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.004	0.008	0.007	0.007	0.007
		RPM	24590	26229	26229	26229	26229	23606	23606	23606	23606	23606	20983	20983	15737	15737	15737	7869	24589	22130	22130	22130
		FEED	197	367	367	367	367	283	283	283	283	283	252	252	157	157	157	63	393	310	310	310
		Ap	0.020	0.043	0.043	0.038	0.038	0.034	0.034	0.034	0.030	0.030	0.030	0.026	0.026	0.021	0.021	0.017	0.046	0.041	0.036	0.036

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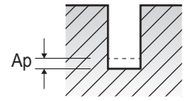
HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			1.2	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6			
			16	6	12	4	6	8	10	12	14	16	18	20	25	30	35	6	8			
P	5	Vc	136	185	167	196	196	176	176	176	176	157	157	157	118	118	59	201	201			
		fz	0.008	0.011	0.010	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012			
		RPM	36065	42154	37939	41581	41581	37423	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958			
		FEED	577	927	759	915	915	748	748	748	748	599	599	599	399	399	175	959	959			
		Ap	0.036	0.063	0.049	0.075	0.068	0.060	0.060	0.060	0.053	0.053	0.053	0.045	0.038	0.038	0.030	0.072	0.072			
	8	Vc	136	185	167	196	196	176	176	176	176	157	157	157	118	118	59	201	201			
		fz	0.008	0.011	0.010	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012			
		RPM	36065	42154	37939	41581	41581	37423	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958			
		FEED	577	927	759	915	915	748	748	748	748	599	599	599	399	399	175	959	959			
		Ap	0.036	0.063	0.049	0.075	0.068	0.060	0.060	0.060	0.053	0.053	0.053	0.045	0.038	0.038	0.030	0.072	0.072			
	9	Vc	136	185	167	196	196	176	176	176	176	157	157	157	118	118	59	201	201			
		fz	0.008	0.011	0.010	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012			
		RPM	36065	42154	37939	41581	41581	37423	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958			
		FEED	577	927	759	915	915	748	748	748	748	599	599	599	399	399	175	959	959			
		Ap	0.036	0.063	0.049	0.075	0.068	0.060	0.060	0.060	0.053	0.053	0.053	0.045	0.038	0.038	0.030	0.072	0.072			
	11.1	Vc	136	185	167	196	196	176	176	176	176	157	157	157	118	118	59	201	201			
		fz	0.008	0.011	0.010	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012			
		RPM	36065	42154	37939	41581	41581	37423	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958			
		FEED	577	927	759	915	915	748	748	748	748	599	599	599	399	399	175	959	959			
		Ap	0.036	0.063	0.049	0.075	0.068	0.060	0.060	0.060	0.053	0.053	0.053	0.045	0.038	0.038	0.030	0.072	0.072			
	11.2	Vc	111	144	130	154	154	139	139	139	139	123	123	123	93	93	46	161	161			
		fz	0.007	0.010	0.009	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010			
		RPM	29507	32786	29507	32754	32754	29479	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966			
		FEED	425	662	536	655	655	531	531	531	531	419	419	419	275	275	118	639	639			
		Ap	0.031	0.054	0.042	0.064	0.057	0.051	0.051	0.051	0.045	0.045	0.045	0.038	0.032	0.032	0.026	0.061	0.061			
H	38.1	Vc	111	144	130	154	154	139	139	139	139	123	123	123	93	93	46	161	161			
		fz	0.007	0.010	0.009	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010			
		RPM	29507	32786	29507	32754	32754	29479	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966			
		FEED	425	662	536	655	655	531	531	531	531	419	419	419	275	275	118	639	639			
		Ap	0.031	0.054	0.042	0.064	0.057	0.051	0.051	0.051	0.045	0.045	0.045	0.038	0.032	0.032	0.026	0.061	0.061			
	38.2	Vc	74	98	88	103	103	93	93	93	93	83	83	83	62	62	31	106	106			
		fz	0.006	0.009	0.008	0.009	0.009	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.005	0.010	0.010			
		RPM	19671	22248	20023	21939	21939	19745	19745	19745	19745	17551	17551	17551	13163	13163	6582	21106	21106			
		FEED	236	400	320	395	395	316	316	316	316	246	246	246	158	158	66	422	422			
		Ap	0.031	0.054	0.042	0.064	0.057	0.051	0.051	0.051	0.045	0.045	0.045	0.038	0.032	0.032	0.026	0.061	0.061			
	39.1	Vc	60	77	70	83	83	74	74	74	74	66	66	66	50	50	25	85	85			
		fz	0.005	0.007	0.006	0.007	0.007	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.007	0.007			
		RPM	15956	17564	15808	17510	17510	15759	15759	15759	15759	14008	14008	14008	10506	10506	5253	17007	17007			
		FEED	160	246	190	245	245	189	189	189	189	140	140	140	105	105	42	238	238			
		Ap	0.029	0.050	0.039	0.060	0.054	0.048	0.048	0.048	0.042	0.042	0.042	0.036	0.030	0.030	0.024	0.058	0.058			
	39.2	Vc	45	60	54	62	62	56	56	56	56	50	50	50	37	37	19	65	65			
		fz	0.004	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.006	0.006			
		RPM	12022	13583	12225	13184	13184	11866	11866	11866	11866	10547	10547	10547	7910	7910	3955	12910	12910			
		FEED	96	136	122	158	158	119	119	119	119	84	84	84	63	63	24	155	155			
		Ap	0.029	0.050	0.039	0.060	0.054	0.048	0.048	0.048	0.042	0.042	0.042	0.036	0.030	0.030	0.024	0.058	0.058			
	39.3	Vc	37	49	44	52	52	47	47	47	47	42	42	42	31	31	16	55	55			
		fz	0.003	0.005	0.004	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.005	0.005			
		RPM	9836	11241	10117	11021	11021	9919	9919	9919	9919	8817	8817	8817	6613	6613	3306	10860	10860			
		FEED	59	112	81	110	110	79	79	79	79	71	71	71	40	40	20	109	109			
		Ap	0.023	0.041	0.032	0.049	0.044	0.039	0.039	0.039	0.034	0.034	0.034	0.029	0.024	0.024	0.020	0.047	0.047			
	40	Vc	111	144	130	154	154	139	139	139	139	123	123	123	93	93	46	161	161			
		fz	0.007	0.010	0.009	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010			
		RPM	29507	32786	29507	32754	32754	29479	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966			
		FEED	425	662	536	655	655	531	531	531	531	419	419	419	275	275	118	639	639			
		Ap	0.031	0.054	0.042	0.064	0.057	0.051	0.051	0.051	0.045	0.045	0.045	0.038	0.032	0.032	0.026	0.061	0.061			
	41	Vc	74	98	88	103	103	93	93	93	93	83	83	83	62	62	31	106	106			
		fz	0.006	0.009	0.008	0.009	0.009	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.005	0.010	0.010			
		RPM	19671	22248	20023	21939	21939	19745	19745	19745	19745	17551	17551	17551	13163	13163	6582	21106	21106			
		FEED	236	400	320	395	395	316	316	316	316	246	246	246	158	158	66	422	422			
		Ap	0.031	0.054	0.042	0.064	0.057	0.051	0.051	0.051	0.045	0.045	0.045	0.038	0.032	0.032	0.026	0.061	0.061			

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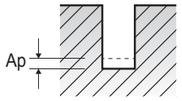
HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			1.8	1.8	1.8	1.8	1.8	1.8	1.8	2	2	2	2	2	2	2	2	2	2	2	2	2
			LBS	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	20	25	30	35	40
P	5	Vc	226	226	203	203	203	203	203	216	216	216	216	195	195	195	195	195	173	173	130	130
		fz	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009
		RPM	39958	39958	35962	35962	35962	35962	35962	34426	34426	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656
		FEED	959	959	719	719	719	719	719	895	895	895	895	744	744	744	744	744	551	551	372	372
		Ap	0.081	0.081	0.072	0.072	0.072	0.063	0.063	0.100	0.100	0.090	0.090	0.080	0.080	0.080	0.070	0.070	0.070	0.060	0.050	0.050
	8	Vc	226	226	203	203	203	203	203	216	216	216	216	195	195	195	195	195	173	173	130	130
		fz	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009
		RPM	39958	39958	35962	35962	35962	35962	35962	34426	34426	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656
		FEED	959	959	719	719	719	719	719	895	895	895	895	744	744	744	744	744	551	551	372	372
		Ap	0.081	0.081	0.072	0.072	0.072	0.063	0.063	0.100	0.100	0.090	0.090	0.080	0.080	0.080	0.070	0.070	0.070	0.060	0.050	0.050
	9	Vc	226	226	203	203	203	203	203	216	216	216	216	195	195	195	195	195	173	173	130	130
		fz	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009
		RPM	39958	39958	35962	35962	35962	35962	35962	34426	34426	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656
		FEED	959	959	719	719	719	719	719	895	895	895	895	744	744	744	744	744	551	551	372	372
		Ap	0.081	0.081	0.072	0.072	0.072	0.063	0.063	0.100	0.100	0.090	0.090	0.080	0.080	0.080	0.070	0.070	0.070	0.060	0.050	0.050
	11.1	Vc	226	226	203	203	203	203	203	216	216	216	216	195	195	195	195	195	173	173	130	130
		fz	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009
		RPM	39958	39958	35962	35962	35962	35962	35962	34426	34426	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656
		FEED	959	959	719	719	719	719	719	895	895	895	895	744	744	744	744	744	551	551	372	372
		Ap	0.081	0.081	0.072	0.072	0.072	0.063	0.063	0.100	0.100	0.090	0.090	0.080	0.080	0.080	0.070	0.070	0.070	0.060	0.050	0.050
	11.2	Vc	181	181	163	163	163	163	163	170	170	170	170	153	153	153	153	153	136	136	102	102
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009
		RPM	31966	31966	28769	28769	28769	28769	28769	27049	27049	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229
		FEED	639	639	518	518	518	518	518	703	703	703	703	584	584	584	584	584	433	433	292	292
		Ap	0.069	0.069	0.061	0.061	0.061	0.054	0.054	0.085	0.085	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.051	0.043	0.043
H	38.1	Vc	181	181	163	163	163	163	163	170	170	170	170	153	153	153	153	153	136	136	102	102
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009
		RPM	31966	31966	28769	28769	28769	28769	28769	27049	27049	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229
		FEED	639	639	518	518	518	518	518	703	703	703	703	584	584	584	584	584	433	433	292	292
		Ap	0.069	0.069	0.061	0.061	0.061	0.054	0.054	0.085	0.085	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.051	0.043	0.043
	38.2	Vc	119	119	107	107	107	107	107	113	113	113	113	102	102	102	102	102	91	91	68	68
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008
		RPM	21106	21106	18995	18995	18995	18995	18995	18032	18032	18032	18032	16229	16229	16229	16229	16229	14426	14426	10819	10819
		FEED	422	422	342	342	342	342	342	433	433	433	433	357	357	357	357	357	289	289	173	173
		Ap	0.069	0.069	0.061	0.061	0.061	0.054	0.054	0.085	0.085	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.051	0.043	0.043
	39.1	Vc	96	96	87	87	87	87	87	93	93	93	93	83	83	83	83	83	74	74	56	56
		fz	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006
		RPM	17007	17007	15306	15306	15306	15306	15306	14754	14754	14754	14754	13279	13279	13279	13279	13279	11803	11803	8852	8852
		FEED	238	238	184	184	184	184	184	266	266	266	266	212	212	212	212	212	165	165	106	106
		Ap	0.065	0.065	0.058	0.058	0.058	0.050	0.050	0.080	0.080	0.072	0.072	0.064	0.064	0.064	0.056	0.056	0.056	0.048	0.040	0.040
	39.2	Vc	73	73	66	66	66	66	66	72	72	72	72	65	65	65	65	65	58	58	43	43
		fz	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005
		RPM	12910	12910	11619	11619	11619	11619	11619	11475	11475	11475	11475	10328	10328	10328	10328	10328	9180	9180	6885	6885
		FEED	155	155	116	116	116	116	116	161	161	161	161	124	124	124	124	124	110	110	69	69
		Ap	0.065	0.065	0.058	0.058	0.058	0.050	0.050	0.080	0.080	0.072	0.072	0.064	0.064	0.064	0.056	0.056	0.056	0.048	0.040	0.040
	39.3	Vc	61	61	55	55	55	55	55	62	62	62	62	56	56	56	56	56	49	49	37	37
		fz	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004
		RPM	10860	10860	9774	9774	9774	9774	9774	9835	9835	9835	9835	8852	8852	8852	8852	8852	7868	7868	5901	5901
		FEED	109	109	78	78	78	78	78	118	118	118	118	89	89	89	89	89	79	79	47	47
		Ap	0.053	0.053	0.047	0.047	0.047	0.041	0.041	0.065	0.065	0.059	0.059	0.052	0.052	0.052	0.046	0.046	0.046	0.039	0.033	0.033
	40	Vc	181	181	163	163	163	163	163	170	170	170	170	153	153	153	153	153	136	136	102	102
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009
		RPM	31966	31966	28769	28769	28769	28769	28769	27049	27049	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229
		FEED	639	639	518	518	518	518	518	703	703	703	703	584	584	584	584	584	433	433	292	292
		Ap	0.069	0.069	0.061	0.061	0.061	0.054	0.054	0.085	0.085	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.051	0.043	0.043
	41	Vc	119	119	107	107	107	107	107	113	113	113	113	102	102	102	102	102	91	91	68	68
		fz	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008
		RPM	21106	21106	18995	18995	18995	18995	18995	18032	18032	18032	18032	16229	16229	16229	16229	16229	14426	14426	10819	10819
		FEED	422	422	342	342	342	342	342	433	433	433	433	357	357	357	357	357	289	289	173	173
		Ap	0.069	0.069	0.061	0.061	0.061	0.054	0.054	0.085	0.085	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.051	0.043	0.043

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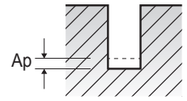
HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING



Vc = m/min. fz = mm/tooth Ap = mm
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	3.5	4	4			
			LBS	50	8	12	16	20	30	40	50	8	12	16	20	25	30	9	10	12		
P	5	Vc	65	217	217	195	195	173	130	130	211	211	190	190	190	190	216	216	216			
		fz	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	0.017	0.017	0.017	0.017	0.022	0.026	0.026			
		RPM	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	20164	20164	20164	20164	19673	17212	17212			
		FEED	165	883	883	696	696	574	364	364	851	851	686	686	686	686	873	895	895			
		Ap	0.040	0.113	0.113	0.100	0.100	0.088	0.075	0.063	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200			
	8	Vc	65	217	217	195	195	173	130	130	211	211	190	190	190	190	216	216	216			
		fz	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	0.017	0.017	0.017	0.017	0.022	0.026	0.026			
		RPM	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	20164	20164	20164	20164	19673	17212	17212			
		FEED	165	883	883	696	696	574	364	364	851	851	686	686	686	686	873	895	895			
		Ap	0.040	0.113	0.113	0.100	0.100	0.088	0.075	0.063	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200			
	9	Vc	65	217	217	195	195	173	130	130	211	211	190	190	190	190	216	216	216			
		fz	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	0.017	0.017	0.017	0.017	0.022	0.026	0.026			
		RPM	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	20164	20164	20164	20164	19673	17212	17212			
		FEED	165	883	883	696	696	574	364	364	851	851	686	686	686	686	873	895	895			
		Ap	0.040	0.113	0.113	0.100	0.100	0.088	0.075	0.063	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200			
	11.1	Vc	65	217	217	195	195	173	130	130	211	211	190	190	190	190	216	216	216			
		fz	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	0.017	0.017	0.017	0.017	0.022	0.026	0.026			
		RPM	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	20164	20164	20164	20164	19673	17212	17212			
		FEED	165	883	883	696	696	574	364	364	851	851	686	686	686	686	873	895	895			
		Ap	0.040	0.113	0.113	0.100	0.100	0.088	0.075	0.063	0.150	0.135	0.120	0.120	0.105	0.105	0.175	0.200	0.200			
	11.2	Vc	51	170	170	153	153	136	102	102	170	170	153	153	153	153	170	170	170			
		fz	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020	0.018	0.018	0.018	0.018	0.023	0.027	0.027			
		RPM	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032	16229	16229	16229	16229	15502	13524	13524			
		FEED	130	735	735	584	584	450	311	311	721	721	584	584	584	584	725	730	730			
		Ap	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170			
H	38.1	Vc	51	170	170	153	153	136	102	102	170	170	153	153	153	153	170	170	170			
		fz	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020	0.018	0.018	0.018	0.018	0.023	0.027	0.027			
		RPM	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032	16229	16229	16229	16229	15502	13524	13524			
		FEED	130	735	735	584	584	450	311	311	721	721	584	584	584	584	725	730	730			
		Ap	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170			
	38.2	Vc	34	113	113	102	102	91	68	68	113	113	102	102	102	102	113	113	113			
		fz	0.007	0.015	0.015	0.014	0.014	0.012	0.011	0.011	0.018	0.018	0.016	0.016	0.016	0.016	0.021	0.025	0.025			
		RPM	5410	14420	14420	12978	12978	11536	8652	8652	12021	12021	10819	10819	10819	10819	10321	9017	9017			
		FEED	76	433	433	363	363	277	190	190	433	433	346	346	346	346	442	451	451			
		Ap	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170			
	39.1	Vc	28	93	93	84	84	74	56	56	93	93	83	83	83	83	93	93	93			
		fz	0.005	0.011	0.011	0.010	0.010	0.009	0.008	0.008	0.014	0.014	0.013	0.013	0.013	0.013	0.016	0.019	0.019			
		RPM	4426	11845	11845	10661	10661	9476	7107	7107	9835	9835	8852	8852	8852	8852	8446	7377	7377			
		FEED	44	261	261	213	213	171	114	114	275	275	230	230	230	230	277	280	280			
		Ap	0.032	0.090	0.090	0.080	0.080	0.070	0.060	0.050	0.120	0.108	0.096	0.096	0.084	0.084	0.140	0.160	0.160			
	39.2	Vc	22	72	72	65	65	58	43	43	72	72	65	65	65	65	72	72	72			
		fz	0.004	0.009	0.009	0.008	0.008	0.007	0.006	0.006	0.011	0.011	0.010	0.010	0.010	0.010	0.013	0.015	0.015			
		RPM	3443	9167	9167	8250	8250	7334	5500	5500	7650	7650	6885	6885	6885	6885	6592	5737	5737			
		FEED	28	165	165	132	132	103	66	66	168	168	138	138	138	138	170	172	172			
		Ap	0.032	0.090	0.090	0.080	0.080	0.070	0.060	0.050	0.120	0.108	0.096	0.096	0.084	0.084	0.140	0.160	0.160			
	39.3	Vc	19	62	62	56	56	50	37	37	62	62	56	56	56	56	62	62	62			
		fz	0.004	0.008	0.008	0.007	0.007	0.006	0.005	0.005	0.009	0.009	0.008	0.008	0.008	0.008	0.011	0.012	0.012			
		RPM	2951	7931	7931	7138	7138	6345	4759	4759	6557	6557	5901	5901	5901	5901	5614	4918	4918			
		FEED	24	127	127	100	100	76	48	48	118	118	94	94	94	94	121	118	118			
		Ap	0.026	0.073	0.073	0.065	0.065	0.057	0.049	0.041	0.098	0.088	0.078	0.078	0.068	0.068	0.114	0.130	0.130			
	40	Vc	51	170	170	153	153	136	102	102	170	170	153	153	153	153	170	170	170			
		fz	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020	0.018	0.018	0.018	0.018	0.023	0.027	0.027			
		RPM	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032	16229	16229	16229	16229	15502	13524	13524			
		FEED	130	735	735	584	584	450	311	311	721	721	584	584	584	584	725	730	730			
		Ap	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170			
	41	Vc	34	113	113	102	102	91	68	68	113	113	102	102	102	102	113	113	113			
		fz	0.007	0.015	0.015	0.014	0.014	0.012	0.011	0.011	0.018	0.018	0.016	0.016	0.016	0.016	0.021	0.025	0.025			
		RPM	5410	14420	14420	12978	12978	11536	8652	8652	12021	12021	10819	10819	10819	10819	10321	9017	9017			
		FEED	76	433	433	363	363	277	190	190	433	433	346	346	346	346	442	451	451			
		Ap	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115	0.102	0.102	0.089	0.089	0.149	0.170	0.170			

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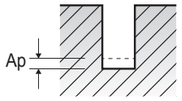
HPI88, HPK19 SERIES

2 FLUTE SQUARE - SLOTTING

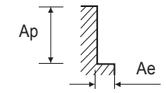


Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min. Ap = mm LBS = Length Below Shank

ISO	VDI 3323	Para-meter	Diameter (Ø)																			
			4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	8	10	12	16	20
			LBS	16	20	30	40	50	13	20	30	40	50	15	20	30	40	50	20	25	28	32	40
P	5	Vc		216	216	195	195	173	252	252	227	227	227	252	252	252	227	227	257	252	257	252	252
		fz		0.026	0.026	0.023	0.023	0.021	0.032	0.032	0.029	0.029	0.029	0.036	0.036	0.036	0.032	0.032	0.047	0.054	0.064	0.074	0.085
		RPM		17212	17212	15491	15491	13770	16065	16065	14459	14459	14459	13388	13388	13388	12049	12049	10245	8033	6830	5020	4016
		FEED		895	895	713	713	578	1028	1028	839	839	839	964	964	964	771	771	963	868	874	743	683
		Ap		0.180	0.180	0.160	0.140	0.140	0.250	0.225	0.200	0.200	0.175	0.300	0.270	0.270	0.240	0.210	0.400	0.500	0.600	0.800	1.000
	8	Vc		216	216	195	195	173	252	252	227	227	227	252	252	252	227	227	257	252	257	252	252
		fz		0.026	0.026	0.023	0.023	0.021	0.032	0.032	0.029	0.029	0.029	0.036	0.036	0.036	0.032	0.032	0.047	0.054	0.064	0.074	0.085
		RPM		17212	17212	15491	15491	13770	16065	16065	14459	14459	14459	13388	13388	13388	12049	12049	10245	8033	6830	5020	4016
		FEED		895	895	713	713	578	1028	1028	839	839	839	964	964	964	771	771	963	868	874	743	683
		Ap		0.180	0.180	0.160	0.140	0.140	0.250	0.225	0.200	0.200	0.175	0.300	0.270	0.270	0.240	0.210	0.400	0.500	0.600	0.800	1.000
	9	Vc		216	216	195	195	173	252	252	227	227	227	252	252	252	227	227	257	252	257	252	252
		fz		0.026	0.026	0.023	0.023	0.021	0.032	0.032	0.029	0.029	0.029	0.036	0.036	0.036	0.032	0.032	0.047	0.054	0.064	0.074	0.085
		RPM		17212	17212	15491	15491	13770	16065	16065	14459	14459	14459	13388	13388	13388	12049	12049	10245	8033	6830	5020	4016
		FEED		895	895	713	713	578	1028	1028	839	839	839	964	964	964	771	771	963	868	874	743	683
		Ap		0.180	0.180	0.160	0.140	0.140	0.250	0.225	0.200	0.200	0.175	0.300	0.270	0.270	0.240	0.210	0.400	0.500	0.600	0.800	1.000
	11.1	Vc		216	216	195	195	173	252	252	227	227	227	252	252	252	227	227	257	252	257	252	252
		fz		0.026	0.026	0.023	0.023	0.021	0.032	0.032	0.029	0.029	0.029	0.036	0.036	0.036	0.032	0.032	0.047	0.054	0.064	0.074	0.085
		RPM		17212	17212	15491	15491	13770	16065	16065	14459	14459	14459	13388	13388	13388	12049	12049	10245	8033	6830	5020	4016
		FEED		895	895	713	713	578	1028	1028	839	839	839	964	964	964	771	771	963	868	874	743	683
		Ap		0.180	0.180	0.160	0.140	0.140	0.250	0.225	0.200	0.200	0.175	0.300	0.270	0.270	0.240	0.210	0.400	0.500	0.600	0.800	1.000
	11.2	Vc		170	170	153	153	136	201	201	181	181	181	201	201	201	181	181	201	201	206	201	201
		fz		0.027	0.027	0.024	0.024	0.022	0.032	0.032	0.029	0.029	0.029	0.037	0.037	0.037	0.033	0.033	0.046	0.055	0.065	0.074	0.085
		RPM		13524	13524	12172	12172	10819	12786	12786	11507	11507	11507	10655	10655	10655	9590	9590	7992	6393	5464	3995	3197
		FEED		730	730	584	584	476	818	818	667	667	667	788	788	788	633	633	735	703	710	591	544
		Ap		0.153	0.153	0.136	0.119	0.119	0.213	0.191	0.170	0.170	0.149	0.255	0.230	0.230	0.204	0.179	0.340	0.425	0.510	0.680	0.850
H	38.1	Vc		170	170	153	153	136	201	201	181	181	181	201	201	201	181	181	201	201	206	201	201
		fz		0.027	0.027	0.024	0.024	0.022	0.032	0.032	0.029	0.029	0.029	0.037	0.037	0.037	0.033	0.033	0.046	0.055	0.065	0.074	0.085
		RPM		13524	13524	12172	12172	10819	12786	12786	11507	11507	11507	10655	10655	10655	9590	9590	7992	6393	5464	3995	3197
		FEED		730	730	584	584	476	818	818	667	667	667	788	788	788	633	633	735	703	710	591	544
		Ap		0.153	0.153	0.136	0.119	0.119	0.213	0.191	0.170	0.170	0.149	0.255	0.230	0.230	0.204	0.179	0.340	0.425	0.510	0.680	0.850
	38.2	Vc		113	113	102	102	91	134	134	121	121	121	134	134	134	121	121	134	134	134	134	134
		fz		0.025	0.025	0.023	0.023	0.020	0.030	0.030	0.027	0.027	0.027	0.035	0.035	0.035	0.032	0.032	0.043	0.051	0.059	0.070	0.082
		RPM		9017	9017	8115	8115	7214	8524	8524	7672	7672	7672	7104	7104	7104	6394	6394	5328	4262	3551	2664	2131
		FEED		451	451	373	373	289	511	511	414	414	414	497	497	497	409	409	458	435	419	373	349
		Ap		0.153	0.153	0.136	0.119	0.119	0.213	0.191	0.170	0.170	0.149	0.255	0.230	0.230	0.204	0.179	0.340	0.425	0.510	0.680	0.850
	39.1	Vc		93	93	83	83	74	103	103	93	93	93	103	103	103	93	93	103	103	103	103	103
		fz		0.019	0.019	0.017	0.017	0.015	0.022	0.022	0.020	0.020	0.020	0.026	0.026	0.026	0.023	0.023	0.032	0.038	0.045	0.053	0.061
		RPM		7377	7377	6639	6639	5902	6557	6557	5901	5901	5901	5464	5464	5464	4918	4918	4098	3278	2733	2049	1640
		FEED		280	280	226	226	177	289	289	236	236	236	284	284	284	226	226	262	249	246	217	200
		Ap		0.144	0.144	0.128	0.112	0.112	0.200	0.180	0.160	0.160	0.140	0.240	0.216	0.216	0.192	0.168	0.320	0.400	0.480	0.640	0.800
	39.2	Vc		72	72	65	65	58	82	82	74	74	74	82	82	82	74	74	82	82	82	82	82
		fz		0.015	0.015	0.014	0.014	0.012	0.018	0.018	0.016	0.016	0.016	0.021	0.021	0.021	0.019	0.019	0.026	0.030	0.037	0.042	0.048
		RPM		5737	5737	5163	5163	4590	5246	5246	4721	4721	4721	4371	4371	4371	3934	3934	3278	2622	2186	1640	1311
		FEED		172	172	145	145	110	189	189	151	151	151	184	184	184	149	149	170	157	162	138	126
		Ap		0.144	0.144	0.128	0.112	0.112	0.200	0.180	0.160	0.160	0.140	0.240	0.216	0.216	0.192	0.168	0.320	0.400	0.480	0.640	0.800
	39.3	Vc		62	62	56	56	49	72	72	65	65	65	72	72	72	65	65	72	72	72	72	72
		fz		0.012	0.012	0.011	0.011	0.010	0.015	0.015	0.013	0.013	0.013	0.018	0.018	0.018	0.016	0.016	0.021	0.026	0.030	0.034	0.039
		RPM		4918	4918	4426	4426	3934	4590	4590	4131	4131	4131	3825	3825	3825	3443	3443	2869	2295	1913	1435	1147
		FEED		118	118	97	97	79	138	138	107	107	107	138	138	138	110	110	120	119	115	97	89
		Ap		0.117	0.117	0.104	0.091	0.091	0.163	0.146	0.130	0.130	0.114	0.195	0.176	0.176	0.156	0.137	0.260	0.325	0.390	0.520	0.650
	40	Vc		170	170	153	153	136	201	201	181	181	181	201	201	201	181	181	201	201	206	201	201
		fz		0.027	0.027	0.024	0.024	0.022	0.032	0.032	0.029	0.029	0.029	0.037	0.037	0.037	0.033	0.033	0.046	0.055	0.065	0.074	0.085
		RPM		13524	13524	12172	12172	10819	12786	12786	11507	11507	11507	10655	10655	10655	9590	9590	7992	6393	5464	3995	3197
		FEED		730	730	584	584	476	818	818	667	667	667	788	788	788	633	633	735	703	710	591	544
		Ap		0.153	0.153	0.136	0.119	0.119	0.213	0.191	0.170	0.170	0.149	0.255	0.230	0.230	0.204	0.179	0.340	0.425	0.510	0.680	0.850
	41	Vc		113	113	102	102	91	134	134	121	121	121	134	134	134	121	121	134	134	134	134	134
		fz		0.025	0.025	0.023	0.023	0.020	0.030	0.030	0.027	0.027	0.027	0.035	0.035	0.035	0.032	0.032	0.043	0.051	0.059	0.070	0.082
		RPM		9017	9017	8115	8115	7214	8524	8524	7672	7672	7672	7104	7104	7104	6394	6394	5328	4262	3551	2664	2131
		FEED		451	451	373	373	289	511	511	414	414	414	497	497	497	409	409	458	435	419	373	349
		Ap		0.153	0.153	0.136	0.119	0.119	0.213	0.191	0.170	0.170	0.149	0.255	0.230	0.230	0.204	0.179	0.340	0.425	0.510	0.680	0.850

HPK20, HPK21 SERIES

4 FLUTE - SIDE CUTTING



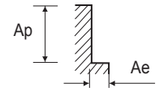
Vc = m/min. RPM = rev./min. fz = mm/tooth FEED = mm/min.

ISO	VDI 3323	Material Description	Side Cutting		Para-meter	Diameter (Ø)													
			Ae	Ap		1	1.2	1.5	1.8	2	2.5	3	4	5	6	8	10	12	16	20
P	5	Non-alloy steel	0.03D	0.8D	Vc	155	176	196	206	216	217	211	216	252	252	258	252	258	252	252
					fz	0.008	0.009	0.010	0.012	0.013	0.016	0.020	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
					RPM	49178	46556	41612	36462	34426	27604	22404	17212	16065	13388	10245	8033	6830	5020	4016
					FEED	1574	1602	1682	1730	1790	1792	1792	1859	2056	1982	1967	1799	1804	1546	1333
	8	Low alloy steel	0.03D	0.8D	Vc	155	176	196	206	216	217	211	216	252	252	258	252	258	252	252
					fz	0.008	0.009	0.010	0.012	0.013	0.016	0.020	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
					RPM	49178	46556	41612	36462	34426	27604	22404	17212	16065	13388	10245	8033	6830	5020	4016
					FEED	1574	1602	1682	1730	1790	1792	1792	1859	2056	1982	1967	1799	1804	1546	1333
	9		0.03D	0.8D	Vc	155	176	196	206	216	217	211	216	252	252	258	252	258	252	252
					fz	0.008	0.009	0.010	0.012	0.013	0.016	0.020	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
					RPM	49178	46556	41612	36462	34426	27604	22404	17212	16065	13388	10245	8033	6830	5020	4016
					FEED	1574	1602	1682	1730	1790	1792	1792	1859	2056	1982	1967	1799	1804	1546	1333
	11.1	High alloyed steel, and tool steel	0.03D	0.8D	Vc	155	176	196	206	216	217	211	216	252	252	258	252	258	252	252
					fz	0.008	0.009	0.010	0.012	0.013	0.016	0.020	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
					RPM	49178	46556	41612	36462	34426	27604	22404	17212	16065	13388	10245	8033	6830	5020	4016
					FEED	1574	1602	1682	1730	1790	1792	1792	1859	2056	1982	1967	1799	1804	1546	1333
	11.2		0.03D	0.8D	Vc	124	139	154	165	170	170	170	170	201	201	201	201	206	201	201
					fz	0.007	0.008	0.008	0.010	0.012	0.015	0.018	0.025	0.030	0.034	0.043	0.051	0.060	0.071	0.078
					RPM	39343	36977	32754	29149	27049	21630	18032	13524	12786	10655	7992	6393	5464	3995	3197
					FEED	1102	1102	1102	1133	1299	1299	1299	1352	1535	1449	1375	1304	1311	1135	997
H	38.1	Hardened steel	0.03D	0.8D	Vc	124	139	154	165	170	170	170	170	201	201	201	201	206	201	201
					fz	0.007	0.008	0.008	0.010	0.012	0.015	0.018	0.025	0.030	0.034	0.043	0.051	0.060	0.071	0.078
					RPM	39343	36977	32754	29149	27049	21630	18032	13524	12786	10655	7992	6393	5464	3995	3197
					FEED	1102	1102	1102	1133	1299	1299	1299	1352	1535	1449	1375	1304	1311	1135	997
	38.2		0.03D	0.8D	Vc	82	93	103	108	113	113	113	113	134	134	134	134	134	134	134
					fz	0.007	0.008	0.009	0.011	0.012	0.015	0.018	0.025	0.030	0.034	0.043	0.051	0.060	0.070	0.079
					RPM	26229	24720	21939	19055	18032	14420	12021	9017	8524	7104	5328	4262	3551	2664	2131
					FEED	734	773	799	824	865	865	865	901	1023	966	917	869	853	746	674
	39.1		0.03D	0.8D	Vc	67	72	82	87	93	93	93	93	103	103	103	103	103	103	103
					fz	0.005	0.006	0.007	0.008	0.009	0.011	0.014	0.019	0.023	0.026	0.033	0.038	0.045	0.053	0.059
					RPM	21311	19055	17407	15450	14754	11845	9835	7377	6557	5464	4098	3278	2733	2049	1640
					FEED	426	443	479	494	531	541	551	560	604	569	541	499	492	435	387
	39.2		0.03D	0.8D	Vc	52	56	62	67	72	72	72	72	82	82	82	82	82	82	82
					fz	0.004	0.005	0.006	0.006	0.007	0.009	0.011	0.015	0.018	0.021	0.026	0.030	0.036	0.042	0.048
					RPM	16392	14935	13184	11845	11475	9167	7650	5737	5246	4371	3278	2622	2186	1640	1311
					FEED	263	268	294	299	321	329	337	344	378	367	341	315	315	275	251
	39.3		0.03D	0.8D	Vc	41	46	51	57	62	61	62	62	72	72	72	72	72	72	72
					fz	0.004	0.005	0.006	0.006	0.007	0.008	0.009	0.013	0.016	0.018	0.022	0.025	0.030	0.036	0.041
					RPM	13114	12257	10918	10094	9835	7828	6557	4918	4590	3825	2869	2295	1913	1435	1147
					FEED	210	227	242	252	275	255	236	255	294	275	252	230	230	207	188
	40	Chilled Cast Iron	0.03D	0.8D	Vc	124	139	154	165	170	170	170	170	201	201	201	201	206	201	201
					fz	0.007	0.008	0.008	0.010	0.012	0.015	0.018	0.025	0.030	0.034	0.043	0.051	0.060	0.071	0.078
					RPM	39343	36977	32754	29149	27049	21630	18032	13524	12786	10655	7992	6393	5464	3995	3197
					FEED	1102	1102	1102	1133	1299	1299	1299	1352	1535	1449	1375	1304	1311	1135	997
	41	Hardened Cast Iron	0.03D	0.8D	Vc	82	93	103	108	113	113	113	113	134	134	134	134	134	134	134
					fz	0.007	0.008	0.009	0.011	0.012	0.015	0.018	0.025	0.030	0.034	0.043	0.051	0.060	0.070	0.079
					RPM	26229	24720	21939	19055	18032	14420	12021	9017	8524	7104	5328	4262	3551	2664	2131
					FEED	734	773	799	824	865	865	865	901	1023	966	917	869	853	746	674

HPK23 SERIES

4,6,8 FLUTE SQUARE LONG - SIDE CUTTING

4 Flute : Ø1-Ø5
6 Flute : Ø6-Ø16
8 Flute : Ø18-Ø25



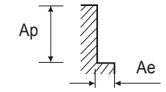
Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Side Cutting Ae	Side Cutting Ap	Para-meter	Diameter (Ø) 1	2	3	4	5	6	8	10	12	14	16	18	20	25
P	5	Non-alloy steel	0.04D	1.5D	Vc	124	124	124	124	124	124	124	124	124	124	124	124	124	129
					fz	0.008	0.013	0.020	0.027	0.032	0.039	0.052	0.063	0.070	0.081	0.090	0.095	0.080	0.110
					RPM	39343	19672	13114	9835	7868	6557	4918	3935	3278	2810	2459	2186	1967	1640
					FEED	1259	1023	1050	1062	1007	1535	1535	1487	1377	1366	1328	1661	1259	1443
	8	Low alloy steel	0.04D	1.5D	Vc	124	124	124	124	124	124	124	124	124	124	124	124	124	129
					fz	0.008	0.013	0.020	0.027	0.032	0.039	0.052	0.063	0.070	0.081	0.090	0.095	0.080	0.110
					RPM	39343	19672	13114	9835	7868	6557	4918	3935	3278	2810	2459	2186	1967	1640
					FEED	1259	1023	1050	1062	1007	1535	1535	1487	1377	1366	1328	1661	1259	1443
	9		0.04D	1.5D	Vc	124	124	124	124	124	124	124	124	124	124	124	124	124	129
					fz	0.008	0.013	0.020	0.027	0.032	0.039	0.052	0.063	0.070	0.081	0.090	0.095	0.080	0.110
					RPM	39343	19672	13114	9835	7868	6557	4918	3935	3278	2810	2459	2186	1967	1640
					FEED	1259	1023	1050	1062	1007	1535	1535	1487	1377	1366	1328	1661	1259	1443
	11.1	High alloyed steel, and tool steel	0.04D	1.5D	Vc	124	124	124	124	124	124	124	124	124	124	124	124	124	129
					fz	0.008	0.013	0.020	0.027	0.032	0.039	0.052	0.063	0.070	0.081	0.090	0.095	0.080	0.110
					RPM	39343	19672	13114	9835	7868	6557	4918	3935	3278	2810	2459	2186	1967	1640
					FEED	1259	1023	1050	1062	1007	1535	1535	1487	1377	1366	1328	1661	1259	1443
	11.2		0.04D	1.5D	Vc	98	98	98	98	98	98	98	98	98	98	98	98	103	98
					fz	0.007	0.012	0.018	0.025	0.030	0.035	0.046	0.055	0.062	0.070	0.079	0.080	0.091	0.096
					RPM	31146	15574	10382	7787	6229	5191	3893	3115	2596	2225	1947	1730	1640	1246
					FEED	872	748	748	779	748	1090	1074	1028	965	934	923	1107	1194	957
H	38.1	Hardened steel	0.04D	1.5D	Vc	98	98	98	98	98	98	98	98	98	98	98	98	103	98
					fz	0.007	0.012	0.018	0.025	0.030	0.035	0.046	0.055	0.062	0.070	0.079	0.080	0.091	0.096
					RPM	31146	15574	10382	7787	6229	5191	3893	3115	2596	2225	1947	1730	1640	1246
					FEED	872	748	748	779	748	1090	1074	1028	965	934	923	1107	1194	957
	38.2		0.04D	1.5D	Vc	98	98	98	98	98	98	98	98	98	98	98	98	103	98
					fz	0.007	0.012	0.018	0.025	0.030	0.035	0.046	0.055	0.062	0.070	0.079	0.080	0.091	0.096
					RPM	31146	15574	10382	7787	6229	5191	3893	3115	2596	2225	1947	1730	1640	1246
					FEED	872	748	748	779	748	1090	1074	1028	965	934	923	1107	1194	957
	39.1		0.04D	1.5D	Vc	70	70	70	70	70	70	70	70	70	70	70	70	75	75
					fz	0.007	0.012	0.018	0.025	0.030	0.031	0.042	0.050	0.056	0.066	0.072	0.073	0.069	0.087
					RPM	22282	11141	7427	5570	4456	3714	2785	2228	1857	1592	1393	1238	1194	955
					FEED	624	535	535	557	535	691	702	668	624	630	602	723	659	665
	39.2		0.04D	1.5D	Vc	70	70	70	70	70	70	70	70	70	70	70	70	75	75
					fz	0.007	0.012	0.018	0.025	0.030	0.031	0.042	0.050	0.056	0.066	0.072	0.073	0.069	0.087
					RPM	22282	11141	7427	5570	4456	3714	2785	2228	1857	1592	1393	1238	1194	955
					FEED	624	535	535	557	535	691	702	668	624	630	602	723	659	665
	39.3		0.04D	1.5D	Vc	50	50	50	50	50	50	50	50	50	45	50	50	45	50
					fz	0.005	0.009	0.014	0.019	0.023	0.028	0.037	0.045	0.050	0.051	0.064	0.066	0.071	0.079
					RPM	15915	7958	5305	3979	3183	2653	1989	1592	1326	1023	995	884	716	637
					FEED	318	286	297	302	293	446	442	430	398	313	382	467	407	403
	40	Chilled Cast Iron	0.04D	1.5D	Vc	98	98	98	98	98	98	98	98	98	98	98	98	103	98
					fz	0.007	0.012	0.018	0.025	0.030	0.035	0.046	0.055	0.062	0.070	0.079	0.080	0.091	0.096
					RPM	31146	15574	10382	7787	6229	5191	3893	3115	2596	2225	1947	1730	1640	1246
					FEED	872	748	748	779	748	1090	1074	1028	965	934	923	1107	1194	957
	41	Hardened Cast Iron	0.04D	1.5D	Vc	98	98	98	98	98	98	98	98	98	98	98	98	103	98
					fz	0.007	0.012	0.018	0.025	0.030	0.035	0.046	0.055	0.062	0.070	0.079	0.080	0.091	0.096
					RPM	31146	15574	10382	7787	6229	5191	3893	3115	2596	2225	1947	1730	1640	1246
					FEED	872	748	748	779	748	1090	1074	1028	965	934	923	1107	1194	957

HPK23 SERIES

4,6,8 FLUTE SQUARE LONG - SIDE CUTTING

4 Flute : Ø1-Ø5
6 Flute : Ø6-Ø16
8 Flute : Ø18-Ø25

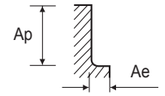


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Side Cutting Ae	Side Cutting Ap	Para-meter	Diameter (Ø) 1	2	3	4	5	6	8	10	12	14	16	18	20	25
P	5	Non-alloy steel	0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.008	0.013	0.020	0.027	0.032	0.040	0.050	0.060	0.070	0.075	0.081	0.085	0.086	0.089
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	629	512	524	531	504	787	737	709	689	632	597	743	677	560
	8	Low alloy steel	0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.008	0.013	0.020	0.027	0.032	0.040	0.050	0.060	0.070	0.075	0.081	0.085	0.086	0.089
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	629	512	524	531	504	787	737	709	689	632	597	743	677	560
	9		0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.008	0.013	0.020	0.027	0.032	0.040	0.050	0.060	0.070	0.075	0.081	0.085	0.086	0.089
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	629	512	524	531	504	787	737	709	689	632	597	743	677	560
	11.1	High alloyed steel, and tool steel	0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.008	0.013	0.020	0.027	0.032	0.040	0.050	0.060	0.070	0.075	0.081	0.085	0.086	0.089
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	629	512	524	531	504	787	737	709	689	632	597	743	677	560
	11.2		0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.007	0.012	0.018	0.025	0.030	0.030	0.040	0.050	0.061	0.066	0.071	0.080	0.090	0.080
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	551	472	472	492	472	590	590	590	600	556	524	699	709	504
H	38.1	Hardened steel	0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.007	0.012	0.018	0.025	0.030	0.030	0.040	0.050	0.061	0.066	0.071	0.080	0.090	0.080
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	551	472	472	492	472	590	590	590	600	556	524	699	709	504
	38.2		0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.007	0.012	0.018	0.025	0.030	0.030	0.040	0.050	0.061	0.066	0.071	0.080	0.090	0.080
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	551	472	472	492	472	590	590	590	600	556	524	699	709	504
	39.1		0.01D	3.0D	Vc	51	52	51	51	51	52	51	52	51	52	52	52	52	52
					fz	0.007	0.012	0.018	0.025	0.030	0.030	0.040	0.050	0.060	0.066	0.071	0.081	0.091	0.081
					RPM	16392	8197	5464	4098	3278	2733	2049	1640	1366	1171	1025	911	820	656
					FEED	459	393	393	410	393	492	491	492	491	464	437	590	596	425
	39.2		0.01D	3.0D	Vc	51	52	51	51	51	52	51	52	51	52	52	52	52	52
					fz	0.007	0.012	0.018	0.025	0.030	0.030	0.040	0.050	0.060	0.066	0.071	0.081	0.091	0.081
					RPM	16392	8197	5464	4098	3278	2733	2049	1640	1366	1171	1025	911	820	656
					FEED	459	393	393	410	393	492	491	492	491	464	437	590	596	425
	40	Chilled Cast Iron	0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.007	0.012	0.018	0.025	0.030	0.030	0.040	0.050	0.061	0.066	0.071	0.080	0.090	0.080
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	551	472	472	492	472	590	590	590	600	556	524	699	709	504
	41	Hardened Cast Iron	0.01D	3.0D	Vc	62	62	62	62	62	62	62	62	62	62	62	62	62	62
					fz	0.007	0.012	0.018	0.025	0.030	0.030	0.040	0.050	0.061	0.066	0.071	0.080	0.090	0.080
					RPM	19672	9835	6557	4918	3935	3278	2459	1967	1640	1405	1230	1093	984	787
					FEED	551	472	472	492	472	590	590	590	600	556	524	699	709	504

HPK22 SERIES

4 FLUTE CORNER RADIUS NORMAL SPEED - SIDE CUTTING

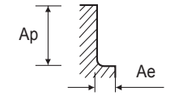


Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Side Cutting Ae	Side Cutting Ap	Para-meter	Diameter (Ø) 2	3	4	5	6	8	10	12	16
P	5	Non-alloy steel	0.3D	0.2R	Vc	88	93	103	103	113	113	113	113	113
					fz	0.120	0.170	0.220	0.281	0.330	0.440	0.546	0.659	0.869
					RPM	13934	9835	8197	6557	6011	4508	3606	3006	2254
					FEED	6689	6689	7213	7371	7934	7934	7876	7922	7835
	8	Low alloy steel	0.3D	0.2R	Vc	88	93	103	103	113	113	113	113	113
					fz	0.120	0.170	0.220	0.281	0.330	0.440	0.546	0.659	0.869
					RPM	13934	9835	8197	6557	6011	4508	3606	3006	2254
					FEED	6689	6689	7213	7371	7934	7934	7876	7922	7835
	9		0.3D	0.2R	Vc	88	93	103	103	113	113	113	113	113
					fz	0.120	0.170	0.220	0.281	0.330	0.440	0.546	0.659	0.869
					RPM	13934	9835	8197	6557	6011	4508	3606	3006	2254
					FEED	6689	6689	7213	7371	7934	7934	7876	7922	7835
	11.1	High alloyed steel, and tool steel	0.3D	0.2R	Vc	88	93	103	103	113	113	113	113	113
					fz	0.120	0.170	0.220	0.281	0.330	0.440	0.546	0.659	0.869
					RPM	13934	9835	8197	6557	6011	4508	3606	3006	2254
					FEED	6689	6689	7213	7371	7934	7934	7876	7922	7835
	11.2		0.3D	0.2R	Vc	62	67	72	77	77	77	77	77	82
					fz	0.099	0.150	0.200	0.250	0.299	0.402	0.500	0.598	0.790
					RPM	9835	7104	5737	4918	4098	3074	2459	2049	1640
					FEED	3895	4262	4590	4918	4902	4943	4918	4902	5180
H	38.1	Hardened steel	0.3D	0.2R	Vc	62	67	72	77	77	77	77	77	82
					fz	0.099	0.150	0.200	0.250	0.299	0.402	0.500	0.598	0.790
					RPM	9835	7104	5737	4918	4098	3074	2459	2049	1640
					FEED	3895	4262	4590	4918	4902	4943	4918	4902	5180
	38.2		0.3D	0.2R	Vc	36	46	51	57	57	57	57	57	57
					fz	0.100	0.151	0.200	0.235	0.302	0.398	0.500	0.603	0.795
					RPM	5737	4918	4098	3606	3006	2254	1804	1503	1127
					FEED	2295	2971	3278	3390	3631	3589	3606	3625	3584
	39.1		0.3D	0.1R	Vc	21	26	31	36	36	36	36	36	36
					fz	0.078	0.101	0.132	0.182	0.250	0.330	0.420	0.500	0.661
					RPM	3278	2733	2459	2295	1913	1435	1147	956	717
					FEED	1023	1104	1299	1671	1913	1893	1928	1913	1896
	39.2 - 39.3		0.3D	0.05R	Vc	15	21	21	26	26	26	26	26	26
					fz	0.063	0.080	0.100	0.117	0.147	0.200	0.250	0.299	0.398
					RPM	2459	2186	1640	1640	1366	1025	820	683	512
					FEED	620	699	656	767	803	820	820	817	816
	40	Chilled Cast Iron	0.3D	0.2R	Vc	62	67	72	77	77	77	77	77	82
					fz	0.099	0.150	0.200	0.250	0.299	0.402	0.500	0.598	0.790
					RPM	9835	7104	5737	4918	4098	3074	2459	2049	1640
					FEED	3895	4262	4590	4918	4902	4943	4918	4902	5180
	41	Hardened Cast Iron	0.3D	0.2R	Vc	36	46	51	57	57	57	57	57	57
					fz	0.100	0.151	0.200	0.235	0.302	0.398	0.500	0.603	0.795
					RPM	5737	4918	4098	3606	3006	2254	1804	1503	1127
					FEED	2295	2971	3278	3390	3631	3589	3606	3625	3584

HPK22 SERIES

4 FLUTE CORNER RADIUS HIGH SPEED - SIDE CUTTING



Vc = m/min. fz = mm/tooth
RPM = rev./min. FEED = mm/min.

ISO	VDI 3323	Material Description	Side Cutting Ae	Side Cutting Ap	Para-meter	Diameter (Ø) 2	3	4	5	6	8	10	12	16
P	5	Non-alloy steel	0.3D	0.1R	Vc	185	211	221	242	263	257	258	257	258
					fz	0.129	0.182	0.257	0.300	0.343	0.463	0.578	0.701	0.925
					RPM	29507	22404	17622	15410	13934	10245	8197	6830	5123
					FEED	15225	16310	18116	18492	19118	18975	18950	19153	18954
	8	Low alloy steel	0.3D	0.1R	Vc	185	211	221	242	263	257	258	257	258
					fz	0.129	0.182	0.257	0.300	0.343	0.463	0.578	0.701	0.925
					RPM	29507	22404	17622	15410	13934	10245	8197	6830	5123
					FEED	15225	16310	18116	18492	19118	18975	18950	19153	18954
	9		0.3D	0.1R	Vc	185	211	221	242	263	257	258	257	258
					fz	0.129	0.182	0.257	0.300	0.343	0.463	0.578	0.701	0.925
					RPM	29507	22404	17622	15410	13934	10245	8197	6830	5123
					FEED	15225	16310	18116	18492	19118	18975	18950	19153	18954
	11.1	High alloyed steel, and tool steel	0.3D	0.1R	Vc	185	211	221	242	263	257	258	257	258
					fz	0.129	0.182	0.257	0.300	0.343	0.463	0.578	0.701	0.925
					RPM	29507	22404	17622	15410	13934	10245	8197	6830	5123
					FEED	15225	16310	18116	18492	19118	18975	18950	19153	18954
	11.2		0.3D	0.1R	Vc	144	165	170	180	206	206	206	206	201
					fz	0.111	0.147	0.231	0.284	0.329	0.438	0.547	0.660	0.897
					RPM	22950	17486	13524	11475	10928	8197	6557	5464	3995
					FEED	10190	10281	12496	13036	14382	14360	14347	14426	14337
H	38.1	Hardened steel	0.3D	0.1R	Vc	144	165	170	180	206	206	206	206	201
					fz	0.111	0.147	0.231	0.284	0.329	0.438	0.547	0.660	0.897
					RPM	22950	17486	13524	11475	10928	8197	6557	5464	3995
					FEED	10190	10281	12496	13036	14382	14360	14347	14426	14337
	38.2		0.3D	0.1R	Vc	98	206	144	160	175	175	175	175	170
					fz	0.131	0.160	0.209	0.250	0.306	0.404	0.509	0.611	0.833
					RPM	15574	21858	11475	10164	9290	6967	5573	4644	3381
					FEED	8161	13988	9593	10164	11370	11259	11348	11352	11266
	39.1		0.3D	0.05R	Vc	72	93	103	113	124	124	124	124	124
					fz	0.101	0.121	0.172	0.214	0.250	0.349	0.447	0.547	0.729
					RPM	11475	9835	8197	7213	6557	4918	3935	3278	2459
					FEED	4636	4761	5639	6174	6557	6865	7035	7174	7170
	39.2 - 39.3		0.3D	0.05R	Vc	57	67	72	77	88	88	88	88	88
					fz	0.070	0.091	0.129	0.158	0.200	0.301	0.352	0.400	0.500
					RPM	9017	7104	5737	4918	4644	3483	2787	2323	1742
					FEED	2525	2585	2960	3109	3716	4194	3924	3716	3483
	40	Chilled Cast Iron	0.3D	0.1R	Vc	144	165	170	180	206	206	206	206	201
					fz	0.111	0.147	0.231	0.284	0.329	0.438	0.547	0.660	0.897
					RPM	22950	17486	13524	11475	10928	8197	6557	5464	3995
					FEED	10190	10281	12496	13036	14382	14360	14347	14426	14337
	41	Hardened Cast Iron	0.3D	0.1R	Vc	98	206	144	160	175	175	175	175	170
					fz	0.131	0.160	0.209	0.250	0.306	0.404	0.509	0.611	0.833
					RPM	15574	21858	11475	10164	9290	6967	5573	4644	3381
					FEED	8161	13988	9593	10164	11370	11259	11348	11352	11266

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