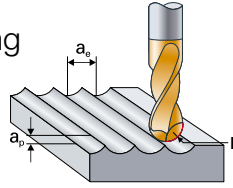


Nano-PVD Technology

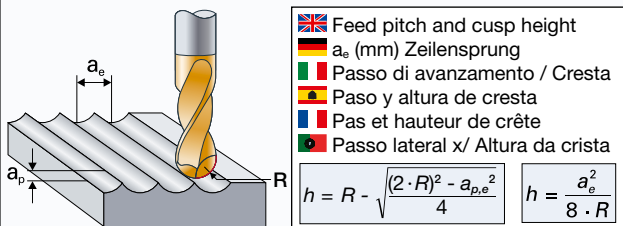
EPBT | Recommended Cutting Conditions | Roughing



Work piece material	Condition Range	a _p a _e	Cutting Condition	Tool Radius (mm)								
				R0.5/D1	R1/D2	R1.5/D3	R2/D4	R3/D6	R4/D8	R5/D10	R6/D12	
II Tool Steel (25-35HRC)	High Speed	a _p =0.06-0.08D a _e =0.3D	n (min ⁻¹)	79,600	47,800	31,800	23,900	18,000	13,500	10,800	9,000	
			V _c (m/min)	250	300	300	300	340	340	340	340	340
			V _r (mm/min)	3,180	2,870	3,180	3,350	3,960	4,050	3,890	3,420	3,420
	General	a _p =0.06-0.08D a _e =0.3D	f _z (mm/tooth)	0.02	0.03	0.05	0.07	0.11	0.15	0.18	0.18	0.19
			n (min ⁻¹)	19,100	19,100	15,900	11,900	9,600	7,200	5,700	4,800	4,800
			V _c (m/min)	60	120	150	150	180	180	180	180	180
III Pre-hardened steel (35-45HRC)	High Speed	a _p =0.06-0.08D a _e =0.3D	V _r (mm/min)	760	1,150	1,590	1,670	2,110	2,160	2,050	1,820	
			f _z (mm/tooth)	0.02	0.03	0.05	0.07	0.11	0.15	0.18	0.18	0.19
			n (min ⁻¹)	19,100	19,100	15,900	11,900	9,600	7,200	5,700	4,800	4,800
	General	a _p =0.06-0.08D a _e =0.3D	V _c (m/min)	60	120	150	150	180	180	180	180	
			V _r (mm/min)	760	1,150	1,590	1,430	1,730	1,870	1,820	1,630	
			f _z (mm/tooth)	0.02	0.03	0.05	0.06	0.09	0.13	0.16	0.17	
IV Hardened steel (45-55HRC)	High Speed	a _p =0.05-0.06D a _e =0.25D	n (min ⁻¹)	76,400	38,200	27,600	20,700	14,900	11,100	8,900	7,400	
			V _c (m/min)	240	240	260	260	280	280	280	280	
			V _r (mm/min)	3,060	2,290	2,210	2,480	2,680	2,660	2,490	2,220	
	General	a _p =0.05-0.06D a _e =0.25D	f _z (mm/tooth)	0.02	0.03	0.04	0.06	0.09	0.12	0.14	0.15	
			n (min ⁻¹)	19,100	15,900	12,700	9,600	7,400	5,600	4,500	3,700	
			V _c (m/min)	60	100	120	120	140	140	140	140	
V Hardened steel (55-65HRC)	High Speed	a _p =0.03-0.04D a _e =0.25D	V _r (mm/min)	380	640	1,020	960	1,180	1,230	1,170	1,040	
			f _z (mm/tooth)	0.01	0.02	0.04	0.05	0.08	0.11	0.13	0.14	
			n (min ⁻¹)	57,300	28,700	21,200	15,900	12,700	9,600	7,600	6,400	
	General	a _p =0.03-0.04D a _e =0.25D	V _c (m/min)	180	180	200	200	240	240	240		
			V _r (mm/min)	1,150	1,150	1,700	1,590	2,030	1,920	1,980	1,790	
			f _z (mm/tooth)	0.01	0.02	0.04	0.05	0.08	0.10	0.13	0.14	
VI Hardened steel (65-70HRC)	High Speed	a _p =0.02-0.03D a _e =0.2D	n (min ⁻¹)	38,200	19,100	12,700	9,600	8,500	6,400	5,100	4,200	
			V _c (m/min)	120	120	120	120	160	160	160	160	
			V _r (mm/min)	760	760	1,020	960	1,360	1,280	1,330	1,180	
	General	a _p =0.02-0.03D a _e =0.2D	f _z (mm/tooth)	0.01	0.02	0.04	0.05	0.08	0.10	0.13	0.14	
			n (min ⁻¹)	15,900	8,000	5,300	4,000	4,200	3,200	2,500	2,100	
			V _c (m/min)	50	50	50	50	80	80	80	80	
General	a _p =0.02-0.03D a _e =0.2D	V _r (mm/min)	320	320	320	400	590	580	600	550		
		f _z (mm/tooth)	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.13		

Theoretical cusp height in end milling (µm)
 Die theoretische Rautiefe in der Fräsbearbeitung (µm)
 Cresta teorica di fresatura (µm)

Cálculo de altura de la cresta teórica en fresado (mm)
 Hauteur de crête théorique en fraisage (µm)
 Altura da crista teórica em fresagem (µm)



NOTE

1. Use a highly rigid and accurate machine as available.
2. The radial step over (Pf, pick feed) in the above table is for general information. Please select the conditions to suit your actual surface finish requirements, according to the cusp height stated.
3. The cutting conditions in the above table are a general guide. For your actual work piece adjust the conditions according to the machining shape, purpose and the machine tool to be used.
4. If the rpm speed available is lower, adjust the feed rate to the same ratio with the rpm.

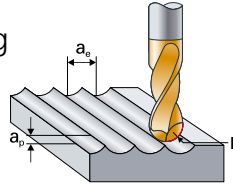
ANMERKUNG

1. Nutzen Sie für die Bearbeitungen die Maschine mit der höchsten Genauigkeit und der höchsten Steifigkeit.
2. Der in der Tabelle angegebene Zeilensprung ist eine generelle Empfehlung. Um die jeweiligen Anforderungen an die Oberflächengüte zu erreichen wählen Sie die Bedingungen entsprechend der angegebenen Rautiefe.
3. Die in der Tabelle angegebenen Schnittbedingungen stellen eine generelle Empfehlung dar. Die Werte sollten immer an die jeweilige Bearbeitung, deren Form und die verwendete Maschine angepasst werden.
4. Sollte die Ihnen verfügbare Drehzahl niedriger als der in der Tabelle angegebene Wert sein, sollte der Vorschub im gleichen Verhältnis reduziert werden.

		a _e (mm)							
		0.05	0.075	0.1	0.15	0.2	0.3	0.4	0.5
R (mm)	0.5	0.63	1.41	2.51	5.66	10.10	23.03	41.74	66.99
	1.0	0.31	0.70	1.25	2.82	5.01	11.31	20.20	31.75
	2.0	0.16	0.35	0.63	1.41	2.50	5.63	10.03	15.69
	3.0	0.10	0.23	0.42	0.94	1.67	3.75	6.67	10.43
	4.0	0.08	0.18	0.31	0.70	1.25	2.81	5.00	7.82
	5.0	0.06	0.14	0.25	0.56	1.00	2.25	4.00	6.25
	6.0	0.05	0.12	0.21	0.47	0.83	1.88	3.33	5.21
	8.0	0.04	0.09	0.16	0.35	0.63	1.41	2.50	3.91
	10.0	0.03	0.07	0.13	0.28	0.50	1.13	2.0	3.13

Nano-PVD Technology

EPBT | Recommended Cutting Conditions | Finishing



Work piece material	Condition Range	a _p a _e	Cutting Condition	Tool Radius (mm)							
				R0.5/D1	R1/D2	R1.5/D3	R2/D4	R3/D6	R4/D8	R5/D10	R6/D12
II Tool Steel (25-35HRC)	High Speed	a _p =0.05-0.1D	n (min ⁻¹)	79,600	47,800	31,800	23,900	15,900	13,900	11,100	9,300
			V _c (m/min)	250	300	300	300	300	350	350	350
		a _e =0.02-0.06D	V _r (mm/min)	7,960	5,740	4,450	4,300	3,500	3,340	2,890	2,600
	General	a _p =0.05-0.1D	f _z (mm/tooth)	0.05	0.06	0.07	0.09	0.11	0.12	0.13	0.14
			n (min ⁻¹)	19,100	19,100	19,100	14,300	9,600	8,000	6,400	5,300
		a _e =0.02-0.06D	V _c (m/min)	60	120	180	180	180	200	200	200
III Pre-hardened steel (35-45HRC)	High Speed	a _p =0.05-0.1D	V _r (mm/min)	1,910	2,290	2,670	2,570	2,110	1,920	1,660	1,480
			f _z (mm/tooth)	0.05	0.06	0.07	0.09	0.11	0.12	0.13	0.14
		a _e =0.02-0.06D	n (min ⁻¹)	19,100	19,100	19,100	14,300	9,600	8,000	6,400	5,300
	General	a _p =0.05-0.1D	V _c (m/min)	60	120	180	180	180	200	200	200
			a _e =0.02-0.06D	V _r (mm/min)	1,910	2,290	2,670	2,570	2,110	1,920	1,660
		f _z (mm/tooth)	0.05	0.06	0.07	0.09	0.11	0.12	0.13	0.14	
IV Hardened steel (45-55HRC)	High Speed	a _p =0.05-0.08D	n (min ⁻¹)	79,600	39,800	26,500	19,900	14,900	11,100	8,900	7,400
			V _c (m/min)	250	250	250	250	280	280	280	280
		a _e =0.02-0.04D	V _r (mm/min)	6,370	3,980	3,180	3,180	3,280	2,660	2,310	2,070
	General	a _p =0.05-0.08D	f _z (mm/tooth)	0.04	0.05	0.06	0.08	0.11	0.12	0.13	0.14
			n (min ⁻¹)	19,100	19,100	13,800	10,400	8,000	6,000	4,800	4,000
		a _e =0.02-0.04D	V _c (m/min)	60	120	130	130	150	150	150	150
V Hardened steel (55-65HRC)	High Speed	a _p =0.04-0.06D	V _r (mm/min)	1,530	1,910	1,660	1,660	1,760	1,440	1,250	1,120
			f _z (mm/tooth)	0.04	0.05	0.06	0.08	0.11	0.12	0.13	0.14
		a _e =0.02-0.04D	n (min ⁻¹)	63,700	31,800	21,200	15,900	13,300	10,000	8,000	6,600
	General	a _p =0.04-0.06D	V _c (m/min)	200	200	200	200	250	250	250	250
			a _e =0.02-0.04D	V _r (mm/min)	3,820	3,180	2,540	2,540	2,660	2,200	1,920
		f _z (mm/tooth)	0.03	0.05	0.06	0.08	0.10	0.11	0.12	0.13	
VI Hardened steel (65-70HRC)	High Speed	a _p =0.02-0.04D	n (min ⁻¹)	47,800	23,900	15,900	11,900	10,600	8,000	6,400	5,300
			V _c (m/min)	150	150	150	150	200	200	200	200
		a _e =0.02-0.03D	V _r (mm/min)	2,870	2,390	1,910	1,900	2,120	1,760	1,540	1,380
	General	a _p =0.02-0.04D	f _z (mm/tooth)	0.03	0.05	0.06	0.08	0.10	0.11	0.12	0.13
			n (min ⁻¹)	19,100	14,300	9,600	7,200	6,400	4,800	3,800	3,200
		a _e =0.02-0.03D	V _c (m/min)	60	90	90	90	120	120	120	120
f _z (mm/tooth)	0.03	0.05	0.06	0.08	0.10	0.11	0.12	0.13			

NOTA

1. Usate centri di lavoro più precisi e rigidi possibile.
2. Gli indicazioni sul passo laterale (a_e) espresso nella tabella sopra riportata sono valori generali. Per ottimizzare il processo di lavoro usate le relazioni cresta/raggio più vicine alle Vostre esigenze.
3. Le condizioni di taglio indicate sono valori generali. Per ottimizzare il Vostro processo di lavoro analizzate i parametri in funzione delle geometrie che dovete generare e del centro di lavoro a disposizione.
4. Se i giri del mandrino della macchina disponibili sono più bassi rispetto al valore espresso regolate l'avanzamento con lo stesso rapporto.

OBSERVACIONES

1. Utilizar la máquina más rígida y precisa posible.
2. El paso radial (Pf, paso) de la tabla es una información general. Hay que utilizar el paso adecuado en función del acabado superficial que se pretenda obtener según la rugosidad máxima prevista (Altura de cresta).
3. Las condiciones de corte de la tabla son una orientación general. Para un trabajo específico hay que ajustar las condiciones en función de la geometría de la pieza, el resultado esperado y el tipo de máquina que vamos a utilizar.
4. Si las rpm de la máquina son inferiores, hay que ajustar el avance en proporción a las mismas.

NOTE

1. Utiliser une machine aussi fiable et rigide que possible .
2. SVP choisissez vos conditions en fonction de l'état de surface requis .
3. Les conditions de coupe du tableau sont indicatives. Pour votre application, ajuster cette base en fonction de votre machine .
4. Si le nombre de tours est insuffisant ajuster les avances dans la même proportion que la rotation disponible .

NOTA

1. Use a máquina disponível mais rígida e precisa possível.
2. O passo lateral (Pf, incremento lateral) na tabela acima é para informação geral. Por favor seleccione as condições para atender às suas exigências de acabamento de superfície real, de acordo com a altura da cresta pretendida.
3. As condições de corte no quadro acima são uma informação geral. Para o seu trabalho real ajuste as condições de acordo com a forma da peça, máquina e ferramenta a ser usada para objectivo pretendido.
4. Se a velocidade rpm disponível é inferior, ajuste o avanço para a mesma relação com a rpm.

Note: For finishing and precise tool definition for the CAM system please download DXF data (QuickFinder), or contact your local Hitachi Tool staff for more details.

Nota: Per lavorazioni di finitura e per una precisa e corretta definizione del profilo dell'utensile per l'utilizzo CAM si prega di richiedere file DXF tramite QuickFinder o rivolgendosi al personale Hitachi Tool.

Remarque : Pour les opérations de finition et une définition précise de l'outil dans votre système FAO, demandez nous le fichier DXF des outils, téléchargez les via notre logiciel QuickFinder, ou contactez votre interlocuteur commercial pour plus de détails.

Achtung: Bitte laden Sie sich für die Schlichtbearbeitung und die präzise Definition der Werkzeuge die DXF Daten herunter (QuickFinder) oder wenden Sie sich an Ihren Hitachi Anwendungstechniker.

Nota: En procesos de acabado y para una más precisa definición de la herramienta en el sistema de CAM por favor solicite los ficheros DXF (QuickFinder), o póngase en contacto con Hitachi Tool para obtener más detalles.

Nota: Para o acabamento e precisão assim como melhor definição da ferramenta para o sistema CAM por favor solicitar dados DXF (QuickFinder), ou entre em contato com sua equipe de ferramentas Hitachi local para obter mais detalhes.