



Leading Through Innovation

SOLID CARBIDE

X1-EH END MILLS

X1-EH VHM - FRÄSER

- Highly Accurate Fine-Finishing for High Hardened Steel
- Hochpräzise Feinbearbeitung für hochgehärtete Stähle

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SOLID CARBIDE
X1-EH
END MILLS

Highly Accurate Fine-Finishing for High Hardened Steel



◎: Excellent ○: Good

Recommended cutting conditions : p. C116

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						
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	Non Metallic Materials	Duroplastic, Fiber Reinforced Plastic									
	30		Rubber, Wood, etc.									
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15						
	32			Cured	280	30						
	33			Annealed	250	25						
	34		Ni or Co Based	Cured	350	38						
	35			Cast	320	34						
	36	Titanium Alloys	Pure Titanium		400 Rm							
	37		Alpha + Beta Alloys Hardened		1050 Rm							
H	38	Hardened steel		Hardened	421-469	45-49	⊙	⊙	⊙	⊙	⊙	
	39			Hardened		66-70	⊙	⊙	⊙	⊙	⊙	
	40	Chilled Cast Iron		Cast	400	42	○	○	○	○	○	
	41	Hardened Cast Iron		Hardened	550	55	⊙	⊙	⊙	⊙	⊙	

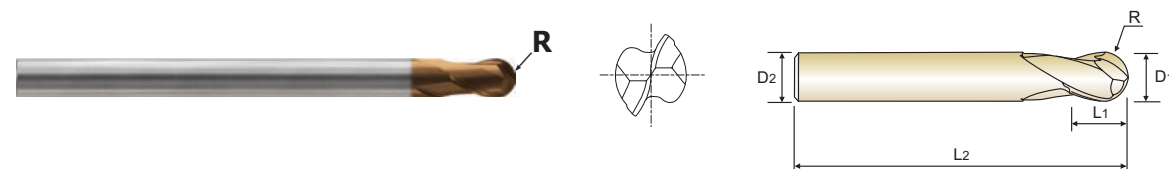


PLAIN SHANK **HPI90** SERIES

CARBIDE, 2 FLUTE BALL NOSE

VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS
🇫🇷 Fraise carbure, 2 dents, hémisphérique
🇮🇹 2 TAGLIENTI, SEMISFERICA

- ▶ Improvement of tool life by applying new coating.
 - ▶ Application of tight tolerances for precision machining.
- ▶ Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
 - ▶ Enge Toleranzen für die Präzisionsbearbeitung



R0.05-R3 R4-R10					Unit : mm
EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D1	D2	L1	L2
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
HPI90005	R0.25	0.5	4	0.8	50
HPI90008	R0.4	0.8	4	1.2	50
HPI90025	R1.25	2.5	6	3.8	60
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

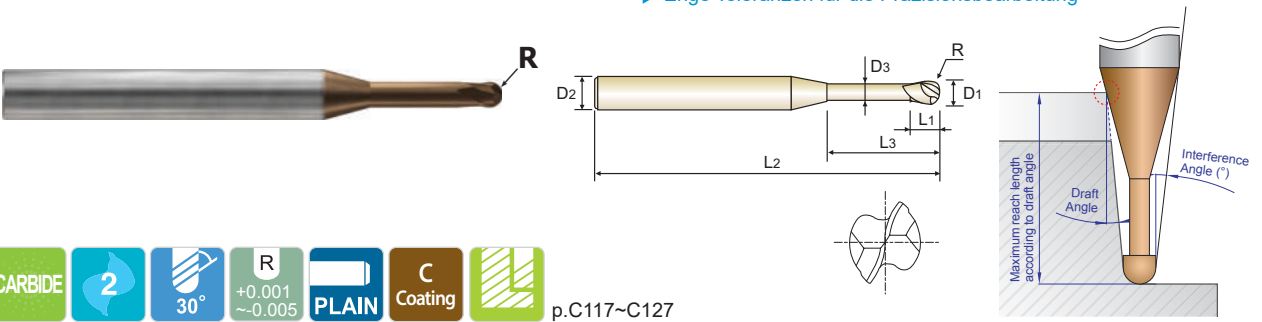
Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007	0~-0.012	* Shank Dia.>ø6 : h5

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
Recommend						○				○	○		○	○											
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		21		23	24	25	26		28	29		31	32	33	34	35	36		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	
Recommend																			◎	◎	◎	◎	◎	◎	◎

CARBIDE, 2 FLUTE BALL NOSE for RIB PROCESSING

 **VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS für SCHMALE RIPPEN**
 **Fraise carbure, 2 dents, hémisphérique pour usinage de rainure**
 2 TAGLIENTI, SEMISFERICA, SCARICATA PER NERVATURE

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



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°
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
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
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
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
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
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
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

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-0.005	0~-0.010	h4

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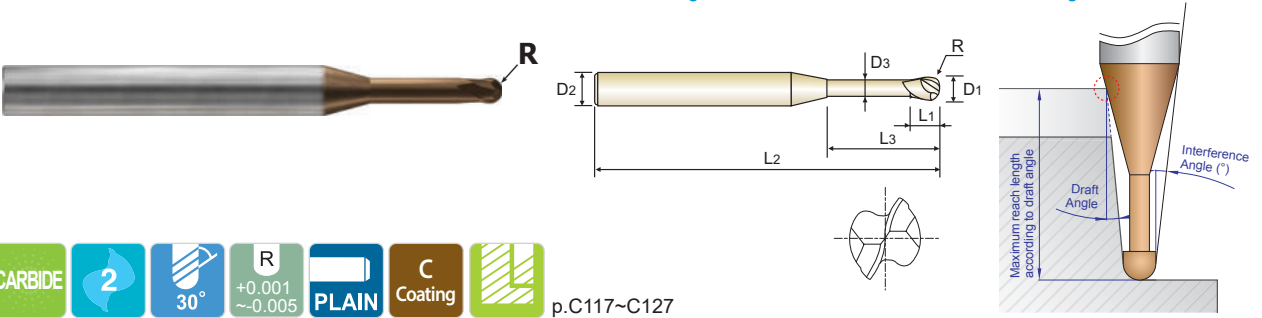
◎ : Excellent ○ : Good

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			
Recommend					○			○	○		○	○												
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
Recommend																		◎	◎	◎	◎	◎	◎	◎

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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°
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
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
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
HPI91802	R0.5	1.0	4	0.75	3	45	0.95	10.38	3.28	3.43	3.60	3.79	4.26

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-0.005	0~-0.010	h4

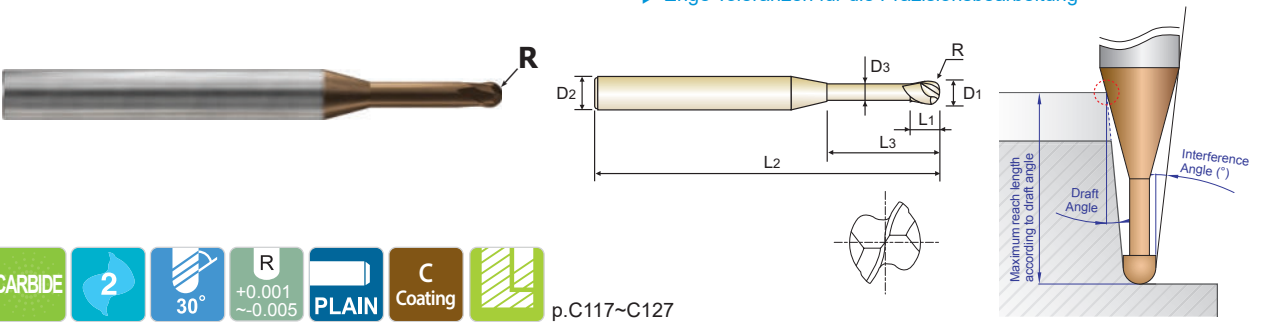
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ISO	P											M			K									
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron				
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	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			
Recommend					○			○	○		○	○												
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	60	40	550
Recommend																		⊙	⊙	⊙	⊙	○	○	⊙

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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°
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
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
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

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-0.005	0~-0.010	h4

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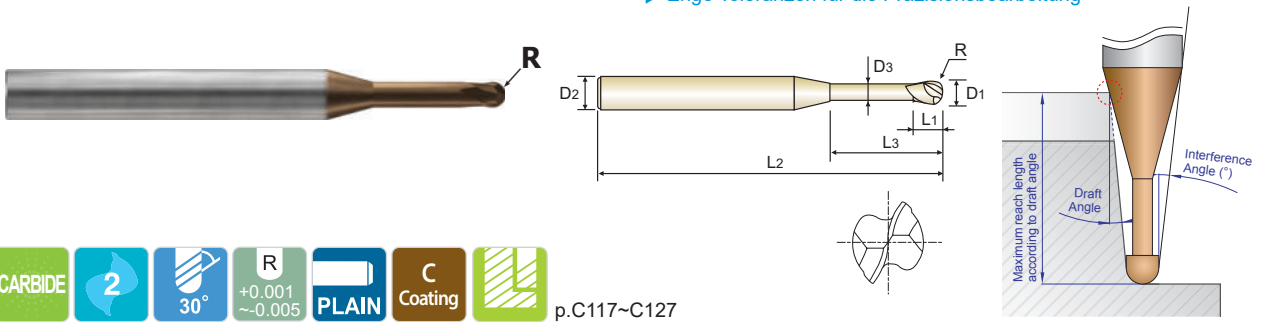
◎ : Excellent ○ : Good

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			
Recommend					○			○	○		○	○												
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	60	40	550
Recommend																		⊙	⊙	⊙	⊙	⊙	○	⊙

CARBIDE, 2 FLUTE BALL NOSE for RIB PROCESSING

 **VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS für SCHMALE RIPPEN**
 **Fraise carbure, 2 dents, hémisphérique pour usinage de rainure**
 2 TAGLIENTI, SEMISFERICA, SCARICATA PER NERVATURE

- Improvement of tool life by applying new coating.
 - Application of tight tolerances for precision machining.
- Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung



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°
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
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
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	3.35	3.93	15.74	16.22	16.75	17.31	18.57
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	-

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-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			
Recommend					○			○	○		○	○												
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
Recommend																		◎	◎	◎	◎	◎	◎	◎



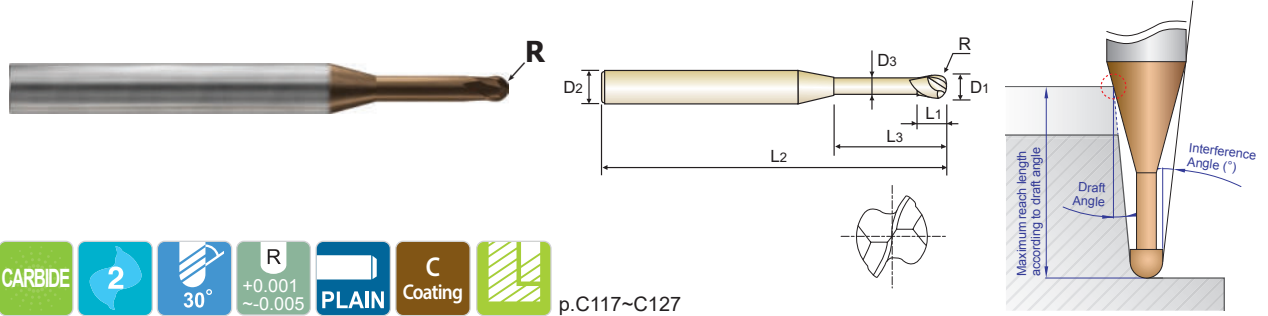
PLAIN SHANK **HPI91** SERIES

CARBIDE, 2 FLUTE BALL NOSE for RIB PROCESSING

- VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS für SCHMALE RIPPEN
- Fraise carbure, 2 dents, hémisphérique pour usinage de rainure
- 2 TAGLIENTI, SEMISFERICA, SCARICATA PER NERVATURE

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

- ▶ Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
- ▶ Enge Toleranzen für die Präzisionsbearbeitung



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°
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
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
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	-	-	-
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	-
HPI91060	R3.0	6.0	6	6	10	70	5.85	0.00	-	-	-	-	-
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	-
HPI91727	R3.0	6.0	6	6	15	45	5.85	0.00	-	-	-	-	-

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Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-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			
Recommend					○			○	○		○	○												
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
Recommend											◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎



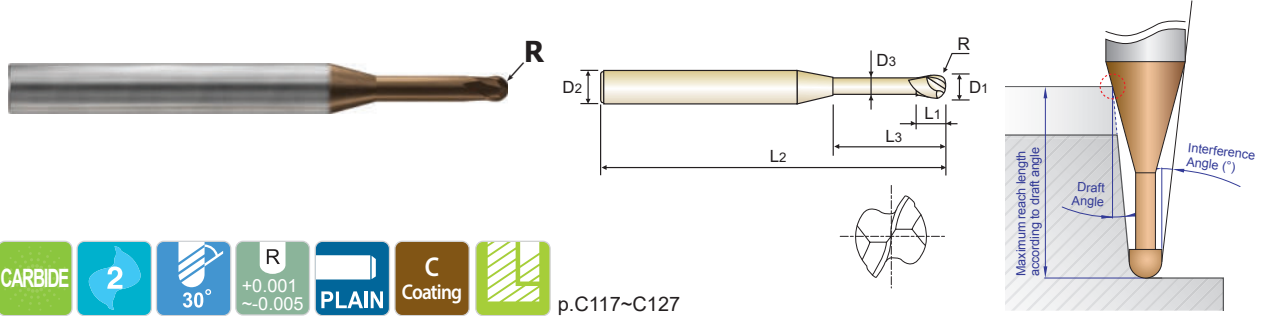
PLAIN SHANK **HPI91** SERIES

CARBIDE, 2 FLUTE BALL NOSE for RIB PROCESSING

- VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS für SCHMALE RIPPEN
- Fraise carbure, 2 dents, hémisphérique pour usinage de rainure
- 2 TAGLIENTI, SEMISFERICA, SCARICATA PER NERVATURE

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

- ▶ Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
- ▶ Enge Toleranzen für die Präzisionsbearbeitung



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°
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	-	-	-	-	-

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-0.005	0~-0.010	h4

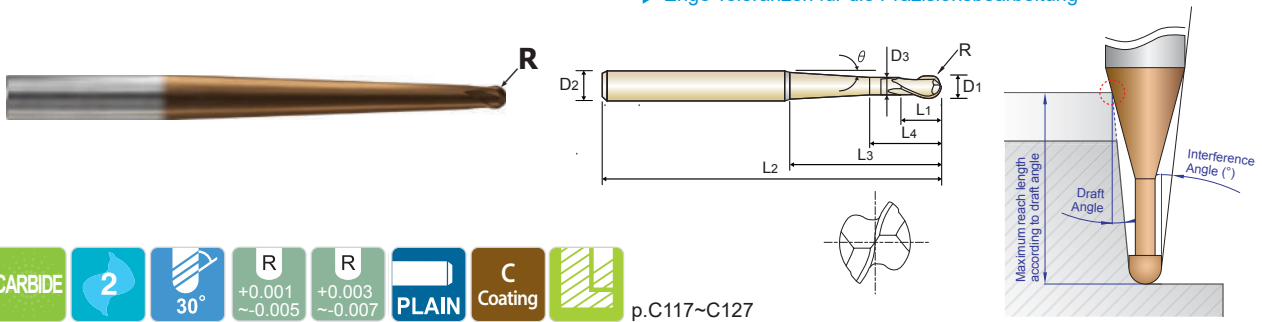
◎ : Excellent ○ : Good

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			
Recommend					○			○	○		○	○												
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
Recommend											◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎

CARBIDE, 2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS für SCHMALE RIPPEN mit KONISCH ABGESETZTEM SCHAFTTEIL
Fraise carbure, 2 dents, hémisphérique pour usinage de rainure avec entrée conique
2 TAGLIENTI, SEMISFERICA, SCARICATA PER NERVATURE, SCARICO CONICO

- Improvement of tool life by applying new coating.
 - Application of tight tolerances for precision machining.
- Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
 - Enge Toleranzen für die Präzisionsbearbeitung



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°
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
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

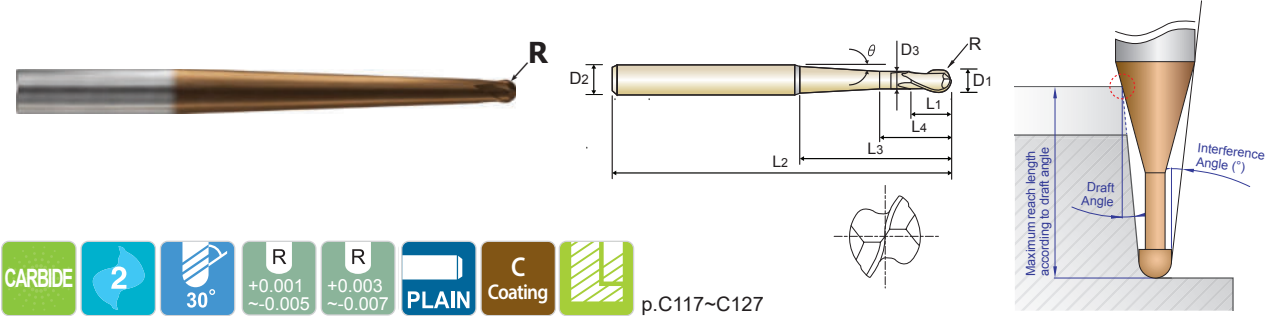
Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007	0~-0.012	* Shank Dia.>ø6 : h5

◎ : 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			
Recommend					○			○	○		○	○												
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	600	400	550
Recommend																		⊗	⊗	⊗	⊗	⊗	○	⊗

CARBIDE, 2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK
🇩🇪 VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS für SCHMALE RIPPEN mit KONISCH ABGESETZTEM SCHAFTTEIL
🇫🇷 Fraise carbure, 2 dents, hémisphérique pour usinage de rainure avec entrée conique
🇮🇹 2 TAGLIENTI, SEMISFERICA, SCARICATA PER NERVATURE, SCARICO CONICO

- ▶ Improvement of tool life by applying new coating.
 - ▶ Application of tight tolerances for precision machining.
- ▶ Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
 - ▶ Enge Toleranzen für die Präzisionsbearbeitung



R0.05~R3 R35~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°
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
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

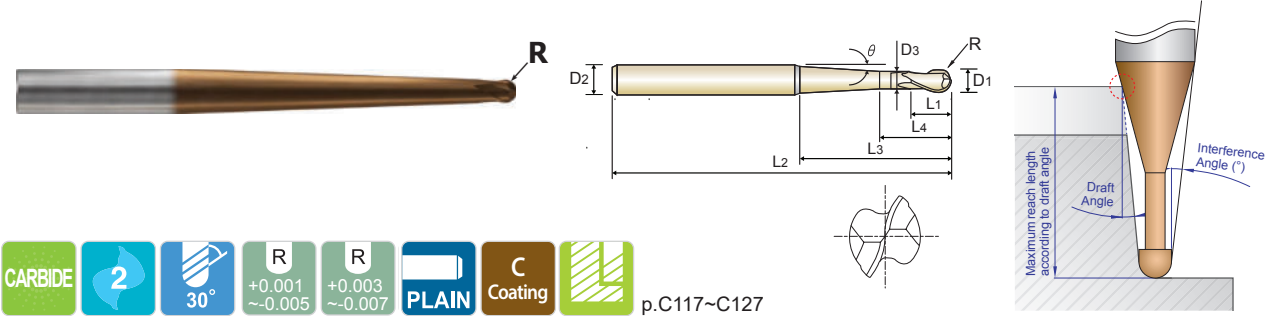
Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007	0~-0.012	* Shank Dia.>ø6 : h5

◎ : 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	15	26	3	25		21			
HB	125	190	250	270	300	180	275		350	200	325	409	200	240	180	180	260	160	250	130	230			
Recommend					○			○	○		○	○												
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	45
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		40	550
Recommend																		⊗	⊗	⊗	⊗	⊗	○	⊗

CARBIDE, 2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK
🇩🇪 VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS für SCHMALE RIPPEN mit KONISCH ABGESETZTEM SCHAFTTEIL
🇫🇷 Fraise carbure, 2 dents, hémisphérique pour usinage de rainure avec entrée conique
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- ▶ Improvement of tool life by applying new coating.
 - ▶ Application of tight tolerances for precision machining.
- ▶ Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
 - ▶ Enge Toleranzen für die Präzisionsbearbeitung



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°
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	-
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	-

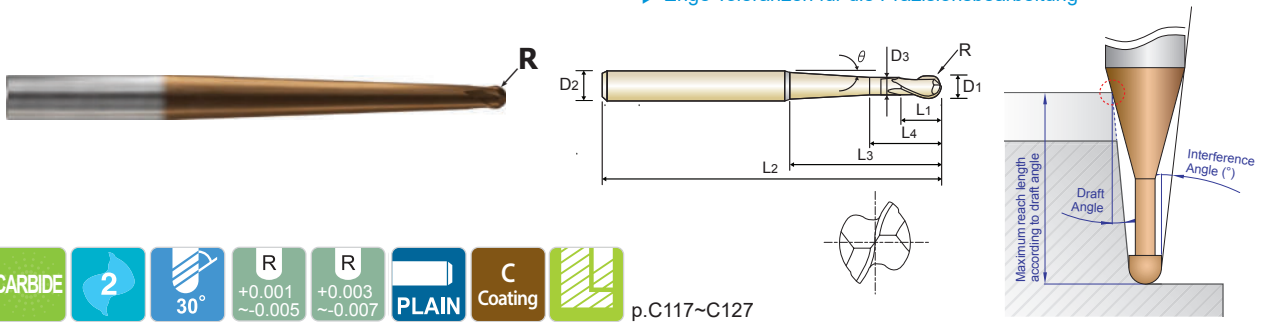
Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007	0~-0.012	* Shank Dia.>ø6 : h5

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			
Recommend					○			○	○		○	○												
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	
Recommend																		⊙	⊙	⊙	⊙	⊙	○	⊙

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



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°
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	-
HPI92899	R2.5	5.0	8	10	60	110	4.85	1°	13	1.42	32.09	61.03	-	-	-
HPI92701	R2.5	5.0	8	10	90	140	4.85	1°	13	0.97	32.09	-	-	-	-
HPI92702	R2.5	5.0	8	10	74	150	4.75	1.5°	13	1.20	25.41	48.31	-	-	-
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	6.7	3°	17	2.25	23.13	28.03	36.20	40.94	-
HPI92875	R3.5	7.0	10	14	45	95	6.7	1°	17	1.87	45.09	46.54	48.09	-	-
HPI92876	R3.5	7.0	10	14	60	110	6.7	1.5°	17	1.47	32.34	60.04	-	-	-
HPI92080	R4.0	8.0	10	14	35	95	7.7	3°	17	1.80	23.03	27.78	35.08	-	-
HPI92877	R4.0	8.0	10	14	50	110	7.7	1°	17	1.19	47.18	51.50	-	-	-
HPI92878	R4.0	8.0	10	14	50	110	7.7	1.5°	17	1.22	32.09	50.35	-	-	-

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	0~-0.012	* Shank Dia.:ø6 : h5

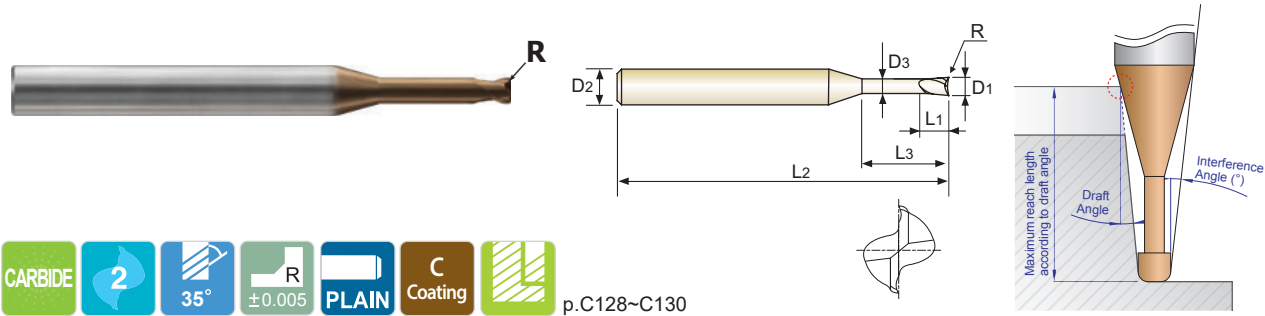
◎ : Excellent ○ : Good

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				
	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20			
VDI 3323																								
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			
Recommend					○			○	○		○	○												
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		
	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
VDI 3323																		38.1	38.2	39.1	39.2	39.3	42	41
HRC											15	30	25	38	34			45-49	50-55	56-60	61-65	66-70	40	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
Recommend																		◎	◎	◎	◎	◎	◎	◎

CARBIDE, 2 FLUTE CORNER RADIUS for RIB PROCESSING

 VOLLHARTMETALL, 2 SCHNEIDEN ECKENRADIUS für SCHMALE RIPPEN
 Fraise carbure, 2 dents, torique pour usinage de rainure
 2 TAGLIENTI, TORICA PER NERVATURE

- ▶ Improvement of tool life by applying new coating.
 - ▶ Application of tight tolerances for precision machining.
- ▶ Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
 - ▶ Enge Toleranzen für die Präzisionsbearbeitung



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	0.83
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

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

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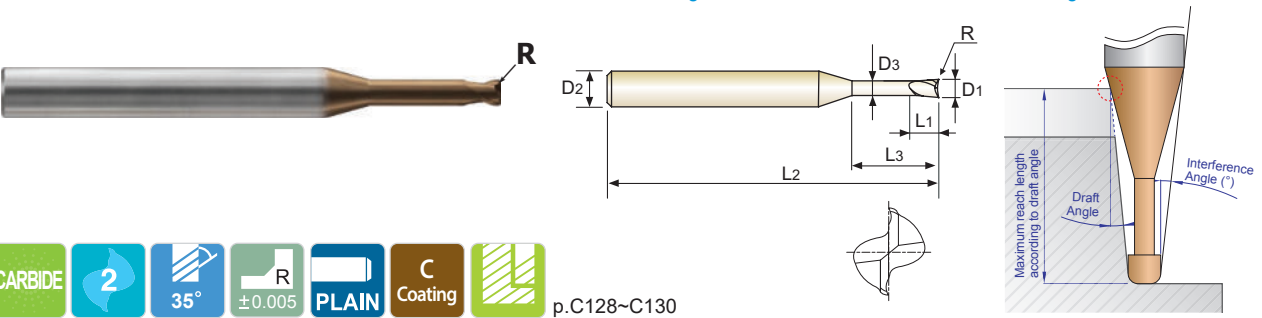
© : Excellent ○ : Good

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			
Recommend					○			○	○		○	○												
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	421-669	481-560	577-654	670-739	600	400	550
Recommend																		⊙	⊙	⊙	⊙	⊙	○	⊙

CARBIDE, 2 FLUTE CORNER RADIUS for RIB PROCESSING

 **VOLLHARTMETALL, 2 SCHNEIDEN ECKENRADIUS für SCHMALE RIPPEN**
 **Fraise carbure, 2 dents, torique pour usinage de rainure**
 **2 TAGLIENTI, TORICA PER NERVATURE**

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



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°
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
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

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

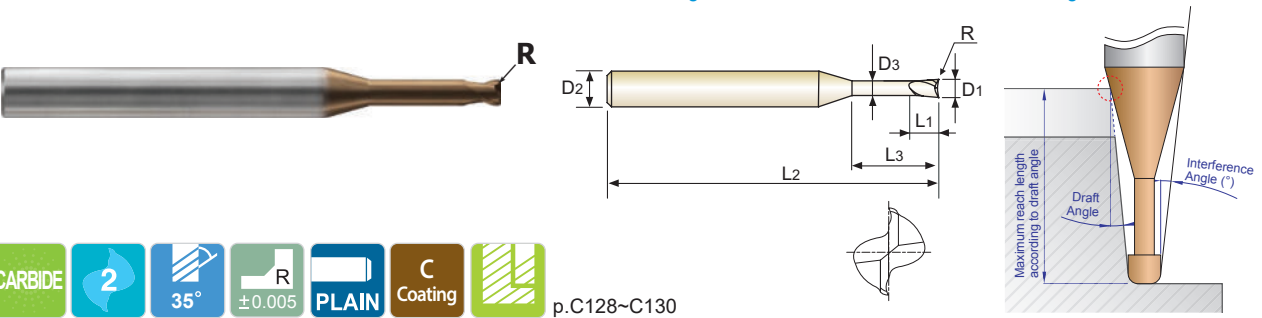
◎: Excellent ○: Good

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			
Recommend					○			○	○		○	○												
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
Recommend																		⊙	⊙	⊙	⊙	⊙	○	⊙

CARBIDE, 2 FLUTE CORNER RADIUS for RIB PROCESSING

 **VOLLHARTMETALL, 2 SCHNEIDEN ECKENRADIUS für SCHMALE RIPPEN**
 **Fraise carbure, 2 dents, torique pour usinage de rainure**
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- Application of tight tolerances for precision machining.



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				
									0.5°	1°	1.5°	2°	3°
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	10.0
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
HPI89821	R0.3	2.0	4	1.7	8	50	1.95	4.96	8.36	8.64	8.94	9.26	9.99
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

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

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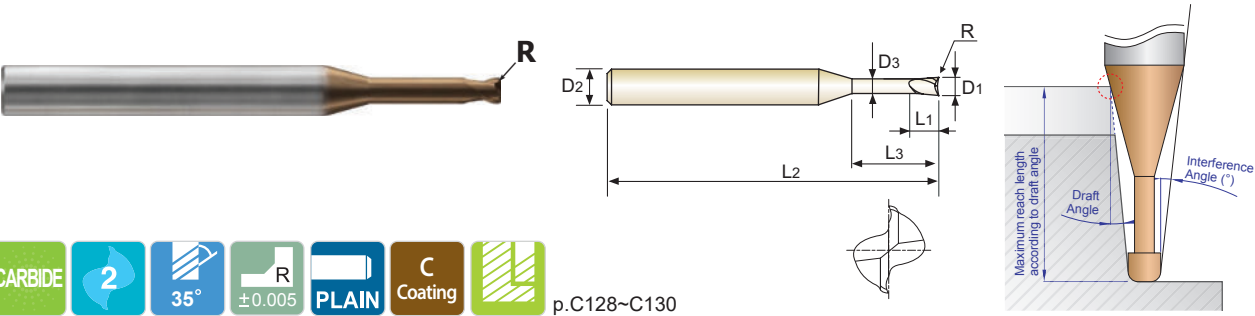
◎: Excellent ○: Good

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			
Recommend					○			○	○		○	○												
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
Recommend																		◎	◎	◎	◎	◎	◎	◎

CARBIDE, 2 FLUTE CORNER RADIUS for RIB PROCESSING

 **VOLLHARTMETALL, 2 SCHNEIDEN ECKENRADIUS für SCHMALE RIPPEN**
 **Fraise carbure, 2 dents, torique pour usinage de rainure**
 2 TAGLIENTI, TORICA PER NERVATURE

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



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°
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	-

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

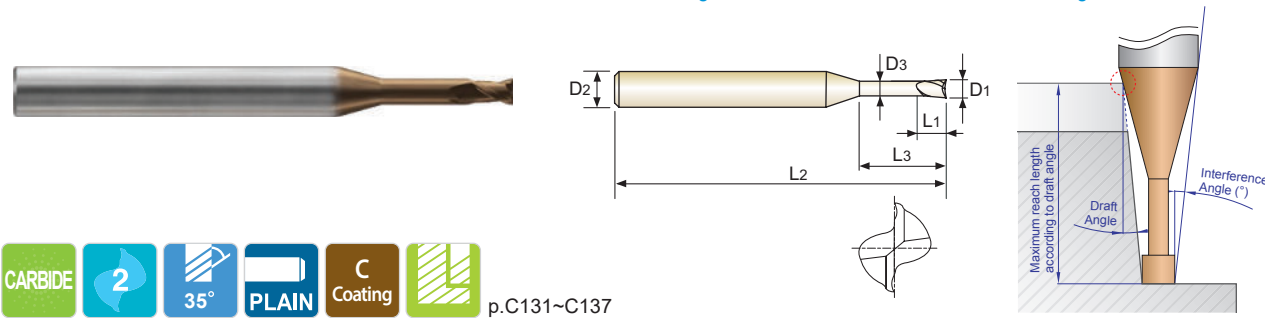
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◎ : Excellent ○ : Good																								
ISO	P												M			K								
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel			Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron				
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			
Recommend					○			○	○		○	○												
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	481-550	577-654	670-739	400	550	
Recommend																		◎	◎	◎	◎	◎	◎	◎

CARBIDE, 2 FLUTE for RIB PROCESSING

 **VOLLHARTMETALL, 2 SCHNEIDEN für SCHMALE RIPPEN**
 **Fraise carbure, 2 dents pour usinage de rainure**
 **2 TAGLIENTI, SCARICATA PER NERVATURE**

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



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°
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
HPI88007	0.7	4	0.55	2	45	0.65	11.31	2.25	2.38	2.52	2.67	3.05

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

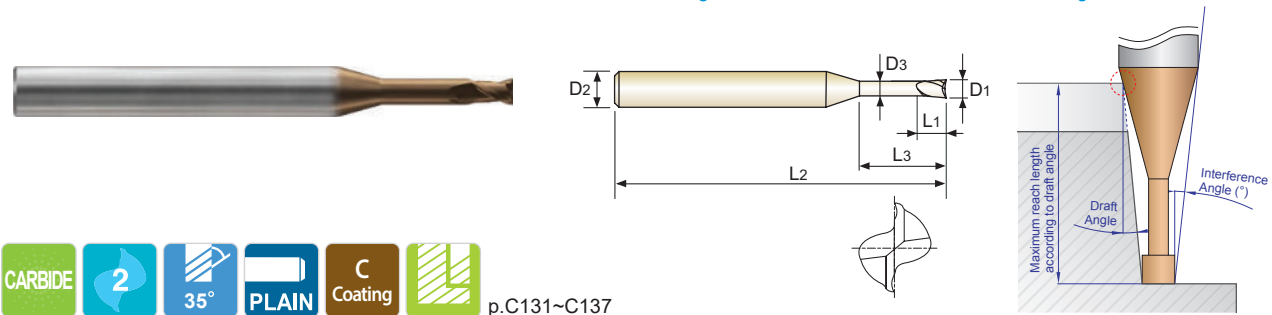
◎ : Excellent ○ : Good

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	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	15	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			
Recommend					○			○	○		○	○												
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
Recommend																		⊗	⊗	⊗	⊗	⊗	○	⊗

CARBIDE, 2 FLUTE for RIB PROCESSING

 **VOLLHARTMETALL, 2 SCHNEIDEN für SCHMALE RIPPEN**
 **Fraise carbure, 2 dents pour usinage de rainure**
 **2 TAGLIENTI, SCARICATA PER NERVATURE**

- Improvement of tool life by applying new coating.
 - Application of tight tolerances for precision machining.
- Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
 - Enge Toleranzen für die Präzisionsbearbeitung



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°
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
HPI88990	1.8	4	1.4	14	50	1.75	3.46	14.57	15.08	15.62	16.21	17.52

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
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			
Recommend					○			○	○		○	○												
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
Recommend																		⊙	⊙	⊙	⊙	⊙	○	⊙

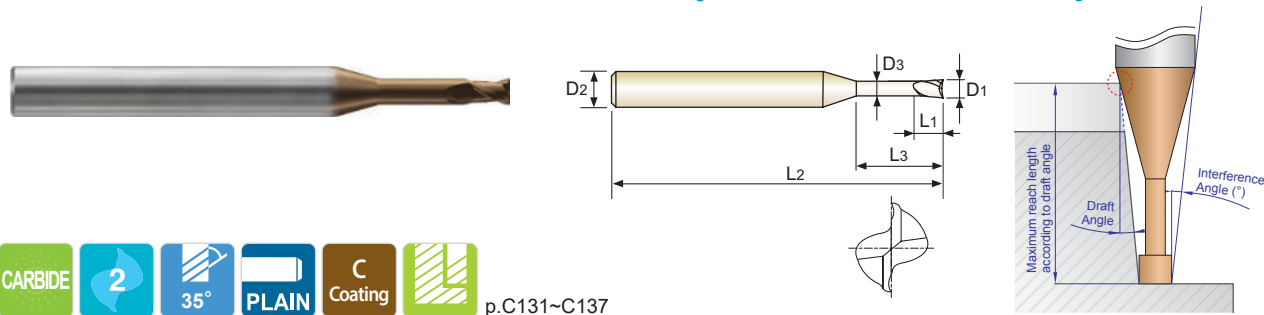


CARBIDE, 2 FLUTE for RIB PROCESSING

- VOLLHARTMETALL, 2 SCHNEIDEN für SCHMALE RIPPEN
- Fraise carbure, 2 dents pour usinage de rainure
- 2 TAGLIENTI, SCARICATA PER NERVATURE

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

- ▶ Verbesserung der Werkzeugstandzeit durch Aufbringen einer neuen Beschichtung
- ▶ Enge Toleranzen für die Präzisionsbearbeitung



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°
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
HPI88814	3.0	6	4.5	16	60	2.85	3.92	16.83	17.41	18.04	18.72	20.24

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Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
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	13	21			
HB	125	190	250	270	300	180	275	300	350	200	325	409	200	240	180	180	260	160	250	130	230			
Recommend					○			○	○		○	○												
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
Recommend											◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	○	◎

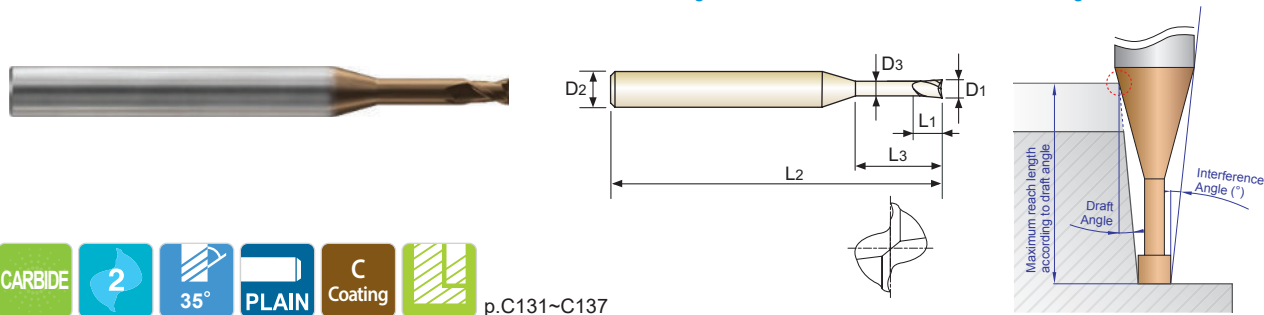


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Unit : mm

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°
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

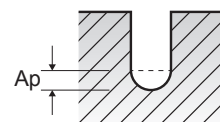
◎ : Excellent ○ : Good

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			
Recommend					○			○	○		○	○												
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
Recommend											◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	○	◎

RECOMMENDED CUTTING CONDITIONS EMPFOHLENE SCHNEIDPARAMETER

HPI91, HPI92 SERIES **2 FLUTE BALL NOSE FOR RIB PROCESSING**

ISO	VDI 3323	Material Description	Parameter	Diameter (Ø)																
				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	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
P	5	Non-alloy steel	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	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	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1239
	Ap	0.004	0.004	0.004	0.004	0.003	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	
	8-9	Low alloy steel	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	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	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1239
	Ap	0.004	0.004	0.004	0.004	0.003	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	
	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	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	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1239
	Ap	0.004	0.004	0.004	0.004	0.003	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	
	11.2		Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	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	0.013	
RPM			49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	44260	
FEED			1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1151	
Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.004		
H	38.1		Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	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	0.013
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	44260
			FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	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	0.004		
	38.2		Vc	29	29	29	29	26	26	26	26	23	23	9	41	41	41	41	41	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	0.012
			RPM	45900	45900	45900	45900	41310	41310	41310	41310	36720	36720	13770	43714	43714	43714	43714	43714	39343
			FEED	918	918	918	918	744	744	744	744	588	588	165	1137	1137	1137	1137	1137	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	0.004		
	39.1	Hardened steel	Vc	26	26	26	26	23	23	23	23	21	21	8	41	41	41	41	41	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	0.011
			RPM	40983	40983	40983	40983	36885	36885	36885	36885	32786	32786	12295	43714	43714	43714	43714	43714	39343
			FEED	820	820	820	820	664	664	664	664	525	525	148	1049	1049	1049	1049	1049	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		
	39.2		Vc	21	21	21	21	19	19	19	19	16	16	6	36	36	36	36	36	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	0.011	
RPM			32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	9836	38250	38250	38250	38250	38250	34425	
FEED			656	656	656	656	531	531	531	531	420	420	118	918	918	918	918	918	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			
39.3		Vc	21	21	21	21	19	19	19	19	16	16	6	31	31	31	31	31	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	0.010	
		RPM	32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	9836	32786	32786	32786	32786	32786	29507	
		FEED	590	590	590	590	472	472	472	472	367	367	98	721	721	721	721	721	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	0.003			
40	Chilled Cast Iron	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	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	0.013	
		RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	44260	
		FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1151	
Ap	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.004		
41	Hardened Cast Iron	Vc	29	29	29	29	26	26	26	26	23	23	9	41	41	41	41	41	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	0.012	
		RPM	45900	45900	45900	45900	41310	41310	41310	41310	36720	36720	13770	43714	43714	43714	43714	43714	39343	
		FEED	918	918	918	918	744	744	744	744	588	588	165	1137	1137	1137	1137	1137	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	0.004			





RECOMMENDED CUTTING CONDITIONS
EMPFOHLENE SCHNEIDPARAMETER

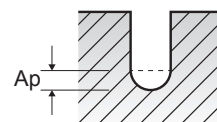
HPI91, HPI92 SERIES 2 FLUTE BALL NOSE for RIB PROCESSING

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																							
			0.3	0.3	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	0.4	0.5		
			2	2.25	2.5	3	3.5	4	5	7	10	15	20	25	30	35	40	45	50	54	60	63	70	80	100	
P	5	Vc	42	42	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82		
		fz	0.014	0.014	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		
		RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458		
		FEED	1239	1239	1239	1239	944	944	649	266	2025	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518		
		Ap	0.005	0.005	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	0.005	0.004	0.010		
	8-9	Vc	42	42	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82		
		fz	0.014	0.014	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		
		RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458		
		FEED	1239	1239	1239	1239	944	944	649	266	2025	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518		
		Ap	0.005	0.005	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	0.005	0.004	0.010		
	11.1	Vc	42	42	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82		
		fz	0.014	0.014	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		
		RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458		
		FEED	1239	1239	1239	1239	944	944	649	266	2025	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518		
		Ap	0.005	0.005	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	0.005	0.004	0.010		
	11.2	Vc	42	42	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82		
		fz	0.013	0.013	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		
		RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458		
		FEED	1151	1151	1151	1151	866	866	590	236	1811	1811	1811	1811	1811	1438	1438	1438	1438	1193	1193	1193	767	2203		
		Ap	0.004	0.004	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	0.004	0.003	0.009		
H	38.1	Vc	42	42	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82		
		fz	0.013	0.013	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		
		RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458		
		FEED	1151	1151	1151	1151	866	866	590	236	1811	1811	1811	1811	1811	1438	1438	1438	1438	1193	1193	1193	767	2203		
		Ap	0.004	0.004	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	0.004	0.003	0.009		
	38.2	Vc	37	37	37	37	33	33	25	12	57	57	57	57	57	51	51	51	51	45	45	45	34	72		
		fz	0.012	0.012	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		
		RPM	39343	39343	39343	39343	34971	34971	26228	13114	45081	45081	45081	45081	45081	40573	40573	40573	40573	36065	36065	36065	27049	45900		
		FEED	944	944	944	944	699	699	472	210	1533	1533	1533	1533	1533	1217	1217	1217	1217	1010	1010	1010	649	1928		
		Ap	0.004	0.004	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	0.004	0.003	0.009		
	39.1	Vc	37	37	37	37	33	33	25	12	52	52	52	52	52	46	46	46	46	41	41	41	31	67		
		fz	0.011	0.011	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		
		RPM	39343	39343	39343	39343	34971	34971	26228	13114	40983	40983	40983	40983	40983	36885	36885	36885	36885	32786	32786	32786	24590	42621		
		FEED	866	866	866	866	699	699	420	184	1229	1229	1229	1229	1229	1033	1033	1033	1033	787	787	787	541	1620		
		Ap	0.004	0.004	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		
	39.2	Vc	32	32	32	32	29	29	22	11	46	46	46	46	46	42	42	42	42	37	37	37	28	57		
		fz	0.011	0.011	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		
		RPM	34425	34425	34425	34425	30600	30600	22950	11475	36884	36884	36884	36884	36884	33196	33196	33196	33196	29507	29507	29507	22130	36064		
		FEED	757	757	757	757	612	612	367	161	1107	1107	1107	1107	1107	929	929	929	929	708	708	708	487	1370		
		Ap	0.004	0.004	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		
	39.3	Vc	28	28	28	28	25	25	19	9	41	41	41	41	41	37	37	37	37	33	33	33	25	52		
		fz	0.010	0.010	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		
		RPM	29507	29507	29507	29507	26229	26229	19672	9836	32786	32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	26229	19672	32786		
		FEED	590	590	590	590	472	472	315	138	918	918	918	918	918	767	767	767	767	577	577	577	393	1115		
		Ap	0.003	0.003	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	0.003	0.003	0.007		
	40	Vc	42	42	42	42	37	37	28	14	67	67	67	67	67	60	60	60	60	54	54	54	40	82		
fz		0.013	0.013	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			
RPM		44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458			
FEED		1151	1151	1151	1151	866	866	590	236	1811	1811	1811	1811	1811	1438	1438	1438	1438	1193	1193	1193	767	2203			
Ap		0.004	0.004	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	0.004	0.003	0.009			
41	Vc	37	37	37	37	33	33	25	12	57	57	57	57	57	51	51	51	51	45	45	45	34	72			
	fz	0.012	0.012	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			
	RPM	39343	39343	39343	39343	34971	34971	26228	13114	45081	45081	45081	45081	45081	40573	40573	40573	40573	36065	36065	36065	27049	45900			
	FEED	944	944	944	944	699	699	472	210	1533	1533	1533	1533	1533	1217	1217	1217	1217	1010	1010	1010	649	1928			
	Ap	0.004	0.004	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	0.004	0.003	0.009			



HPI91, HPI92 SERIES **2 FLUTE BALL NOSE for RIB PROCESSING**

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																					
			1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	2	2	2	2	2	2	2	2	2	2	2	2	
			18	20	22	25	30	8	12	16	20	3	4	6	8	10	12	13	14	16	18	20	22	
P	5	Vc	194	194	194	145	145	258	232	232	206	319	319	319	319	319	287	287	287	287	287	287	255	
		fz	0.043	0.043	0.043	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	
		RPM	41092	41092	41092	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654	
		FEED	3534	3534	3534	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	
	Ap	0.021	0.020	0.020	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.028	0.028	0.028		
	8-9	Vc	194	194	194	145	145	258	232	232	206	319	319	319	319	319	287	287	287	287	287	287	255	
		fz	0.043	0.043	0.043	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	
		RPM	41092	41092	41092	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654	
		FEED	3534	3534	3534	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	
	Ap	0.021	0.020	0.020	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.028	0.028	0.028		
	11.1	Vc	194	194	194	145	145	258	232	232	206	319	319	319	319	319	287	287	287	287	287	287	255	
		fz	0.043	0.043	0.043	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	
		RPM	41092	41092	41092	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654	
		FEED	3534	3534	3534	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	
	Ap	0.021	0.020	0.020	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.028	0.028	0.028		
	11.2	Vc	185	185	185	139	139	247	222	222	198	309	309	309	309	309	278	278	278	278	278	278	247	
fz		0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040		
RPM		39342	39342	39342	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342		
FEED		2990	2990	2990	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147		
Ap	0.018	0.017	0.017	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024			
H	38.1	Vc	185	185	185	139	139	247	222	222	198	309	309	309	309	309	278	278	278	278	278	278	247	
		fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.040		
		RPM	39342	39342	39342	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342	
		FEED	2990	2990	2990	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147	
	Ap	0.018	0.017	0.017	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024		
	38.2	Vc	169	169	169	127	127	225	202	202	180	258	258	258	258	258	232	232	232	232	232	232	206	
		fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.040		
		RPM	35846	35846	35846	26884	26884	44671	40204	40204	35737	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	36885	32786	
		FEED	2724	2724	2724	1774	1774	4288	3458	3458	2716	4098	4098	4098	4098	4098	3320	3320	3320	3320	3320	3320	2623	
	Ap	0.018	0.017	0.017	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024		
	39.1	Vc	144	144	144	108	108	192	172	172	153	227	227	227	227	227	204	204	204	204	204	204	181	
		fz	0.034	0.034	0.034	0.029	0.029	0.043	0.039	0.039	0.034	0.045	0.045	0.045	0.045	0.045	0.041	0.041	0.041	0.041	0.041	0.041	0.036	
		RPM	30600	30600	30600	22950	22950	38114	34303	34303	30491	36064	36064	36064	36064	36064	32458	32458	32458	32458	32458	32458	28851	
		FEED	2081	2081	2081	1331	1331	2782	2676	2676	2073	3246	3246	3246	3246	3246	2662	2662	2662	2662	2662	2662	2077	
	Ap	0.017	0.016	0.016	0.012	0.012	0.023	0.020	0.018	0.018	0.032	0.032	0.032	0.029	0.029	0.026	0.026	0.026	0.026	0.022	0.022	0.022		
	39.2	Vc	128	128	128	96	96	170	153	153	136	206	206	206	206	206	185	185	185	185	185	185	165	
fz		0.033	0.033	0.033	0.029	0.029	0.043	0.039	0.039	0.034	0.044	0.044	0.044	0.044	0.044	0.040	0.040	0.040	0.040	0.040	0.040	0.035		
RPM		27103	27103	27103	20327	20327	33811	30430	30430	27049	32786	32786	32786	32786	32786	29507	29507	29507	29507	29507	29507	26239		
FEED		1789	1789	1789	1179	1179	2098	2374	2374	1839	2885	2885	2885	2885	2885	2361	2361	2361	2361	2361	2361	1832		
Ap	0.017	0.016	0.016	0.012	0.012	0.023	0.020	0.018	0.018	0.032	0.032	0.032	0.029	0.029	0.026	0.026	0.026	0.026	0.022	0.022	0.022			
39.3	Vc	115	115	115	87	87	153	138	138	123	185	185	185	185	185	167	167	167	167	167	167	148		
	fz	0.031	0.031	0.031	0.027	0.027	0.039	0.035	0.035	0.031	0.040	0.040	0.040	0.040	0.040	0.036	0.036	0.036	0.036	0.036	0.036	0.032		
	RPM	24480	24480	24480	18360	18360	30532	27479	27479	24426	29507	29507	29507	29507	29507	26556	26556	26556	26556	26556	26556	23606		
	FEED	1518	1518	1518	991	991	2381	1924	1924	1514	2361	2361	2361	2361	2361	1912	1912	1912	1912	1912	1912	1511		
Ap	0.014	0.013	0.013	0.010	0.010	0.019	0.017	0.015	0.015	0.026	0.026	0.026	0.023	0.023	0.021	0.021	0.021	0.021	0.018	0.018	0.018			
40	Vc	185	185	185	139	139	247	222	222	198	309	309	309	309	309	278	278	278	278	278	278	247		
	fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.040			
	RPM	39342	39342	39342	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342		
	FEED	2990	2990	2990	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147		
Ap	0.018	0.017	0.017	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024			
41	Vc	169	169	169	127	127	225	202	202	180	258	258	258	258	258	232	232	232	232	232	232	206		
	fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.040			
	RPM	35846	35846	35846	26884	26884	44671	40204	40204	35737	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	36885	32786		
	FEED	2724	2724	2724	1774	1774	4288	3458	3458	2716	4098	4098	4098	4098	4098	3320	3320	3320	3320	3320	3320	2623		
Ap	0.018	0.017	0.017	0.013	0.013	0.024	0.022	0.019	0.019	0.034	0.034	0.034	0.031	0.031	0.027	0.027	0.027	0.027	0.024	0.024	0.024			

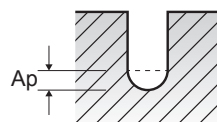




2 FLUTE BALL NOSE for RIB PROCESSING

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

ISO	VDI 3323	Parameter	Diameter (Ø)																				
			3	3	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4	4		
			LBS	30	35	40	50	15	20	25	30	35	40	45	8	10	12	14	15	20	25	30	35
P	5	Vc	287	255	255	192	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292
		fz	0.082	0.073	0.073	0.064	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
		RPM	30491	27103	27103	20327	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237
		FEED	5001	3957	3957	2602	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019
	Ap	0.042	0.042	0.039	0.030	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	
	8-9	Vc	287	255	255	192	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292
		fz	0.082	0.073	0.073	0.064	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
		RPM	30491	27103	27103	20327	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237
		FEED	5001	3957	3957	2602	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019
	11.1	Vc	287	255	255	192	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292
		fz	0.082	0.073	0.073	0.064	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
		RPM	30491	27103	27103	20327	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237
		FEED	5001	3957	3957	2602	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019
	11.2	Vc	287	247	247	185	309	278	278	278	278	247	247	309	309	309	309	309	309	278	278	278	278
		fz	0.075	0.066	0.066	0.058	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
		RPM	29507	26229	26229	19672	28068	25261	25261	25261	25261	22454	22454	24589	24589	24589	24589	24589	24589	22130	22130	22130	22130
FEED		4426	3462	3462	2282	5445	4395	4395	4395	4395	3503	3503	5459	5459	5459	5459	5459	5459	4426	4426	4426	4426	
H	38.1	Vc	278	247	247	185	309	278	278	278	278	247	247	309	309	309	309	309	309	278	278	278	278
		fz																					



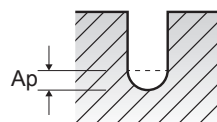


RECOMMENDED CUTTING CONDITIONS EMPFOHLENE SCHNEIDPARAMETER

HPI91, HPI92 SERIES 2 FLUTE BALL NOSE for RIB PROCESSING

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

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																		
			8	8	8	8	8	8	8	8	8	10	10	10	10	10	10	12	12	12	12
			35	50	55	60	70	80	98	120	35	55	60	65	75	86	120	60	80	106	120
P	5	Vc	288	260	260	260	260	260	231	231	299	269	269	269	269	269	239	268	241	241	241
		fz	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.179	0.179	0.179	0.179	0.179	0.159	0.212	0.191	0.191	0.191
		RPM	11475	10328	10328	10328	10328	10328	9180	9180	9508	8557	8557	8557	8557	8557	7606	7104	6394	6394	6394
		FEED	4338	3512	3512	3512	3512	3512	2772	2772	3784	3063	3063	3063	3063	3063	2419	3012	2443	2443	2443
		Ap	0.144	0.128	0.128	0.128	0.112	0.112	0.112	0.104	0.180	0.160	0.160	0.160	0.160	0.160	0.140	0.216	0.192	0.168	0.168
	8-9	Vc	288	260	260	260	260	260	231	231	299	269	269	269	269	269	239	268	241	241	241
		fz	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.179	0.179	0.179	0.179	0.179	0.159	0.212	0.191	0.191	0.191
		RPM	11475	10328	10328	10328	10328	10328	9180	9180	9508	8557	8557	8557	8557	8557	7606	7104	6394	6394	6394
		FEED	4338	3512	3512	3512	3512	3512	2772	2772	3784	3063	3063	3063	3063	3063	2419	3012	2443	2443	2443
		Ap	0.144	0.128	0.128	0.128	0.112	0.112	0.112	0.104	0.180	0.160	0.160	0.160	0.160	0.160	0.140	0.216	0.192	0.168	0.168
	11.1	Vc	288	260	260	260	260	260	231	231	299	269	269	269	269	269	239	268	241	241	241
		fz	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.179	0.179	0.179	0.179	0.179	0.159	0.212	0.191	0.191	0.191
		RPM	11475	10328	10328	10328	10328	10328	9180	9180	9508	8557	8557	8557	8557	8557	7606	7104	6394	6394	6394
		FEED	4338	3512	3512	3512	3512	3512	2772	2772	3784	3063	3063	3063	3063	3063	2419	3012	2443	2443	2443
		Ap	0.144	0.128	0.128	0.128	0.112	0.112	0.112	0.104	0.180	0.160	0.160	0.160	0.160	0.160	0.140	0.216	0.192	0.168	0.168
	11.2	Vc	278	250	250	250	250	250	222	222	288	260	260	260	260	260	231	257	232	232	232
		fz	0.164	0.148	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.157	0.157	0.157	0.157	0.157	0.139	0.187	0.168	0.168	0.168
		RPM	11065	9959	9959	9959	9959	9959	8852	8852	9180	8262	8262	8262	8262	8262	7344	6830	6147	6147	6147
		FEED	3629	2948	2948	2948	2948	2948	2319	2319	3195	2594	2594	2594	2594	2594	2042	2554	2065	2065	2065
		Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143
H	38.1	Vc	278	250	250	250	250	250	222	222	288	260	260	260	260	260	231	257	232	232	232
		fz	0.164	0.148	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.157	0.157	0.157	0.157	0.157	0.139	0.187	0.168	0.168	0.168
		RPM	11065	9959	9959	9959	9959	9959	8852	8852	9180	8262	8262	8262	8262	8262	7344	6830	6147	6147	6147
		FEED	3629	2948	2948	2948	2948	2948	2319	2319	3195	2594	2594	2594	2594	2594	2042	2554	2065	2065	2065
		Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143
	38.2	Vc	232	209	209	209	209	209	185	185	242	218	218	218	218	218	194	216	195	195	195
		fz	0.150	0.135	0.135	0.135	0.135	0.135	0.120	0.120	0.160	0.144	0.144	0.144	0.144	0.144	0.128	0.170	0.153	0.153	0.153
		RPM	9221	8299	8299	8299	8299	8299	7377	7377	7704	6934	6934	6934	6934	6934	6163	5737	5163	5163	5163
		FEED	2766	2241	2241	2241	2241	2241	1770	1770	2465	1997	1997	1997	1997	1997	1578	1951	1580	1580	1580
		Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143
	39.1	Vc	206	185	185	185	185	185	165	165	211	190	190	190	190	190	169	196	176	176	176
		fz	0.134	0.121	0.121	0.121	0.121	0.121	0.107	0.107	0.144	0.130	0.130	0.130	0.130	0.130	0.115	0.155	0.140	0.140	0.140
		RPM	8197	7377	7377	7377	7377	7377	6558	6558	6721	6049	6049	6049	6049	6049	5377	5191	4672	4672	4672
		FEED	2197	1785	1785	1785	1785	1785	1403	1403	1936	1573	1573	1573	1573	1573	1237	1609	1308	1308	1308
		Ap	0.115	0.102	0.102	0.102	0.090	0.090	0.090	0.083	0.144	0.128	0.128	0.128	0.128	0.128	0.112	0.112	0.173	0.154	0.134
	39.2	Vc	180	162	162	162	162	162	144	144	185	167	167	167	167	167	148	170	153	153	153
		fz	0.132	0.119	0.119	0.119	0.119	0.119	0.106	0.106	0.142	0.128	0.128	0.128	0.128	0.128	0.114	0.142	0.128	0.128	0.128
		RPM	7172	6455	6455	6455	6455	6455	5738	5738	5902	5312	5312	5312	5312	5312	4722	4508	4057	4057	4057
		FEED	1893	1536	1536	1536	1536	1536	1216	1216	1676	1360	1360	1360	1360	1360	1077	1280	1039	1039	1039
		Ap	0.115	0.102	0.102	0.102	0.090	0.090	0.090	0.083	0.144	0.128	0.128	0.128	0.128	0.128	0.112	0.112	0.173	0.154	0.134
39.3	Vc	170	153	153	153	153	153	136	136	170	153	153	153	153	153	136	154	139	139	139	
	fz	0.119	0.107	0.107	0.107	0.107	0.107	0.095	0.095	0.130	0.117	0.117	0.117	0.117	0.117	0.104	0.131	0.118	0.118	0.118	
	RPM	6762	6086	6086	6086	6086	6086	5410	5410	5410	4869	4869	4869	4869	4869	4328	4098	3688	3688	3688	
	FEED	1609	1302	1302	1302	1302	1302	1028	1028	1407	1139	1139	1139	1139	1139	900	1074	870	870	870	
	Ap	0.094	0.083	0.083	0.083	0.073	0.073	0.073	0.068	0.117	0.104	0.104	0.104	0.104	0.104	0.091	0.091	0.140	0.125	0.109	0.109
40	Vc	278	250	250	250	250	250	222	222	288	260	260	260	260	260	231	257	232	232	232	
	fz	0.164	0.148	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.157	0.157	0.157	0.157	0.157	0.139	0.187	0.168	0.168	0.168	
	RPM	11065	9959	9959	9959	9959	9959	8852	8852	9180	8262	8262	8262	8262	8262	7344	6830	6147	6147	6147	
	FEED	3629	2948	2948	2948	2948	2948	2319	2319	3195	2594	2594	2594	2594	2594	2042	2554	2065	2065	2065	
	Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143	0.143
41	Vc	232	209	209	209	209	209	185	185	242	218	218	218	218	218	194	216	195	195	195	
	fz	0.150	0.135	0.135	0.135	0.135	0.135	0.120	0.120	0.160	0.144	0.144	0.144	0.144	0.144	0.128	0.170	0.153	0.153	0.153	
	RPM	9221	8299	8299	8299	8299	8299	7377	7377	7704	6934	6934	6934	6934	6934	6163	5737	5163	5163	5163	
	FEED	2766	2241	2241	2241	2241	2241	1770	1770	2465	1997	1997	1997	1997	1997	1578	1951	1580	1580	1580	
	Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143	0.143





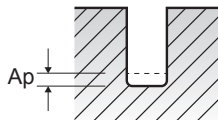
RECOMMENDED CUTTING CONDITIONS
EMPFOHLENE SCHNEIDPARAMETER

HPI89 SERIES

2 FLUTE CORNER RADIUS for RIB PROCESSING

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

ISO	VDI 3323	Material Description	Slotting	Parameter	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	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	2	3	
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	74	
				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	0.004	
				RPM	49178	49178	44260	44260	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949	52458	52458	47212	
				FEED	98	98	89	89	197	197	177	177	177	213	213	213	192	192	192	420	420	378	
				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	0.023	0.020	
	8~9	Low alloy steel	1.0D	Vc	31	31	28	28	46	46	42	42	42	67	67	67	60	60	60	82	82	74	
				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	0.004	0.004	0.004		
				RPM	49178	49178	44260	44260	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949	52458	52458	47212	
				FEED	98	98	89	89	197	197	177	177	177	213	213	213	192	192	192	420	420	378	
				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	0.023	0.020	
	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	74	
				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	0.004	0.004	0.004		
				RPM	49178	49178	44260	44260	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949	52458	52458	47212	
				FEED	98	98	89	89	197	197	177	177	177	213	213	213	192	192	192	420	420	378	
				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	0.023	0.020	
	11.2		1.0D	Vc	31	31	28	28	41	41	37	37	37	57	57	57	51	51	51	72	72	65	
				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	0.003	0.003	0.003		
				RPM	49178	49178	44260	44260	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573	45900	45900	41310	
				FEED	98	98	89	89	175	175	157	157	157	180	180	180	162	162	162	275	275	248	
				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	0.019	0.017	
H	38.1		1.0D	Vc	31	31	28	28	41	41	37	37	37	57	57	57	51	51	51	72	72	65	
				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	0.003	0.003	0.003		
				RPM	49178	49178	44260	44260	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573	45900	45900	41310	
				FEED	98	98	89	89	175	175	157	157	157	180	180	180	162	162	162	275	275	248	
				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	0.019	0.017	
	38.2		1.0D	Vc	26	26	23	23	41	41	37	37	37	52	52	52	46	46	46	67	67	60	
				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	0.003	0.003	0.003		
				RPM	40983	40983	36885	36885	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885	36885	42621	42621	38359	
				FEED	82	82	74	74	87	87	79	79	79	164	164	164	148	148	148	256	256	230	
				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	0.019	0.017	
	39.1	Hardened steel	1.0D	Vc	21	21	19	19	31	31	28	28	28	41	41	41	37	37	37	52	52	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	0.001	0.001	0.001	0.002	0.002	0.002	
				RPM	32786	32786	29507	29507	32786	32786	29507	29507	29507	32786	32786	32786	29507	29507	29507	32786	32786	29507	
				FEED	66	66	59	59	66	66	59	59	59	66	66	66	59	59	59	131	131	118	
				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	0.018	0.016	
	39.2		1.0D	Vc	21	21	19	19	26	26	23	23	23	31	31	31	28	28	28	41	41	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	0.002	0.002	0.002	
				RPM	32786	32786	29507	29507	27322	27322	24590	24590	24590	24589	24589	24589	22130	22130	22130	26229	26229	23606	
				FEED	66	66	59	59	55	55	49	49	49	49	49	44	44	44	105	105	94		
				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	0.018	0.016	
	39.3		1.0D	Vc	21	21	19	19	21	21	19	19	19	26	26	26	23	23	23	31	31	28	
				fz	0.009	0.009	0.008	0.008	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	0.001	
				RPM	32786	32786	29507	29507	21858	21858	19672	19672	19672	20491	20491	20491	18442	18442	18442	19672	19672	17705	
				FEED	590	590	472	472	44	44	39	39	39	41	41	41	37	37	37	79	79	35	
				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	0.015	0.013	
	40	Chilled Cast Iron	1.0D	Vc	31	31	28	28	41	41	37	37	37	57	57	57	51	51	51	72	72	65	
				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	0.003	0.003	0.003		
				RPM	49178	49178	44260	44260	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573	45900	45900	41310	
				FEED	98	98	89	89	175	175	157	157	157	180	180	180	162	162	162	275	275	248	
				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	0.019	0.017	
	41	Hardened Cast Iron	1.0D	Vc	26	26	23	23	41	41	37	37	37	52	52	52	46	46	46	67	67	60	
				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	0.003	0.003	0.003		
				RPM	40983	40983	36885	36885	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885	36885	42621	42621	38359	
				FEED	82	82	74	74	87	87	79	79	79	164	164	164	148	148	148	256	256	230	
				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	0.019	0.017	



▶ NEXT PAGE



RECOMMENDED CUTTING CONDITIONS
EMPFOHLENE SCHNEIDPARAMETER

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

HPI89 SERIES 2 FLUTE CORNER RADIUS for RIB PROCESSING

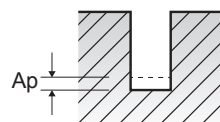
ISO	VDI 3323	Parameter LBS	Diameter (Ø)																					
			1	1	1	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2	3	3	3	3	3	3
			12	16	20	4	8	12	15	20	6	8	12	16	20	25	30	8	12	16	20	30	35	
P	5	Vc	124	93	93	196	176	176	176	157	216	216	195	195	195	173	173	211	211	190	190	190	169	
		fz	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.019	0.019	0.017	0.017	0.017	0.015	
		RPM	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983	30983	30983	27541	27541	22404	22404	20164	20164	20164	17923	
		FEED	629	413	413	915	748	748	748	599	895	895	744	744	744	551	551	851	851	686	686	686	538	
		Ap	0.035	0.030	0.025	0.075	0.060	0.060	0.053	0.045	0.100	0.090	0.080	0.080	0.070	0.070	0.060	0.150	0.135	0.120	0.120	0.105	0.105	
	8~9	Vc	124	93	93	196	176	176	176	157	216	216	195	195	195	173	173	211	211	190	190	190	169	
		fz	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.019	0.019	0.017	0.017	0.017	0.015	
		RPM	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983	30983	30983	27541	27541	22404	22404	20164	20164	20164	17923	
		FEED	629	413	413	915	748	748	748	599	895	895	744	744	744	551	551	851	851	686	686	686	538	
		Ap	0.035	0.030	0.025	0.075	0.060	0.060	0.053	0.045	0.100	0.090	0.080	0.080	0.070	0.070	0.060	0.150	0.135	0.120	0.120	0.105	0.105	
	11.1	Vc	124	93	93	196	176	176	176	157	216	216	195	195	195	173	173	211	211	190	190	190	169	
		fz	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.019	0.019	0.017	0.017	0.017	0.015	
		RPM	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983	30983	30983	27541	27541	22404	22404	20164	20164	20164	17923	
		FEED	629	413	413	915	748	748	748	599	895	895	744	744	744	551	551	851	851	686	686	686	538	
		Ap	0.035	0.030	0.025	0.075	0.060	0.060	0.053	0.045	0.100	0.090	0.080	0.080	0.070	0.070	0.060	0.150	0.135	0.120	0.120	0.105	0.105	
	11.2	Vc	99	74	74	154	139	139	139	123	170	170	153	153	153	136	136	170	170	153	153	153	136	
		fz	0.006	0.006	0.006	0.010	0.009	0.009	0.009	0.008	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.020	0.020	0.018	0.018	0.018	0.016	
		RPM	31474	23606	23606	32754	29479	29479	29479	26203	27049	27049	24344	24344	24344	21639	21639	18032	18032	16229	16229	16229	14426	
		FEED	378	283	283	655	531	531	531	419	703	703	584	584	584	433	433	721	721	584	584	584	462	
		Ap	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068	0.068	0.060	0.060	0.051	0.128	0.115	0.102	0.102	0.089	0.089	
H	38.1	Vc	99	74	74	154	139	139	139	123	170	170	153	153	153	136	136	170	170	153	153	153	136	
		fz	0.006	0.006	0.006	0.010	0.009	0.009	0.009	0.008	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.020	0.020	0.018	0.018	0.018	0.016	
		RPM	31474	23606	23606	32754	29479	29479	29479	26203	27049	27049	24344	24344	24344	21639	21639	18032	18032	16229	16229	16229	14426	
		FEED	378	283	283	655	531	531	531	419	703	703	584	584	584	433	433	721	721	584	584	584	462	
		Ap	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068	0.068	0.060	0.060	0.051	0.128	0.115	0.102	0.102	0.089	0.089	
	38.2	Vc	66	49	49	103	93	93	93	83	113	113	102	102	102	91	91	113	113	102	102	102	91	
		fz	0.006	0.005	0.005	0.009	0.008	0.008	0.008	0.007	0.012	0.012	0.011	0.011	0.011	0.010	0.010	0.018	0.018	0.016	0.016	0.016	0.014	
		RPM	20983	15737	15737	21939	19745	19745	19745	17551	18032	18032	16229	16229	16229	14426	14426	12021	12021	10819	10819	10819	9617	
		FEED	252	157	157	395	316	316	316	246	433	433	357	357	357	289	289	433	433	346	346	346	269	
		Ap	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068	0.068	0.060	0.060	0.051	0.128	0.115	0.102	0.102	0.089	0.089	
	39.1	Vc	54	40	40	83	74	74	74	66	93	93	83	83	83	74	74	93	93	83	83	83	74	
		fz	0.004	0.004	0.004	0.007	0.006	0.006	0.006	0.005	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.014	0.014	0.013	0.013	0.013	0.011	
		RPM	17049	12787	12787	17510	15759	15759	15759	14008	14754	14754	13279	13279	13279	11803	11803	9835	9835	8852	8852	8852	7868	
		FEED	136	102	102	245	189	189	189	140	266	266	212	212	212	165	165	275	275	230	230	230	173	
		Ap	0.028	0.024	0.020	0.060	0.048	0.048	0.042	0.036	0.080	0.072	0.064	0.064	0.056	0.056	0.048	0.120	0.108	0.096	0.096	0.084	0.084	
	39.2	Vc	41	31	31	62	56	56	56	50	72	72	65	65	65	58	58	72	72	65	65	65	58	
		fz	0.003	0.003	0.003	0.006	0.005	0.005	0.005	0.004	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.011	0.011	0.010	0.010	0.010	0.009	
		RPM	13114	9835	9835	13184	11866	11866	11866	10547	11475	11475	10328	10328	10328	9180	9180	7650	7650	6885	6885	6885	6120	
		FEED	79	59	59	158	119	119	119	84	161	161	124	124	124	110	110	168	168	138	138	138	110	
		Ap	0.028	0.024	0.020	0.060	0.048	0.048	0.042	0.036	0.080	0.072	0.064	0.064	0.056	0.056	0.048	0.120	0.108	0.096	0.096	0.084	0.084	
	39.3	Vc	33	25	25	52	47	47	47	42	62	62	56	56	56	49	49	62	62	56	56	56	49	
		fz	0.003	0.002	0.002	0.005	0.004	0.004	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.009	0.009	0.008	0.008	0.008	0.007	
		RPM	10491	7868	7868	11021	9919	9919	9919	8817	9835	9835	8852	8852	8852	7868	7868	6557	6557	5901	5901	5901	5246	
		FEED	63	31	31	110	79	79	79	71	118	118	89	89	89	79	79	118	118	94	94	94	73	
		Ap	0.023	0.020	0.016	0.049	0.039	0.039	0.034	0.029	0.065	0.059	0.052	0.052	0.046	0.046	0.039	0.098	0.088	0.078	0.078	0.068	0.068	
H	40	Vc	99	74	74	154	139	139	139	123	170	170	153	153	153	136	136	170	170	153	153	153	136	
		fz	0.006	0.006	0.006	0.010	0.009	0.009	0.009	0.008	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.020	0.020	0.018	0.018	0.018	0.016	
		RPM	31474	23606	23606	32754	29479	29479	29479	26203	27049	27049	24344	24344	24344	21639	21639	18032	18032	16229	16229	16229	14426	
		FEED	378	283	283	655	531	531	531	419	703	703	584	584	584	433	433	721	721	584	584	584	462	
		Ap	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068	0.068	0.060	0.060	0.051	0.128	0.115	0.102	0.102	0.089	0.089	
H	41	Vc	66	49	49	103	93	93	93	83	113	113	102	102	102	91	91	113	113	102	102	102	91	
		fz	0.006	0.005	0.005	0.009	0.008	0.008	0.008	0.007	0.012	0.012	0.011	0.011	0.011	0.010	0.010	0.018	0.018	0.016	0.016	0.016	0.014	
		RPM	20983	15737	15737	21939	19745	19745	19745	17551	18032	18032	16229	16229	16229	14426	14426	12021	12021	10819	10819	10819	9617	
		FEED	252	157	157	395	316	316	316	246	433	433	357	357	357	289	289	433	433	346	346	346	269	
		Ap	0.030	0.026	0.021	0.064	0.051	0.051	0.045	0.038	0.085	0.077	0.068	0.068	0.060	0.060	0.051	0.128	0.115	0.102	0.102	0.089	0.089	

CARBIDE				RECOMMENDED CUTTING CONDITIONS EMPFOHLENE SCHNEIDPARAMETER																			
HSS																							
CBN END MILLS																							
i-Xmill END MILLS																							
i-SMART MODULAR END MILLS																							
X1-EH END MILLS																							
X5070 END MILLS																							
4G MILL END MILLS																							
X-POWER PRO END MILLS																							
TitaNox- POWER END MILLS																							
JET-POWER END MILLS																							
V7 PLUS END MILLS																							
ALU-POWER HPC END MILLS																							
ALU-POWER END MILLS																							
D-POWER GRAPHITE END MILLS																							
CRX S END MILLS																							
K-2 END MILLS																							
ONLY ONE COATED PM60 END MILLS																							
TANK POWER END MILLS																							
GENERAL HSS END MILLS																							
MILLING CUTTERS																							



2 FLUTE SQUARE for RIB PROCESSING

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																			
			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.8	1.8	1.8	1.8	1.8	1.8	2	2
			10	12	14	16	18	20	25	30	35	6	8	6	8	10	12	14	16	18	4	6
P	5	Vc	176	176	176	157	157	157	118	118	59	201	201	226	226	203	203	203	203	203	216	216
		fz	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013
		RPM	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958	39958	39958	35962	35962	35962	35962	35962	34426	34426
		FEED	748	748	748	599	599	599	399	399	175	959	959	959	959	719	719	719	719	719	895	895
	8~9	Ap	0.060	0.060	0.053	0.053	0.053	0.045	0.038	0.038	0.030	0.072	0.072	0.081	0.081	0.072	0.072	0.072	0.063	0.063	0.100	0.100
		Vc	176	176	176	157	157	157	118	118	59	201	201	226	226	203	203	203	203	203	216	216
		fz	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013
		RPM	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958	39958	39958	35962	35962	35962	35962	35962	34426	34426
	11.1	FEED	748	748	748	599	599	599	399	399	175	959	959	959	959	719	719	719	719	719	895	895
		Ap	0.060	0.060	0.053	0.053	0.053	0.045	0.038	0.038	0.030	0.072	0.072	0.081	0.081	0.072	0.072	0.072	0.063	0.063	0.100	0.100
		Vc	176	176	176	157	157	157	118	118	59	201	201	226	226	203	203	203	203	203	216	216
		fz	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013
	11.2	RPM	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958	39958	39958	35962	35962	35962	35962	35962	34426	34426
		FEED	748	748	748	599	599	599	399	399	175	959	959	959	959	719	719	719	719	719	895	895
		Ap	0.060	0.060	0.053	0.053	0.053	0.045	0.038	0.038	0.030	0.072	0.072	0.081	0.081	0.072	0.072	0.072	0.063	0.063	0.100	0.100
		Vc	139	139	139	123	123	123	93	93	46	161	161	181	181	163	163	163	163	163	170	170
H	38.1	fz	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013
		RPM	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966	31966	31966	28769	28769	28769	28769	28769	27049	27049
		FEED	531	531	531	419	419	419	275	275	118	639	639	639	639	518	518	518	518	518	703	703
		Ap	0.051	0.051	0.045	0.045	0.045	0.038	0.032	0.032	0.026	0.061	0.061	0.069	0.069	0.061	0.061	0.061	0.054	0.054	0.085	0.085
	38.2	Vc	93	93	93	83	83	83	62	62	31	106	106	119	119	107	107	107	107	107	113	113
		fz	0.008	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.005	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.012	0.012
		RPM	19745	19745	19745	17551	17551	17551	13163	13163	6582	21106	21106	21106	21106	18995	18995	18995	18995	18995	18032	18032
		FEED	316	316	316	246	246	246	158	158	66	422	422	422	422	342	342	342	342	342	433	433
	39.1	Ap	0.051	0.051	0.045	0.045	0.045	0.038	0.032	0.032	0.026	0.061	0.061	0.069	0.069	0.061	0.061	0.061	0.054	0.054	0.085	0.085
		Vc	74	74	74	66	66	66	50	50	25	85	85	96	96	87	87	87	87	87	93	93
		fz	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.009	0.009
		RPM	15759	15759	15759	14008	14008	14008	10506	10506	5253	17007	17007	17007	17007	15306	15306	15306	15306	15306	14754	14754
	39.2	FEED	189	189	189	140	140	140	105	105	42	238	238	238	238	184	184	184	184	184	266	266
		Ap	0.048	0.048	0.042	0.042	0.042	0.036	0.030	0.030	0.024	0.058	0.058	0.065	0.065	0.058	0.058	0.058	0.050	0.050	0.080	0.080
		Vc	56	56	56	50	50	50	37	37	19	65	65	73	73	66	66	66	66	66	72	72
		fz	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.007	0.007
39.3	RPM	11866	11866	11866	10547	10547	10547	7910	7910	3955	12910	12910	12910	12910	11619	11619	11619	11619	11619	11475	11475	
	FEED	119	119	119	84	84	84	63	63	24	155	155	155	155	116	116	116	116	116	161	161	
	Ap	0.048	0.048	0.042	0.042	0.042	0.036	0.030	0.030	0.024	0.058	0.058	0.065	0.065	0.058	0.058	0.058	0.050	0.050	0.080	0.080	
	Vc	47	47	47	42	42	42	31	31	16	55	55	61	61	55	55	55	55	55	62	62	
40	fz	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.006	0.006	
	RPM	9919	9919	9919	8817	8817	8817	6613	6613	3306	10860	10860	10860	10860	9774	9774	9774	9774	9774	9835	9835	
	FEED	79	79	79	71	71	71	40	40	20	109	109	109	109	78	78	78	78	78	118	118	
	Ap	0.039	0.039	0.034	0.034	0.034	0.029	0.024	0.024	0.020	0.047	0.047	0.053	0.053	0.047	0.047	0.047	0.041	0.041	0.065	0.065	
41	Vc	139	139	139	123	123	123	93	93	46	161	161	181	181	163	163	163	163	163	170	170	
	fz	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013	
	RPM	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966	31966	31966	28769	28769	28769	28769	28769	27049	27049	
	FEED	531	531	531	419	419	419	275	275	118	639	639	639	639	518	518	518	518	518	703	703	





RECOMMENDED CUTTING CONDITIONS
EMPFOHLENE SCHNEIDPARAMETER

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

HPI88 SERIES 2 FLUTE SQUARE for RIB PROCESSING

ISO	VDI 3323	Parameter	Diameter (Ø)																					
			2	2	2	2	2	2	2	2	2	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	3	3		
			LBS	8	10	12	14	16	18	20	25	30	35	40	50	8	12	16	20	30	40	50	8	12
P	5	Vc	216	216	195	195	195	195	195	173	173	130	130	65	217	217	195	195	173	130	130	211	211	
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	
		RPM	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	
		FEED	895	895	744	744	744	744	744	551	551	372	372	165	883	883	696	696	574	364	364	851	851	
		Ap	0.090	0.090	0.080	0.080	0.080	0.070	0.070	0.070	0.070	0.060	0.050	0.050	0.040	0.113	0.113	0.100	0.100	0.088	0.075	0.063	0.150	0.135
	8~9	Vc	216	216	195	195	195	195	195	173	173	130	130	65	217	217	195	195	173	130	130	211	211	
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	
		RPM	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	
		FEED	895	895	744	744	744	744	744	551	551	372	372	165	883	883	696	696	574	364	364	851	851	
		Ap	0.090	0.090	0.080	0.080	0.080	0.070	0.070	0.070	0.070	0.060	0.050	0.050	0.040	0.113	0.113	0.100	0.100	0.088	0.075	0.063	0.150	0.135
	11.1	Vc	216	216	195	195	195	195	195	173	173	130	130	65	217	217	195	195	173	130	130	211	211	
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	
		RPM	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	
		FEED	895	895	744	744	744	744	744	551	551	372	372	165	883	883	696	696	574	364	364	851	851	
		Ap	0.090	0.090	0.080	0.080	0.080	0.070	0.070	0.070	0.070	0.060	0.050	0.050	0.040	0.113	0.113	0.100	0.100	0.088	0.075	0.063	0.150	0.135
	11.2	Vc	170	170	153	153	153	153	153	136	136	102	102	51	170	170	153	153	136	102	102	170	170	
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020	
		RPM	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032	
		FEED	703	703	584	584	584	584	584	433	433	292	292	130	735	735	584	584	450	311	311	721	721	
		Ap	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.060	0.051	0.043	0.043	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115
H	38.1	Vc	170	170	153	153	153	153	136	136	102	102	51	170	170	153	153	136	102	102	170	170		
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020	
		RPM	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032	
		FEED	703	703	584	584	584	584	584	433	433	292	292	130	735	735	584	584	450	311	311	721	721	
		Ap	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.060	0.051	0.043	0.043	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115
	38.2	Vc	113	113	102	102	102	102	102	91	91	68	68	34	113	113	102	102	91	68	68	113	113	
		fz	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008	0.007	0.015	0.015	0.014	0.014	0.012	0.011	0.011	0.018	0.018	
		RPM	18032	18032	16229	16229	16229	16229	16229	14426	14426	10819	10819	5410	14420	14420	12978	12978	11536	8652	8652	12021	12021	
		FEED	433	433	357	357	357	357	357	289	289	173	173	76	433	433	363	363	277	190	190	433	433	
		Ap	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.060	0.051	0.043	0.043	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115
	39.1	Vc	93	93	83	83	83	83	83	74	74	56	56	28	93	93	84	84	74	56	56	93	93	
		fz	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.005	0.011	0.011	0.010	0.010	0.009	0.008	0.008	0.014	0.014	
		RPM	14754	14754	13279	13279	13279	13279	13279	11803	11803	8852	8852	4426	11845	11845	10661	10661	9476	7107	7107	9835	9835	
		FEED	266	266	212	212	212	212	212	165	165	106	106	44	261	261	213	213	171	114	114	275	275	
		Ap	0.072	0.072	0.064	0.064	0.064	0.056	0.056	0.056	0.048	0.040	0.040	0.032	0.090	0.090	0.080	0.080	0.070	0.060	0.050	0.120	0.108	
	39.2	Vc	72	72	65	65	65	65	65	58	58	43	43	22	72	72	65	65	58	43	43	72	72	
		fz	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.004	0.009	0.009	0.008	0.008	0.007	0.006	0.006	0.011	0.011	
		RPM	11475	11475	10328	10328	10328	10328	10328	9180	9180	6885	6885	3443	9167	9167	8250	8250	7334	5500	5500	7650	7650	
		FEED	161	161	124	124	124	124	124	110	110	69	69	28	165	165	132	132	103	66	66	168	168	
		Ap	0.072	0.072	0.064	0.064	0.064	0.056	0.056	0.056	0.048	0.040	0.040	0.032	0.090	0.090	0.080	0.080	0.070	0.060	0.050	0.120	0.108	
39.3	Vc	62	62	56	56	56	56	56	49	49	37	37	19	62	62	56	56	50	37	37	62	62		
	fz	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.008	0.008	0.007	0.007	0.006	0.005	0.005	0.009	0.009		
	RPM	9835	9835	8852	8852	8852	8852	8852	7868	7868	5901	5901	2951	7931	7931	7138	7138	6345	4759	4759	6557	6557		
	FEED	118	118	89	89	89	89	89	79	79	47	47	24	127	127	100	100	76	48	48	118	118		
	Ap	0.059	0.059	0.052	0.052	0.052	0.046	0.046	0.046	0.039	0.033	0.033	0.026	0.073	0.073	0.065	0.065	0.057	0.049	0.041	0.098	0.088		
40	Vc	170	170	153	153	153	153	153	136	136	102	102	51	170	170	153	153	136	102	102	170	170		
	fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020		
	RPM	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032		
	FEED	703	703	584	584	584	584	584	433	433	292	292	130	735	735	584	584	450	311	311	721	721		
	Ap	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.060	0.051	0.043	0.043	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115	
41	Vc	113	113	102	102	102	102	102	91	91	68	68	34	113	113	102	102	91	68	68	113	113		
	fz	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008	0.007	0.015	0.015	0.014	0.014	0.012	0.011	0.011	0.018	0.018		
	RPM	18032	18032	16229	16229	16229	16229	16229	14426	14426	10819	10819	5410	14420	14420	12978	12978	11536	8652	8652	12021	12021		
	FEED	433	433	357	357	357	357	357	289	289	173	173	76	433	433	363	363	277	190	190	433	433		
	Ap	0.077	0.077	0.068	0.068	0.068	0.060	0.060	0.060	0.060	0.051	0.043	0.043	0.034	0.096	0.096	0.085	0.085	0.074	0.064	0.053	0.128	0.115	



Global Cutting Tool Leader **YG-1**



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