

Stampi

La lavorazione degli stampi rappresenta una delle aree più difficili da affrontare nel settore dell'asportazione truciolo.

Le esigenze dei produttori di stampi devono soddisfare i più elevati standard qualitativi in termini di precisione, durata e affidabilità di utensili nella lavorazione di materiali che vanno, a seconda delle applicazioni, dagli acciai bonificati fino a quelli temprati di elevatissima durezza.

Per soddisfare queste esigenze abbiamo ampliato la gamma esistente ed introdotto utensili innovativi.

Molds

Mould machining represents one of the most difficult areas faced in the sector of chip removal.

The requirements of mould manufacturers have to meet the highest quality standards in terms of precision, durability and reliability of tools for machining materials ranging from quenched and tempered steels to extreme-hardness hardened steels, according to their different applications.

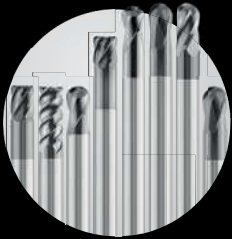
In order to meet these requirements, we have introduced innovative tools and expanded our existing range.

Stampi Molds

Per maggiori informazioni
scarica la brochure digitale.

For further information
download the digital brochure.

silmax.it/hrc



Ampia Gamma

- + Tipologie di utensili adatti a diverse applicazioni
- + Diverso numero di taglienti e geometrie di taglio
- + Diametri dal D. 0,2 al D. 20 mm

Wide Range

- + Typologies of tools suited to different applications
- + Different number of flutes and cutting geometries
- + Diameters from D. 0.2 to D. 20 mm

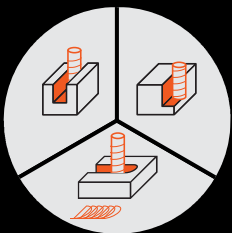


Multimateriale

Le frese per stampi sono state progettate per lavorare, con parametri elevati, materiali che vanno, a seconda delle applicazioni, dagli acciai bonificati fino agli acciai temprati di elevatissima durezza.

Multi-material

These end mills for molds have been designed for machining materials ranging from quenched and tempered steels to extreme-hardness hardened steels at high parameters, according to the different applications.

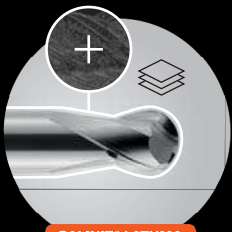


Multiapplicazione

La versatilità di questi utensili permette il loro utilizzo nelle più svariate lavorazioni, da quelle di sgrossatura e finitura, fino alle avanzate tecnologie del trocoidale.

Multi-application

The versatility of these tools allows their use in a large number of different applications, from roughing and finishing to the most advanced technologies of trochoidal milling.



BALINIT® LATUMA

X-HARD

Rivestimento PVD

PVD Balinit® Latuma

- + La migliore proposta per la lavorazione di acciai fino alla durezza di 58 HRC
- + Estremamente resistente all'usura
- + Elevata durezza a caldo e stabilità agli shock termici

PVD X-Hard

- + La migliore proposta per la lavorazione di acciai fino alla durezza di 65 HRC

PVD Coating

PVD Balinit® Latuma

- + The best offer for machining steels up to the hardness of 58 HRC
- + Extremely wear-resistant
- + High heat hardness and thermal-shock stability

PVD X-HARD

- + The best offer for machining steels up to the hardness of 65 HRC

SIL SERVICE

L'esperienza Silmax dimostra che un utensile correttamente affilato ha un rendimento uguale a quello nuovo.

Silmax experience shows that a properly sharpened tool grants the same performances of a new tool.



Riaffilatura e rigenerazione
Resharpening and Reconditioning



Esecuzione perfetta
Perfect Execution



Rivestimento PVD
PVD Coating



Trattamento 4S
4S Treatment



Consegna rapida
Fast Delivery

08w

Fresa 4 taglienti serie normale per elevati avanzamenti
4 flute, high feed end mill regular version
→ 79

09w

Fresa 4 taglienti serie lunga per elevati avanzamenti
4 flute high feed end mill long version
→ 79

142

Fresa 4/6 taglienti torica serie normale
4/6 flute corner radius end mill regular version
→ 81

144

Fresa 4/6 taglienti torica serie lunga
4/6 flute corner radius end mill long version
→ 81

143

Fresa 6 taglienti serie normale per la finitura di acciai temprati
6 flute end mill for hardened steels finishing regular version
→ 83

145

Fresa 6 taglienti serie lunga per la finitura di acciai temprati
6 flute end mill for hardened steels finishing long version
→ 83

043

Fresa 4 taglienti serie normale per la sgrossatura di acciai temprati
4 flute end mill for the roughing of hardened steels regular version
→ 85

725 NEW

Fresa 2 taglienti serie normale semisferica per elevate asportazioni
2 flute ball nose end mill for roughing
→ 87

726 NEW

Fresa 2 taglienti serie lunga semisferica per elevate asportazioni
2 flute ball nose end mill for roughing long version
→ 87

727

Fresa 2 tagli serie normale semisferica
2 flute ball nose end mill regular version
→ 89

729

Fresa 2 tagli serie lunga semisferica
2 flute ball nose end mill long version
→ 89

149

Fresa 3 taglienti serie lunga semisferica
3 flute ball nose end mill long version
→ 91

147

Fresa 4 taglienti serie lunga semisferica
4 flute ball nose end mill long version
→ 91

191

Fresa 2 taglienti torica con collarino conico per lavorazioni in profondità
2 flute corner radius end mill with tapered neck for deep milling
→ 93

190

Fresa 2 taglienti semisferica con collarino conico per lavorazioni in profondità
2 flute ball nose end mill with tapered neck for deep milling
→ 95

192

Fresa 2 taglienti semisferica con collarino conico per lavorazioni in profondità
2 flute ball nose end mill with tapered neck for deep milling
→ 95

721

Fresa 2 taglienti torica per nervature
2 flute corner radius end mill for ribbing
→ 97

621 NEW

Fresa 2 taglienti torica per nervature con gambo rinforzato
2 flute corner radius end mill for ribbing with reinforced shank
→ 98

521 NEW

Fresa 2 taglienti torica per nervature con collarino conico e gambo rinforzato
2 flute corner radius end mill for deep milling with tapered neck and reinforced shank
→ 100

722

Fresa 2 taglienti semisferica per nervature
2 flute ball nose end mill for ribbing
→ 104

622 NEW

Fresa 2 taglienti semisferica per nervature con gambo rinforzato
2 flute ball nose end mill for ribbing with reinforced shank
→ 105

522 NEW

Fresa 2 taglienti semisferica per nervature con collarino conico e gambo rinforzato
2 flute ball nose end mill for ribbing with tapered neck and reinforced shank
→ 106

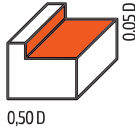
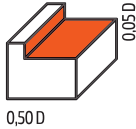
724

Fresa 4 taglienti torica per nervature
4 flute corner radius end mill for ribbing
→ 109



08w/09w

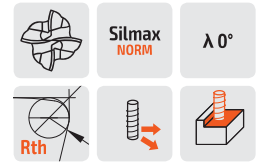
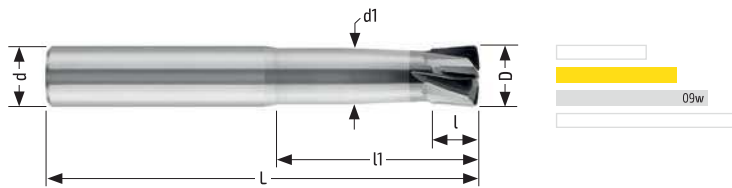
Parametri di lavoro / Working Parameters

Materiale Material	Diametro Diameter	08w				09w			
									
HRC < 35	m/min	Vc=200				Vc=200			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3,0	0,236	20000	21200	0,141	12000	21200		
	4,0	0,314	20000	15900	0,189	12000	15900		
	6,0	0,472	20000	10600	0,283	12000	10600		
	8,0	0,625	20000	8000	0,375	12000	8000		
	10,0	0,695	17800	6400	0,417	10680	6400		
	12,0	0,698	14800	5300	0,419	8880	5300		
HRC 35 ÷ 45	m/min	Vc=150				Vc=150			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3,0	0,250	15900	15900	0,165	10500	15900		
	4,0	0,305	14500	11900	0,183	8700	11900		
	6,0	0,394	12600	8000	0,236	7560	8000		
	8,0	0,396	9500	6000	0,238	5700	6000		
	10,0	0,401	7700	4800	0,241	4620	4800		
	12,0	0,400	6400	4000	0,240	3840	4000		
HRC 45 ÷ 55	m/min	Vc=120				Vc=120			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3,0	0,175	8900	12730	0,090	4590	12730		
	4,0	0,200	7600	9500	0,120	4560	9500		
	6,0	0,195	5000	6400	0,117	3000	6400		
	8,0	0,198	3800	4800	0,119	2280	4800		
	10,0	0,204	3100	3800	0,122	1860	3800		
	12,0	0,195	2500	3200	0,117	1500	3200		
HRC 55 ÷ 65	m/min	Vc=100				Vc=100			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3,0	0,085	3600	10600	0,050	2120	10600		
	4,0	0,097	3100	8000	0,058	1860	8000		
	6,0	0,099	2100	5300	0,059	1260	5300		
	8,0	0,100	1600	4000	0,060	960	4000		
	10,0	0,102	1300	3200	0,061	780	3200		
	12,0	0,106	1100	2600	0,063	660	2600		

Notes

08w

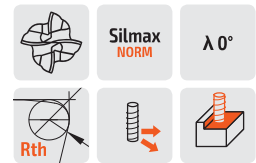
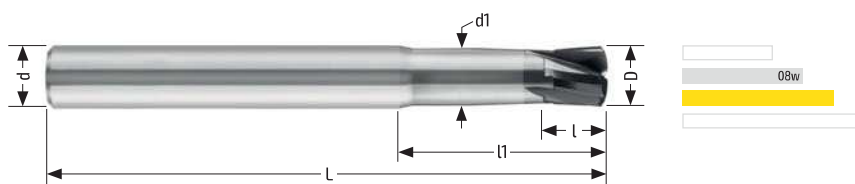
Fresa 4 taglienti serie normale per elevati avanzamenti
4 flute, high feed end mill regular version



Cr	D h10	d h6	d1	L	l ap	l1	Rth	Cr	Z	Balinit® Latuma
	3,0	6	2,6	57	3,0	8,0	0,40	0,30	4	HMC08W030
	4,0	6	3,6	57	3,0	11,0	0,60	0,50	4	HMC08W040
	5,0	6	4,6	57	4,0	15,0	0,60	0,50	4	HMC08W050
	6,0	6	5,6	57	5,0	18,0	0,70	0,60	4	HMC08W060
	8,0	8	7,3	63	6,0	24,0	0,80	0,60	4	HMC08W080
	10,0	10	9,0	72	7,0	32,0	1,00	0,70	4	HMC08W100
	12,0	12	11,0	83	8,0	36,0	1,20	0,80	4	HMC08W120

09w

Fresa 4 taglienti serie lunga per elevati avanzamenti
4 flute high feed end mill long version



Cr	D h10	d h6	d1	L	l ap	l1	Rth	Cr	Z	Balinit® Latuma
	3,0	6	2,6	78	3,0	8,0	0,40	0,30	4	HMC09W030
	4,0	6	3,6	78	3,0	11,0	0,60	0,50	4	HMC09W040
	5,0	6	4,6	78	4,0	15,0	0,60	0,50	4	HMC09W050
	6,0	6	5,6	78	5,0	18,0	0,70	0,60	4	HMC09W060
	8,0	8	7,3	92	6,0	24,0	0,80	0,60	4	HMC09W080
	10,0	10	9,0	105	7,0	32,0	1,00	0,70	4	HMC09W100
	12,0	12	11,0	105	8,0	36,0	1,20	0,80	4	HMC09W120

1
Acciaio
Steel

2
Ghise
Cast
Iron

3
Acciai
Temprati
Hardened
Steel

4
Acciaio
Inox
Stainless
Steel

5
Titanio
Titanium

6
Leghe
Leggere
Light
Alloys

7
PH
Duplex

8
Superleghe
Superalloys




9
Compositi
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Materials

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Guida alla
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Legend

142 Serie LUNGA 144 F -15%, n -15% / LONG version 144 F -15%, n -15%

Parametri di lavoro / Working Parameters

Materiale Material	Diametro Diameter	 0,20 D			 0,50 D			 0,030 D		
		m/min	Vc=143			Vc=110			Vc=220	
HRC < 35	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm
	2,0	0,015	1366	22771	0,012	841	17516	0,100	14013	35032
	3,0	0,025	1518	15180	0,021	981	11677	0,120	11210	23355
	4,0	0,050	2263	11380	0,030	1041	8754	0,140	9785	17507
	6,0	0,070	2124	7586	0,050	1167	5836	0,160	7470	11671
	8,0	0,084	1921	5690	0,064	1127	4377	0,174	6106	8754
	10,0	0,096	1740	4552	0,076	1058	3501	0,186	5197	7003
	12,0	0,105	2382	3793	0,085	1482	2918	0,195	6816	5836
16,0	0,119	2032	2845	0,099	1300	2188	0,209	5490	4377	
HRC 35 ÷ 45	m/min	Vc=107			Vc=90			Vc=180		
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm
	2,0	0,010	682	17038	0,008	459	14331	0,050	5732	28662
	3,0	0,015	682	11359	0,011	420	9554	0,070	5350	19108
	4,0	0,025	844	8535	0,017	479	7162	0,090	5141	14324
	6,0	0,045	1024	5690	0,037	707	4775	0,110	4202	9549
	8,0	0,059	1014	4267	0,051	736	3581	0,124	3563	7162
	10,0	0,071	963	3414	0,063	717	2865	0,136	3106	5730
12,0	0,080	1360	2845	0,072	1026	2387	0,145	4144	4775	
16,0	0,094	1204	2134	0,086	924	1790	0,159	3417	3581	
HRC 45 ÷ 55	m/min	Vc=86			Vc=70			Vc=156		
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm
	2,0	0,006	329	13694	0,005	223	11146	0,035	3478	24841
	3,0	0,008	292	9130	0,007	208	7431	0,050	3312	16561
	4,0	0,012	326	6828	0,011	252	5570	0,065	3214	12414
	6,0	0,029	528	4552	0,028	416	3714	0,085	2814	8276
	8,0	0,043	592	3414	0,042	472	2785	0,099	2468	6207
	10,0	0,055	596	2731	0,054	477	2228	0,111	2196	4966
12,0	0,064	869	2276	0,063	698	1857	0,120	2971	4138	
16,0	0,078	799	1707	0,077	644	1393	0,134	2496	3104	
HRC 55 ÷ 65	m/min	Vc=64			Vc=80			Vc=110		
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm
	2,0	0,003	122	10191	0,003	153	12739	0,020	1401	17516
	3,0	0,005	136	6794	0,005	170	8493	0,032	1495	11677
	4,0	0,007	146	5121	0,007	136	4775	0,042	1461	8754
	6,0	0,021	287	3414	0,021	267	3183	0,062	1447	5836
	8,0	0,035	362	2560	0,035	338	2387	0,076	1337	4377
	10,0	0,047	381	2048	0,047	356	1910	0,088	1226	3501
12,0	0,056	570	1707	0,056	531	1592	0,097	1692	2918	
16,0	0,070	538	1280	0,070	502	1194	0,111	1458	2188	

1 Acciaio
Steel

2 Ghise
Cast
Iron

3 Acciai
Temprati
Hardened
Steel

4 Acciaio
Inox
Stainless
Steel

5 Titanio
Titanium

6 Leghe
Leggere
Light
Alloys

7 PH
Duplex

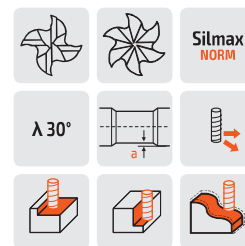
8 Superleghe
Superalloys

9 Compositi
Composite
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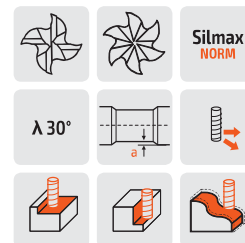
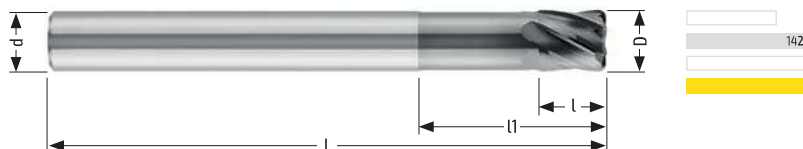
Fresa 4/6 taglienti torica serie normale
4/6 flute corner radius end mill regular version

1 2 3



D e8	d h6	L	l ap	l1	a	Cr	Z	Balinit® Latuma	X-Hard
2,0	6	57	3,0	4,0	0,10	0,30	4	HMC142020CR03R	HMH142020CR03R
3,0	6	57	4,0	6,0	0,10	0,30	4	HMC142030CR03R	HMH142030CR03R
4,0	6	57	5,0	8,0	0,10	0,30	4	HMC142040CR03R	HMH142040CR03R
5,0	6	57	6,0	10,0	0,10	0,30	4	HMC142050CR03R	HMH142050CR03R
6,0	6	57	7,0	-	-	0,30	4	HMC142060CR03	HMH142060CR03
6,0	6	57	7,0	-	-	0,50	4	HMC142060CR05	HMH142060CR05
6,0	6	57	7,0	-	-	1,00	4	HMC142060CR10	HMH142060CR10
8,0	8	63	9,0	-	-	0,30	4	HMC142080CR03	HMH142080CR03
8,0	8	63	9,0	-	-	0,50	4	HMC142080CR05	HMH142080CR05
8,0	8	63	9,0	-	-	1,00	4	HMC142080CR10	HMH142080CR10
10,0	10	72	11,0	-	-	0,50	4	HMC142100CR05	HMH142100CR05
10,0	10	72	11,0	-	-	1,00	4	HMC142100CR10	HMH142100CR10
10,0	10	72	11,0	-	-	1,50	4	HMC142100CR15	HMH142100CR15
12,0	12	81	12,0	-	-	1,00	6	HMC142120CR10	HMH142120CR10
12,0	12	81	12,0	-	-	1,50	6	HMC142120CR15	HMH142120CR15
16,0	16	86	16,0	-	-	1,50	6	HMC142160CR15	HMH142160CR15

144

Fresa 4/6 taglienti torica serie lunga
4/6 flute corner radius end mill, long version

1 2 3



D e8	d h6	L	l ap	l1	a	Cr	Z	Balinit® Latuma	X-Hard
2,0	6	80	3,0	6,0	0,10	0,30	4	HMC144020CR03	HMH144020CR03
3,0	6	80	4,0	9,0	0,10	0,30	4	HMC144030CR03	HMH144030CR03
4,0	6	80	5,0	12,0	0,10	0,30	4	HMC144040CR03	HMH144040CR03
5,0	6	80	6,0	15,0	0,10	0,30	4	HMC144050CR03	HMH144050CR03
6,0	6	80	7,0	18,0	0,15	0,30	4	HMC144060CR03	HMH144060CR03
6,0	6	80	7,0	18,0	0,15	0,50	4	HMC144060CR05	HMH144060CR05
6,0	6	80	7,0	18,0	0,15	1,00	4	HMC144060CR10	HMH144060CR10
8,0	8	80	9,0	24,0	0,15	0,30	4	HMC144080CR03	HMH144080CR03
8,0	8	80	9,0	24,0	0,15	0,50	4	HMC144080CR05	HMH144080CR05
8,0	8	80	9,0	24,0	0,15	1,00	4	HMC144080CR10	HMH144080CR10
10,0	10	108	11,0	31,0	0,15	0,50	4	HMC144100CR05	HMH144100CR05
10,0	10	108	11,0	31,0	0,15	1,00	4	HMC144100CR10	HMH144100CR10
10,0	10	108	11,0	31,0	0,15	1,50	4	HMC144100CR15	HMH144100CR15
12,0	12	108	12,0	36,0	0,20	1,00	6	HMC144120CR10	HMH144120CR10
12,0	12	108	12,0	36,0	0,20	1,50	6	HMC144120CR15	HMH144120CR15
16,0	16	120	16,0	36,0	0,20	1,50	6	HMC144160CR15	HMH144160CR15

143

Materiale Material	Diametro Diameter					
		m/min	Vc=243			
HRC 40 ± 50	D mm	fz mm/z	F mm/min	n rpm		
	3,0	0,007	1083	25783		
	4,0	0,014	1599	19337		
	6,0	0,030	2320	12892		
	8,0	0,042	2408	9669		
	10,0	0,050	2341	7735		
	12,0	0,058	2233	6446		
	16,0	0,069	2008	4834		
HRC 50 ± 60	D mm	fz mm/z	F mm/min	n rpm		
	3,0	0,003	344	19100		
	4,0	0,006	546	14324		
	6,0	0,020	1146	9549		
	8,0	0,032	1354	7162		
	10,0	0,040	1390	5730		
	12,0	0,048	1367	4775		
	16,0	0,059	1273	3581		
HRC > 60	D mm	fz mm/z	F mm/min	n rpm		
	3,0	0,002	153	12730		
	4,0	0,004	221	9549		
	6,0	0,015	573	6366		
	8,0	0,027	759	4775		
	10,0	0,035	812	3820		
	12,0	0,043	816	3183		
	16,0	0,054	777	2387		

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Parametri di lavoro / Working Parameters

Materiale Material	Diametro Diameter									
		m/min	Vc=220			Vc=110				
HRC 40 ± 50	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm			
	3,0	-	-	-	-	-	-	-		
	4,0	-	-	-	-	-	-	-		
	6,0	0,030	2088	11602	0,030	1050	5836			
	8,0	0,042	2167	8702	0,042	1090	4377			
	10,0	0,050	2107	6961	0,050	1060	3501			
	12,0	0,058	2009	5801	0,058	1010	2918			
	16,0	0,069	1807	4351	0,069	909	2188			
HRC 50 ± 60	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm			
	3,0	-	-	-	-	-	-			
	4,0	-	-	-	-	-	-			
	6,0	0,020	1031	8594	0,020	516	4297			
	8,0	0,032	1219	6446	0,032	609	3223			
	10,0	0,040	1251	5157	0,040	626	2578			
	12,0	0,048	1231	4297	0,048	615	2149			
	16,0	0,059	1145	3223	0,059	572	1611			
HRC > 60	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm			
	3,0	-	-	-	-	-	-			
	4,0	-	-	-	-	-	-			
	6,0	0,015	516	5730	0,015	258	2865			
	8,0	0,027	683	4297	0,027	342	2149			
	10,0	0,035	731	3438	0,035	365	1719			
	12,0	0,043	734	2865	0,043	367	1432			
	16,0	0,054	699	2149	0,054	350	1074			

Notes

143

Fresa 6 taglienti serie normale per la finitura di acciai temprati
6 flute end mill for the finishing of hardened steels regular version



90°

D e8	d h6	L	l ap	Cr	Z	Balinit® Latuma	X-Hard
3,0	6	57	7,0	-	6	HMC143030	HMH143030
4,0	6	57	9,0	-	6	HMC143040	HMH143040
5,0	6	57	11,0	-	6	HMC143050	HMH143050
6,0	6	57	13,0	-	6	HMC143060	HMH143060
8,0	8	63	19,0	-	6	HMC143080	HMH143080
10,0	10	72	22,0	-	6	HMC143100	HMH143100
12,0	12	81	26,0	-	6	HMC143120	HMH143120
16,0	16	86	32,0	-	6	HMC143160	HMH143160

Cr

D e8	d h6	L	l ap	Cr	Z	Balinit® Latuma	X-Hard
3,0	6	57	7,0	0,30	6	HMC143030CR03	HMH143030CR03
4,0	6	57	9,0	0,30	6	HMC143040CR03	HMH143040CR03
5,0	6	57	11,0	0,30	6	HMC143050CR03	HMH143050CR03
6,0	6	57	13,0	0,50	6	HMC143060CR05	HMH143060CR05
8,0	8	63	19,0	0,50	6	HMC143080CR05	HMH143080CR05
10,0	10	72	22,0	1,00	6	HMC143100CR10	HMH143100CR10
12,0	12	81	26,0	1,50	6	HMC143120CR15	HMH143120CR15
16,0	16	86	32,0	1,50	6	HMC143160CR15	HMH143160CR15

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Fresa 6 taglienti serie lunga per la finitura di acciai temprati
6 flute end mill for the finishing of hardened steels long version



90°


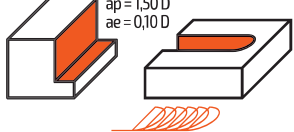
D e8	d h6	L	l ap	Z	Balinit® Latuma	X-Hard
6,0	6	80	24,0	6	HMC145060	HMH145060
8,0	8	80	32,0	6	HMC145080	HMH145080
10,0	10	108	40,0	6	HMC145100	HMH145100
12,0	12	108	48,0	6	HMC145120	HMH145120
16,0	16	130	64,0	6	HMC145160	HMH145160
20,0	20	160	80,0	6	HMC145200*	HMH145200*

* a richiesta / * on request

1
Acciaio
Steel2
Ghise
Cast
Iron3
Acciai
Temprati
Hardened
Steel4
Acciaio
Inox
Stainless
Steel5
Titanio
Titanium6
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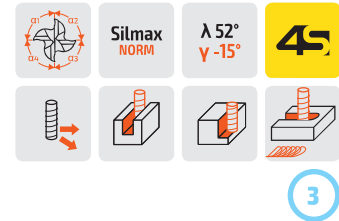
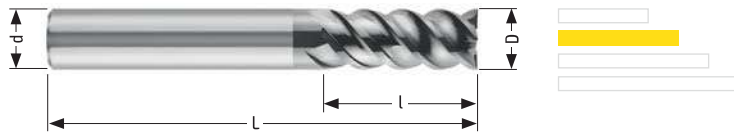
043

Parametri di lavoro / Working Parameters

Materiale Material	Diametro Diameter								
		Vc=50				Vc=96			
HRC 30 ÷ 45	m/min								
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	6,0	0,024	255	2654	0,024	489	5096		
	8,0	0,036	283	1990	0,036	543	3822		
	10,0	0,044	283	1592	0,044	543	3057		
	12,0	0,052	275	1327	0,052	527	2548		
	16,0	0,063	252	995	0,063	483	1911		
20,0	0,072	230	796	0,072	441	1529			
HRC 45 ÷ 55	m/min	Vc=20				Vc=78			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	6,0	0,016	68	1062	0,016	265	4140		
	8,0	0,028	88	796	0,028	342	3105		
	10,0	0,036	93	637	0,036	362	2484		
	12,0	0,044	93	531	0,044	362	2070		
	16,0	0,055	88	398	0,055	343	1553		
20,0	0,064	82	318	0,064	319	1242			
HRC 55 ÷ 65	m/min	Vc=20							
	D mm				fz mm/z	F mm/min	n rpm		
	6,0				0,012	52	1083		
	8,0				0,024	76	812		
	10,0				0,032	84	650		
	12,0				0,040	86	541		
	16,0				0,051	83	406		
20,0				0,060	78	325			

Notes

043

Fresa 4 taglienti serie normale per la sgrossatura di acciai temprati
4 flute end mill for the roughing of hardened steels regular version

90°

D e8	d h6	L	l ap	Z	Balinit® Latuma	X-Hard
6,0	6	57	13,0	4	HMC043060	HMH043060
8,0	8	63	19,0	4	HMC043080	HMH043080
10,0	10	72	22,0	4	HMC043100	HMH043100
12,0	12	81	26,0	4	HMC043120	HMH043120
16,0	16	86	32,0	4	HMC043160	HMH043160
20,0	20	108	38,0	4	HMC043200	HMH043200

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UNV

Universali
Universal Line

53

HPC

Alto Rendimento
High Performance

75

HRC

Stampi
Molds

113

TIS

Titanox e Superleghe
Titanox & Superalloys

137

ALU

Leghe Leggere
Light Alloys

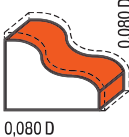
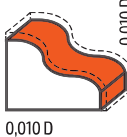
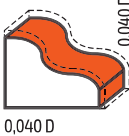
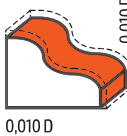

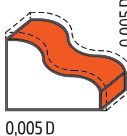
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CMP

Materiali Compositi
Composite Materials1
Acciaio
Steel2
Ghise
Cast
Iron3
Acciai
Temprati
Hardened
Steel4
Acciaio
Inox
Stainless
Steel5
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725/726

Parametri di lavoro / Working Parameters

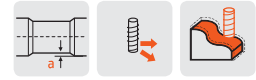
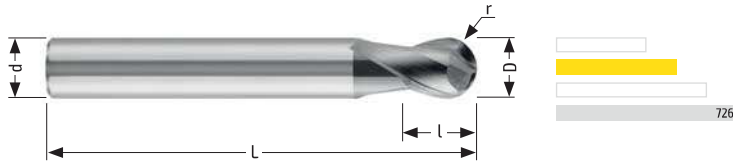
Materiale Material	Diametro Diameter	725/726				725/726			
									
Acciaio < 1300 N/mm ² Steel < 1300 N/mm ²	m/min	Vc=250				Vc=290			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3	0,053	4178	26526	0,027	2492	30770		
	4	0,070	4178	19894	0,036	2492	23077		
	5	0,088	4202	15915	0,045	2492	18462		
	6	0,120	4775	13263	0,054	2492	15385		
	8	0,160	4775	9947	0,072	2492	11539		
	10	0,200	4775	7958	0,090	2492	9231		
12	0,240	4775	6631	0,100	2308	7692			
HRC 35-45	m/min	Vc=220				Vc=250			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3	0,053	3676	23343	0,027	2149	26526		
	4	0,070	3676	17507	0,036	2149	19894		
	5	0,088	3697	14006	0,045	2149	15915		
	6	0,120	4202	11671	0,054	2149	13263		
	8	0,160	4202	8754	0,072	2149	9947		
	10	0,200	4202	7003	0,090	2149	7958		
12	0,240	4202	5836	0,100	1989	6631			
Materiale Material	Diametro Diameter								
		0,040 D				0,010 D			
HRC 45-55	m/min	Vc=160				Vc=190			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3	0,024	1222	16977	0,016	968	20160		
	4	0,030	1146	12732	0,022	998	15120		
	5	0,037	1131	10186	0,029	1052	12096		
	6	0,045	1146	8488	0,037	1119	10080		
	8	0,060	1146	6366	0,052	1179	7560		
	10	0,085	1299	5093	0,077	1397	6048		
12	0,100	1273	4244	0,092	1391	5040			
Materiale Material	Diametro Diameter								
		0,020 D				0,005 D			
HRC 55-65	m/min	Vc=70				Vc=90			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	3	0,008	167	7427	0,008	215	9549		
	4	0,010	167	5570	0,010	215	7162		
	5	0,013	167	4456	0,013	215	5730		
	6	0,015	167	3714	0,015	215	4775		
	8	0,020	167	2785	0,020	215	3581		
	10	0,025	167	2228	0,025	215	2865		
12	0,030	167	1857	0,030	215	2387			

Notes

NEW

725

Fresa 2 taglienti serie normale semisferica per elevate asportazioni
2 flute ball nose end mill for roughing

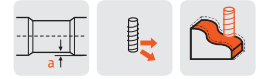


D	d _{h6}	L	l _{ap}	l1	a	r +/-0,01	Z	Balinit® Latuma	X-Hard
3,0	6	57	3,0	6,0	0,10	1,50	2	HMC725030	HMH725030
4,0	6	57	4,0	8,0	0,10	2,00	2	HMC725040	HMH725040
5,0	6	57	5,0	10,0	0,10	2,50	2	HMC725050	HMH725050
6,0	6	57	6,0	-	-	3,00	2	HMC725060	HMH725060
8,0	8	63	8,0	-	-	4,00	2	HMC725080	HMH725080
10,0	10	72	10,0	-	-	5,00	2	HMC725100	HMH725100
12,0	12	83	12,0	-	-	6,00	2	HMC725120	HMH725120

NEW

726

Fresa 2 taglienti serie lunga semisferica per elevate asportazioni
2 flute ball nose end mill for roughing, long version



D	d _{h6}	L	l _{ap}	l1	a	r +/-0,01	Z	Balinit® Latuma	X-Hard
3,0	6	78	3,0	6,0	0,10	1,50	2	HMC726030	HMH726030
4,0	6	78	4,0	8,0	0,10	2,00	2	HMC726040	HMH726040
5,0	6	105	5,0	10,0	0,10	2,50	2	HMC726050	HMH726050
6,0	6	105	6,0	18,0	0,15	3,00	2	HMC726060	HMH726060
8,0	8	105	8,0	24,0	0,15	4,00	2	HMC726080	HMH726080
10,0	10	120	10,0	30,0	0,15	5,00	2	HMC726100	HMH726100
12,0	12	125	12,0	36,0	0,2	6,00	2	HMC726120	HMH726120

1
Acciaio
Steel

2
Ghise
Cast
Iron

3
Acciai
Temprati
Hardened
Steel

4
Acciaio
Inox
Stainless
Steel

5
Titanio
Titanium

6
Leghe
Leggere
Light
Alloys

7
PH
Duplex

8
Superleghe
Superalloys

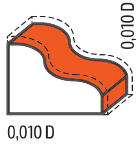
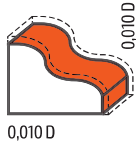
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Composite
Materials

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Guida alla
lettura
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guide

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Legenda
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727/729

Parametri di lavoro / Working Parameters

Materiale Material	Diametro Diameter	727				729			
									
HRC < 35	m/min	Vc=303				Vc=258			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	1,0	0,050	10504	105042	-	-	-		
	2,0	0,060	6303	52521	-	-	-		
	4,0	0,090	4727	26261	0,038	1542	20531		
	6,0	0,110	3852	17507	0,070	1916	13687		
	8,0	0,120	3151	13130	0,093	1910	10265		
	10,0	0,130	2731	10504	0,111	1821	8212		
	12,0	0,140	2451	8754	0,125	1717	6844		
	16,0	0,160	2101	6565	0,148	1524	5133		
20,0	0,180	1736	4822	0,162	1330	4106			
HRC 35 ÷ 45	m/min	Vc=280				Vc=194			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	1,0	0,050	8913	89127	-	-	-		
	2,0	0,060	5348	44563	-	-	-		
	4,0	0,090	4011	22282	0,028	849	15398		
	6,0	0,110	3268	14854	0,060	1232	10265		
	8,0	0,120	2674	11141	0,083	1278	7699		
	10,0	0,130	2317	8913	0,101	1243	6159		
	12,0	0,140	2080	7427	0,115	1185	5133		
	16,0	0,160	1783	5570	0,138	1066	3850		
20,0	0,180	604	4456	0,144	890	3088			
HRC 45 ÷ 55	m/min	Vc=220				Vc=155			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	1,0	0,050	7003	70028	-	-	-		
	2,0	0,060	4202	35014	-	-	-		
	4,0	0,090	3151	17507	0,018	436	12319		
	6,0	0,110	2568	11671	0,050	821	8212		
	8,0	0,120	2101	8754	0,073	899	6159		
	10,0	0,130	1821	7003	0,091	895	4927		
	12,0	0,140	1634	5836	0,105	866	4106		
	16,0	0,160	1401	4377	0,128	791	3080		
20,0	0,180	1260	3501	0,138	681	2467			
HRC 55 ÷ 65	m/min	Vc=180				Vc=116			
	D mm	fz mm/z	F mm/min	n rpm	fz mm/z	F mm/min	n rpm		
	1,0	0,050	5730	57296	-	-	-		
	2,0	0,060	3438	28648	-	-	-		
	4,0	0,090	2578	14324	0,013	235	9239		
	6,0	0,110	2101	9549	0,040	493	6159		
	8,0	0,120	1719	7162	0,063	582	4619		
	10,0	0,130	1490	5730	0,081	598	3696		
	12,0	0,140	1337	4775	0,095	588	3080		
	16,0	0,160	1146	3581	0,118	547	2310		
20,0	0,180	1031	2865	0,130	480	1846			

Notes

727

Fresa 2 tagli serie normale semisferica
2 flute ball nose end mill



D	d _{h6}	L	l _{ap}	l1	a	NEW r +/-0,005	Z	Balinit® Latuma	X-Hard
1,0	6	57	1,5	3,0	0,10	0,50	2	HMC727010	HMH727010
1,5	6	57	2,0	4,0	0,10	0,75	2	HMC727015	HMH727015
2,0	6	57	2,0	4,0	0,10	1,00	2	HMC727020	HMH727020
2,5	6	57	2,5	5,0	0,10	1,25	2	HMC727025	HMH727025
3,0	6	57	3,0	6,0	0,10	1,50	2	HMC727030	HMH727030
4,0	6	57	4,0	8,0	0,10	2,00	2	HMC727040	HMH727040
5,0	6	57	5,0	10,0	0,10	2,50	2	HMC727050	HMH727050
6,0	6	57	6,0	-	-	3,00	2	HMC727060	HMH727060
8,0	8	63	8,0	-	-	4,00	2	HMC727080	HMH727080
10,0	10	72	10,0	-	-	5,00	2	HMC727100	HMH727100
12,0	12	83	12,0	-	-	6,00	2	HMC727120	HMH727120
16,0	16	92	16,0	-	-	8,00	2	HMC727160	HMH727160
20,0	20	104	20,0	-	-	10,00	2	HMC727200	HMH727200

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Fresa 2 tagli serie lunga semisferica
2 flute ball nose end mill, long version

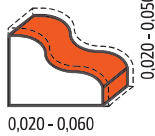


D	d _{h6}	L	l _{ap}	l1	a	NEW r +/-0,005	Z	Balinit® Latuma	X-Hard
3,0	6	78	3,0	9,0	0,10	1,50	2	HMC729030	HMH729030
4,0	6	78	4,0	9,0	0,10	2,00	2	HMC729040	HMH729040
5,0	6	105	5,0	15,0	0,10	2,50	2	HMC729050	HMH729050
6,0	6	105	6,0	18,0	0,15	3,00	2	HMC729060	HMH729060
8,0	8	105	8,0	24,0	0,15	4,00	2	HMC729080	HMH729080
10,0	10	120	10,0	30,0	0,15	5,00	2	HMC729100	HMH729100
12,0	12	125	12,0	36,0	0,20	6,00	2	HMC729120	HMH729120
16,0	16	130	16,0	48,0	0,20	8,00	2	HMC729160	HMH729160
20,0	20	160	20,0	60,0	0,20	10,00	2	HMC729200	HMH729200

- 1
Acciaio
Steel
- 2
Ghise
Cast Iron
- 3
Acciai
Temprati
Hardened Steel
- 4
Acciaio
Inox
Stainless Steel
- 5
Titanio
Titanium
- 6
Leghe
Leggere
Light Alloys
- 7
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Parametri di lavoro / Working Parameters

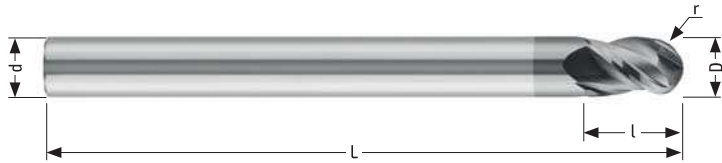
Materiale Material	Diametro Diameter	 0,020 - 0,050		
HRC < 35	m/min	Vc=300		
	D mm	fz mm/z	F mm/min	n rpm
	3,0	0,035	3342	31831
	4,0	0,058	4123	23873
	6,0	0,090	4297	15915
	8,0	0,113	4047	11937
	10,0	0,131	3749	9549
	12,0	0,145	3472	7958
16,0	0,168	3016	5968	
HRC 35 ÷ 45	m/min	Vc=270		
	D mm	fz mm/z	F mm/min	n rpm
	3,0	0,030	2578	28648
	4,0	0,049	3130	21486
	6,0	0,081	3481	14324
	8,0	0,104	3352	10743
	10,0	0,122	3142	8594
	12,0	0,136	2932	7162
16,0	0,159	2570	5371	
HRC 45 ÷ 55	m/min	Vc=216		
	D mm	fz mm/z	F mm/min	n rpm
	3,0	0,020	1375	22918
	4,0	0,035	1808	17189
	6,0	0,068	2320	11459
	8,0	0,091	2334	8594
	10,0	0,108	2235	6875
	12,0	0,123	2113	5730
16,0	0,146	1882	4297	
HRC 55 ÷ 65	m/min	Vc=175		
	D mm	fz mm/z	F mm/min	n rpm
	3,0	0,008	446	18568
	4,0	0,017	731	13966
	6,0	0,050	1383	9311
	8,0	0,073	1519	6983
	10,0	0,090	1514	5586
	12,0	0,105	1466	4655
16,0	0,128	1340	3491	

Sgrossatura n:-10% F:-10% / Roughing n:-10% F:-10%

Raccomandate per lavorazioni 5 assi / Recommended for 5 axis machining

Notes

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Fresa 3 taglienti serie lunga semisferica
3 flute ball nose end mill, long versionSilmax
NORM λ 40°
 γ -4°

D	d h6	L	l ap	r f8	Z	Balinit® Latuma	X-Hard
3,0	6	78	4,5	1,50	3	HMC149030	HMH149030
4,0	6	78	6,0	2,00	3	HMC149040	HMH149040
5,0	6	78	7,5	2,50	3	HMC149050	HMH149050
6,0	6	78	9,0	3,00	3	HMC149060	HMH149060
8,0	8	104	12,0	4,00	3	HMC149080	HMH149080
10,0	10	104	15,0	5,00	3	HMC149100	HMH149100
12,0	12	104	18,0	6,00	3	HMC149120	HMH149120

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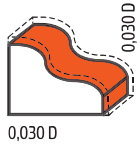
Fresa 4 taglienti serie lunga semisferica
4 flute ball nose end mill, long versionSilmax
NORM λ 30°
 γ -10°

D	d h6	L	l ap	r f8	Z	Balinit® Latuma	X-Hard
6,0	6	80	10,0	3,00	4	HMC147060	HMH147060
8,0	8	80	16,0	4,00	4	HMC147080	HMH147080
10,0	10	108	19,0	5,00	4	HMC147100	HMH147100
12,0	12	108	22,0	6,00	4	HMC147120	HMH147120
16,0	16	130	26,0	8,00	4	HMC147160	HMH147160

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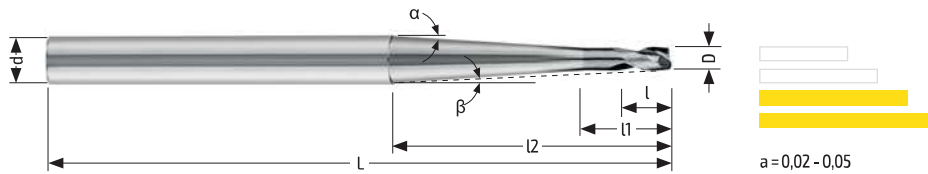
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Parametri di lavoro / Working Parameters

Materiale Material	Diametro Diameter			
Acciaio <800 N/mm ² Steel <800 N/mm ²	m/min	Vc=256		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,005	815	81487
	2,0	0,009	761	40764
	4,0	0,026	1054	20382
	5,0	0,031	1025	16306
	6,0	0,036	978	13588
	8,0	0,043	880	10191
	10,0	0,049	795	8153
12,0	0,053	725	6794	
Acciaio <1000 N/mm ² - Ghisa Steel <1000 N/mm ² - Cast iron	m/min	Vc=208		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,004	530	66208
	2,0	0,008	519	33121
	4,0	0,023	757	16561
	5,0	0,028	754	13248
	6,0	0,033	729	11040
	8,0	0,040	666	8280
	10,0	0,046	606	6624
12,0	0,050	556	5520	
Acciaio <1300 N/mm ² Steel <1300 N/mm ²	m/min	Vc=160		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,002	204	50930
	2,0	0,006	323	25478
	4,0	0,020	506	12739
	5,0	0,025	519	10191
	6,0	0,030	510	8493
	8,0	0,037	474	6369
	10,0	0,043	436	5096
12,0	0,047	402	4246	
Acciaio da stampi Mold Steel	m/min	Vc=80		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,002	102	25465
	2,0	0,006	161	12739
	4,0	0,020	253	6369
	5,0	0,025	259	5096
	6,0	0,030	255	4246
	8,0	0,037	237	3185
	10,0	0,043	218	2548
12,0	0,047	201	2123	

Notes

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Fresa 2 taglienti torica con collarino conico per lavorazioni in profondità
2 flute corner radius end mill with tapered neck for deep millingSilmax
NORM

λ 30°



1 2

Cr

D e8	d h6	L	l ap	l1	l2	α	β	Cr	Z	Balinit® Latuma
1,0	6	78	3,0	5,0	36,0	4,50	4,00	0,30	2	HMC19107801
1,5	6	78	3,0	6,0	35,0	4,30	3,80	0,30	2	HMC191078015
2,0	6	78	3,0	7,0	34,0	4,10	3,40	0,30	2	HMC19107802
2,0	6	105	3,0	7,0	61,0	2,10	1,90	0,30	2	HMC19110502
2,5	6	78	4,0	8,0	34,0	3,70	3,10	0,30	2	HMC191078025
2,5	6	105	4,0	8,0	61,0	1,80	1,70	0,30	2	HMC191105025
3,0	6	78	4,0	10,0	34,0	3,50	2,60	0,30	2	HMC19107803
3,0	6	105	4,0	10,0	61,0	1,60	1,40	0,30	2	HMC19110503
4,0	6	78	5,0	13,0	34,0	2,70	1,70	0,30	2	HMC19107804
4,0	6	105	5,0	13,0	61,0	1,20	1,00	0,30	2	HMC19110504
5,0	6	78	6,0	16,0	34,0	1,60	0,90	0,50	2	HMC19107805
5,0	6	105	6,0	16,0	61,0	0,60	0,50	0,50	2	HMC19110505
6,0	8	78	6,0	18,0	34,0	3,60	1,80	0,50	2	HMC19107806
6,0	8	105	6,0	18,0	61,0	1,30	1,00	0,50	2	HMC19110506
6,0	8	160	6,0	18,0	116,0	0,60	0,50	0,50	2	HMC19116006
8,0	10	105	8,0	24,0	57,0	1,70	1,10	0,50	2	HMC19110508
8,0	10	160	8,0	24,0	112,0	0,80	0,50	0,50	2	HMC19116008
10,0	12	105	10,0	30,0	51,0	2,70	1,20	1,00	2	HMC19110510
10,0	12	160	10,0	30,0	106,0	0,80	0,60	1,00	2	HMC19116010
12,0	16	160	12,0	36,0	102,0	1,70	1,20	1,00	2	HMC19116012

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UNV

Universali
Universal Line

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HPC

Alto Rendimento
High Performance

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HRC

Stampi
Molds

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TIS

Titanox e Superleghe
Titanox & Superalloys

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ALU

Leghe Leggere
Light Alloys

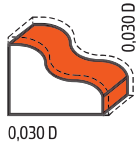
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CMP

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Parametri di lavoro / Working Parameters

Materiale Material	Diametro Diameter			
Acciaio <800 N/mm ² Steel <800 N/mm ²	m/min	Vc=288		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,018	3300	91673
	2,0	0,039	3548	45860
	4,0	0,135	6187	22930
	5,0	0,180	6587	18344
	6,0	0,216	6604	15287
	8,0	0,274	6272	11465
	10,0	0,318	5836	9172
12,0	0,355	5421	7643	
Acciaio <1000 N/mm ² - Ghisa Steel <1000 N/mm ² - Cast iron	m/min	Vc=234		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,011	1788	74485
	2,0	0,030	2212	37261
	4,0	0,117	4356	18631
	5,0	0,162	4815	14904
	6,0	0,198	4918	12420
	8,0	0,256	4761	9315
	10,0	0,300	4474	7452
12,0	0,337	4181	6210	
Acciaio <1300 N/mm ² Steel <1300 N/mm ²	m/min	Vc=180		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,011	1260	57325
	2,0	0,025	1417	28662
	4,0	0,099	2835	14331
	5,0	0,144	3291	11465
	6,0	0,180	3439	9554
	8,0	0,238	3404	7166
	10,0	0,282	3235	5732
12,0	0,319	3044	4777	
Acciaio da stampi Mold Steel	m/min	Vc=90		
	D mm	fz mm/z	F mm/min	n rpm
	1,0	0,011	630	28648
	2,0	0,025	709	14331
	4,0	0,099	1417	7166
	5,0	0,144	1646	5732
	6,0	0,180	1720	4777
	8,0	0,238	1702	3583
	10,0	0,282	1618	2866
12,0	0,319	1522	2389	

1
Acciaio
Steel

2
Ghise
Cast
Iron

3
Acciai
Temprati
Hardened
Steel

4
Acciaio
Inox
Stainless
Steel

5
Titanio
Titanium

6
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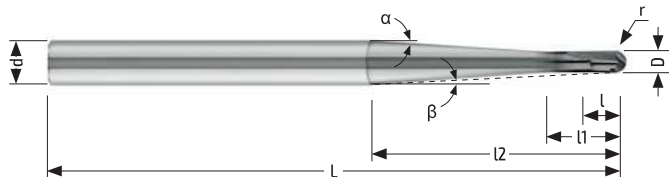
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Fresa 2 taglienti semisferica con collarino conico per lavorazioni in profondità
2 flute ball nose end mill with tapered neck for deep milling

a=0,02-0,05

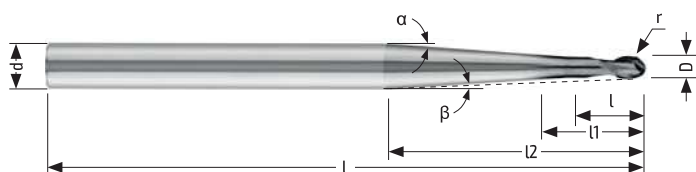
 $\lambda 0^\circ$ 

1 2



D	d _{h6}	L	l _{ap}	l1	l2	α	β	r _{f8}	Z	Balinit® Latuma
1,0	6	78	3,0	5,0	36,0	4,50	4,00	0,50	2	HMC19007801
1,5	6	78	3,0	6,0	35,0	4,30	3,80	0,75	2	HMC190078015
2,0	6	78	3,0	7,0	34,0	4,10	3,40	1,00	2	HMC19007802
2,0	6	105	3,0	7,0	61,0	2,10	1,90	1,00	2	HMC19010502
2,5	6	78	4,0	8,0	34,0	3,70	3,10	1,25	2	HMC190078025
2,5	6	105	4,0	8,0	61,0	1,80	1,70	1,25	2	HMC190105025
3,0	6	78	4,0	10,0	34,0	3,50	2,60	1,50	2	HMC19007803
3,0	6	105	4,0	10,0	61,0	1,60	1,40	1,50	2	HMC19010503
4,0	6	78	5,0	13,0	34,0	2,70	1,70	2,00	2	HMC19007804
4,0	6	105	5,0	13,0	61,0	1,20	1,00	2,00	2	HMC19010504
5,0	6	78	6,0	16,0	34,0	1,60	0,90	2,50	2	HMC19007805
5,0	6	105	6,0	16,0	61,0	0,60	0,50	2,50	2	HMC19010505
6,0	8	78	6,0	18,0	34,0	3,60	1,80	3,00	2	HMC19007806
6,0	8	105	6,0	18,0	61,0	1,30	1,00	3,00	2	HMC19010506
6,0	8	160	6,0	18,0	116,0	0,60	0,50	3,00	2	HMC19016006
8,0	10	105	8,0	24,0	57,0	1,70	1,10	4,00	2	HMC19010508
8,0	10	160	8,0	24,0	112,0	0,80	0,50	4,00	2	HMC19016008
10,0	12	105	10,0	30,0	51,0	2,70	1,20	5,00	2	HMC19010510
10,0	12	160	10,0	30,0	106,0	0,80	0,60	5,00	2	HMC19016010
12,0	16	160	12,0	36,0	102,0	1,70	1,20	6,00	2	HMC19016012

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Fresa 2 taglienti semisferica con collarino conico per lavorazioni in profondità
2 flute ball nose end mill with tapered neck for deep milling

a=0,02-0,05

 $\lambda 30^\circ$ 

1 2



D	d _{h6}	L	l _{ap}	l1	l2	α	β	r _{f8}	Z	Balinit® Latuma
1,0	6	78	3,0	5,0	36,0	4,50	4,00	0,50	2	HMC19207801
1,5	6	78	3,0	6,0	35,0	4,30	3,80	0,75	2	HMC192078015
2,0	6	78	3,0	7,0	34,0	4,10	3,40	1,00	2	HMC19207802
2,0	6	105	3,0	7,0	61,0	2,10	1,90	1,00	2	HMC19210502
2,5	6	78	4,0	8,0	34,0	3,70	3,10	1,25	2	HMC192078025
2,5	6	105	4,0	8,0	61,0	1,80	1,70	1,25	2	HMC192105025
3,0	6	78	4,0	10,0	34,0	3,50	2,60	1,50	2	HMC19207803
3,0	6	105	4,0	10,0	61,0	1,60	1,40	1,50	2	HMC19210503
4,0	6	78	5,0	13,0	34,0	2,70	1,70	2,00	2	HMC19207804
4,0	6	105	5,0	13,0	61,0	1,20	1,00	2,00	2	HMC19210504
5,0	6	78	6,0	16,0	34,0	1,60	0,90	2,50	2	HMC19207805
5,0	6	105	6,0	16,0	61,0	0,60	0,50	2,50	2	HMC19210505
6,0	8	78	6,0	18,0	34,0	3,60	1,80	3,00	2	HMC19207806
6,0	8	105	6,0	18,0	61,0	1,30	1,00	3,00	2	HMC19210506
6,0	8	160	6,0	18,0	116,0	0,60	0,50	3,00	2	HMC19216006
8,0	10	105	8,0	24,0	57,0	1,70	1,10	4,00	2	HMC19210508
8,0	10	160	8,0	24,0	112,0	0,80	0,50	4,00	2	HMC19216008
10,0	12	105	10,0	30,0	51,0	2,70	1,20	5,00	2	HMC19210510
10,0	12	160	10,0	30,0	106,0	0,80	0,60	5,00	2	HMC19216010
12,0	16	160	12,0	36,0	102,0	1,70	1,20	6,00	2	HMC19216012

Nervature / Stiffening Ribs

D	l1	Toriche / Corner radius						Sferiche / Ball nose						
		521A	521B	521C	521D	621H	721H	724H	522A	522B	522C	522D	622H	722H
		<30° ZZ	<1° ZZ	<1°30' ZZ	<2° ZZ	ZZ	ZZ	Z4	<30° ZZ	<1° ZZ	<1°30' ZZ	<2° ZZ	ZZ	ZZ
0,20	0,5					•			•	•		•	•	
	1,5						•							•
0,30	1,5							•	•		•			
	2,0													•
0,40	1,5							•	•		•			
	2,0						•							
	3,0						•							
	4,0						•							
0,50	2,0					•								•
	2,5	•	•		•			•	•		•			
	4,0					•								•
	5,0	•	•		•			•	•		•			
	6,0													•
	7,5	•	•		•			•	•		•			•
	8,0													•
	10,0					•							•	
0,60	2,0					•								•
	2,5					•							•	
	4,0					•								•
	5,0	•	•	•		•	•	•	•	•	•	•	•	•
	6,0					•								•
	7,5	•	•	•		•		•	•	•				•
	8,0													•
	10,0							•	•	•				•
0,70	2,0	•	•	•		•		•	•	•				
	4,0	•	•	•				•	•	•				
	6,0					•								•
0,80	4,0					•								•
	5,0					•								•
	6,0					•								•
	7,5					•								•
	8,0					•								•
	10,0													•
1,00	4,0													•
	5,0					•							•	
	6,0						•							•
	7,5					•							•	
	8,0						•							•
	10,0	•	•	•		•	•	•	•	•	•	•	•	•
	12,0					•								•
	15,0	•	•	•		•		•	•	•				•
	16,0													•
	17,5							•	•	•				•
20,0	•	•	•		•		•	•	•				•	
25,0	•	•	•		•		•	•	•				•	
1,20	6,0					•								•
	8,0					•								•
	12,0					•								•
1,40	6,0					•								•
	8,0					•								•
	12,0					•								•
	16,0													•
1,50	5,0												•	
	6,0						•							•
	7,5					•							•	
	8,0					•							•	
	10,0	•	•	•		•	•	•	•	•	•	•	•	•
	12,0					•								•
	15,0	•	•	•		•		•	•	•				•
	16,0					•	•							•
	17,5							•	•	•				•
	20,0	•	•	•		•		•	•	•				•
25,0	•	•	•		•		•	•	•				•	

D	l1	Toriche / Corner radius						Sferiche / Ball nose						
		521A	521B	521C	521D	621H	721H	724H	522A	522B	522C	522D	622H	722H
		<30° ZZ	<1° ZZ	<1°30' ZZ	<2° ZZ	ZZ	ZZ	Z4	<30° ZZ	<1° ZZ	<1°30' ZZ	<2° ZZ	ZZ	ZZ
1,60	6,0						•							•
	8,0													•
	12,0						•							•
	16,0						•							•
1,80	5,0												•	
	6,0						•		•					•
	7,5						•						•	
	8,0													•
	10,0	•	•	•		•		•	•	•	•	•	•	•
	12,0						•							•
	15,0	•	•	•		•		•	•	•				•
	16,0						•							•
	17,5							•	•	•				•
	20,0	•	•	•		•		•	•	•				•
25,0	•	•	•		•		•	•	•				•	
2,00	6,0						•	•						•
	10,0						•		•				•	
	12,0						•		•					•
	15,0	•	•	•		•		•	•	•	•	•	•	•
	16,0						•		•					•
	17,5												•	
	20,0	•	•	•		•	•	•	•	•	•	•	•	•
	25,0	•	•	•		•		•	•	•			•	•
	30,0	•	•	•		•		•	•	•				•
	35,0	•	•	•		•		•	•	•				•
40,0	•	•	•		•		•	•	•				•	
45,0	•	•	•		•		•	•	•				•	
2,50	10,0						•	•	•				•	•
	15,0	•	•	•		•		•		•	•	•	•	•
	16,0						•	•						•
	17,5												•	
	20,0	•	•	•		•	•	•	•	•	•	•	•	•
	25,0	•	•	•		•	•	•	•	•	•	•	•	•
	30,0							•	•	•				•
	35,0							•	•	•				•
	40,0							•	•	•				•
	45,0							•	•	•				•
3,00	10,0						•	•	•				•	•
	15,0	•	•	•		•		•		•	•	•	•	•
	16,0						•	•						•
	17,5												•	
	20,0	•	•	•		•	•	•	•	•	•	•	•	•
	25,0	•	•	•		•	•	•	•	•	•	•	•	•
	30,0	•	•	•		•		•	•	•			•	•
	35,0	•	•	•		•		•	•	•				•
40,0	•	•	•		•		•	•	•				•	
45,0	•	•	•		•		•	•	•				•	
4,00	10,0								•					•
	16,0								•					•
	20,0								•					•

Ribassamento "l1" a richiesta sui diametri disponibili, quantità minima 5 pezzi.
 "l1" neck relief upon request on available diameters, minimum order 5pcs.

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Fresa 2 taglienti torica per nervature
2 flute corner radius end mill for ribbingSilmax
NORM

λ 20°



D h8	Cr +/-0,01	L	l ap	d h5	d1	Z	l1	Balinit® Latuma
0,2	0,05	45	0,30	4	0,18	2	0,5	HMC72100502
							1,5	HMC72101502
0,3	0,05	45	0,45	4	0,18	2	1,5	HMC72101503
0,4	0,05	45	0,60	4	0,37	2	2,0	HMC72102004
							2,0	HMC72104004
0,5	0,05	45	0,70	4	0,47	2	2,0	HMC72102005
							4,0	HMC72104005
							6,0	HMC72106005
0,6	0,06	45	0,90	4	0,57	2	2,0	HMC72102006
							4,0	HMC72104006
							6,0	HMC72106006
0,7	0,07	45	1,00	4	0,67	2	2,0	HMC72102007
							4,0	HMC72104007
							6,0	HMC72106007
							4,0	HMC72104008
0,8	0,08	45	1,20	4	0,77	2	6,0	HMC72106008
							8,0	HMC72108008
							6,0	HMC72106010
1,0	0,10	50	1,50	4	0,96	2	8,0	HMC72108010
							10,0	HMC72110010
							12,0	HMC72112010
							6,0	HMC72106012
1,2	0,12	50	1,80	4	1,15	2	8,0	HMC72108012
							12,0	HMC72112012
							6,0	HMC72106014
1,4	0,14	50	2,10	4	1,34	2	8,0	HMC72108014
							12,0	HMC72112014
							6,0	HMC72106015
1,5	0,15	50	2,30	4	1,44	2	8,0	HMC72108015
							10,0	HMC72110015
							12,0	HMC72112015
							16,0	HMC72116015
1,6	0,16	50	2,40	4	1,54	2	6,0	HMC72106016
							12,0	HMC72112016
							16,0	HMC72116016
1,8	0,18	50	2,70	4	1,73	2	6,0	HMC72106018
							12,0	HMC72112018
							16,0	HMC72116018
2,0	0,20	62	3,00	4	1,92	2	6,0	HMC72106020
							12,0	HMC72112020
							16,0	HMC72116020
							20,0	HMC72120020
2,5	0,25	62	3,70	4	2,40	2	10,0	HMC72110025
							16,0	HMC72116025
							20,0	HMC72120025
							25,0	HMC72125025
3,0	0,30	80	4,50	6	2,88	2	10,0	HMC72110030
							16,0	HMC72116030
							20,0	HMC72120030
							25,0	HMC72125030
							30,0	HMC72130030

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UNV

Universali
Universal Line

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HPC

Alto Rendimento
High Performance

75

HRC

Stampi
Molds

113

TIS

Titanox e Superleghe
Titanium & Superalloys

137

ALU

Leghe Leggere
Light Alloys

155

CMP

Materiali Compositi
Composite Materials

Nervature / Stiffening Ribs

NEW

621

Fresa 2 taglienti torica per nervature con gambo rinforzato
2 flute corner radius end mill for ribbing with reinforced shank



λ 30°



D +0/-0,02	Cr +/-0,005	L	l ap	d h5	d1	Z	l1	Balinit® Latuma	
0,5	0,05	50	1,20	6	0,45	2	2,5	HMC62102505005	
							5,0	HMC62105005005	
0,6	0,06	50	1,20	6	0,55	2	2,5	HMC62102506006	
							5,0	HMC62105006006	
1,0	0,10	50	2,50	6	0,95	2	5,0	HMC62105010010	
							7,5	HMC62107510010	
							10,0	HMC62110010010	
							15,0	HMC62115010010	
	0,20	60	2,50	2,50	6	0,95	2	20,0	HMC62120010010
								5,0	HMC62105010020
								7,5	HMC62107510020
								10,0	HMC62110010020
								15,0	HMC62115010020
								20,0	HMC62120010020
1,5	0,15	60	2,50	6	1,45	2	7,5	HMC62107515015	
							10,0	HMC62110015015	
							15,0	HMC62115015015	
							20,0	HMC62120015015	
							25,0	HMC62125015015	
	0,30	60	2,50	2,50	6	1,45	2	7,5	HMC62107515030
								10,0	HMC62110015030
								15,0	HMC62115015030
								20,0	HMC62120015030
								25,0	HMC62125015030
1,8	0,18	60	2,50	6	1,70	2	7,5	HMC62107518018	
							10,0	HMC62110018018	
							15,0	HMC62115018018	
							20,0	HMC62120018018	
							25,0	HMC62125018018	
	0,50	60	2,50	2,50	6	1,70	2	7,5	HMC62107518050
								10,0	HMC62110018050
								15,0	HMC62115018050
								20,0	HMC62120018050
								25,0	HMC62125018050
2,0	0,20	60	5,00	6	1,90	2	10,0	HMC62110020020	
							15,0	HMC62115020020	
							20,0	HMC62120020020	
							25,0	HMC62125020020	
	0,50	60	5,00	5,00	6	1,90	2	10,0	HMC62110020050
								15,0	HMC62115020050
2,5	0,20	60	5,00	6	2,40	2	20,0	HMC62120025020	
							25,0	HMC62125025020	
							10,0	HMC62110025050	
							15,0	HMC62115025050	
							20,0	HMC62120025050	
	0,50	60	5,00	5,00	6	2,40	2	25,0	HMC62125025050
								10,0	HMC62110025050
								15,0	HMC62115025050
								20,0	HMC62120025050
								25,0	HMC62125025050

621

Fresa 2 taglienti torica per nervature con gambo rinforzato
2 flute corner radius end mill for ribbing with reinforced shank

D +0/-0,02	Cr +/-0,005	L	l _{ap}	d _{h5}	d1	Z	l1	Balinit® Latuma
3,0	0,20	60	5,00	6	2,90	2	10,0	HMC62110030020
							15,0	HMC62115030020
							20,0	HMC62120030020
							25,0	HMC62125030020
	0,50	60	5,00	6	2,90	2	10,0	HMC62110030050
							15,0	HMC62115030050
								HMC62120030050
							25,0	HMC62125030050

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Acciaio
Steel2
Ghise
Cast
Iron3
Acciai
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Steel4
Acciaio
Inox
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Nervature / Stiffening Ribs

NEW

521

Fresa 2 taglienti torica per nervature con collarino conico e gambo rinforzato
2 flute corner radius end mill for deep milling with tapered neck and reinforced shank

Silmax
NORM

λ 30°



D	Cr	L	l	d	d1	Z	α	l1	Balinit® Latuma
+0/-0,02	+/-0,005		ap	h5					
0,5	0,05	50	1,20	6	0,45	2	<0,5°	5,0	HMC521D05005005
								7,5	HMC521D07505005
								10,0	HMC521D10005005
							<1°	5,0	HMC521B05005005
								7,5	HMC521B07505005
								10,0	HMC521B10005005
							<2°	5,0	HMC521A05005005
								7,5	HMC521A07505005
								10,0	HMC521A10005005
0,8	0,08	50	2,50	6	0,75	2	<0,5°	5,0	HMC521D05008008
								7,5	HMC521D07508008
								10,0	HMC521D10008008
							<1°	5,0	HMC521B05008008
								7,5	HMC521B07508008
								10,0	HMC521B10008008
							<2°	5,0	HMC521A05008008
								7,5	HMC521A07508008
								10,0	HMC521A10008008
1,0	0,10	60	2,50	6	0,95	2	<0,5°	10,0	HMC521C10010010
								15,0	HMC521C15010010
								20,0	HMC521C20010010
							<1°	10,0	HMC521B10010010
								15,0	HMC521B15010010
								20,0	HMC521B20010010
							<1,5°	25,0	HMC521B25010010
								10,0	HMC521A10010010
								15,0	HMC521A15010010
	<0,5°	20,0	HMC521A20010010						
		25,0	HMC521A25010010						
		<1°	10,0	HMC521C10010020					
			15,0	HMC521C15010020					
			20,0	HMC521C20010020					
		<1,5°	25,0	HMC521C25010020					
			10,0	HMC521B10010020					
			15,0	HMC521B15010020					
		<1°	20,0	HMC521B20010020					
25,0	HMC521B25010020								
<1,5°	10,0		HMC521A10010020						
	15,0	HMC521A15010020							
	20,0	HMC521A20010020							
25,0	HMC521A25010020								

Notes

521

Fresa 2 taglienti torica per nervature con collarino conico e gambo rinforzato
2 flute corner radius end mill for deep milling with tapered neck and reinforced shank

D	Cr	L	l	d	d1	Z	α	l1	Balinit® Latuma
+0/-0,02	+/-0,005		ap	h5					
1,5	0,15	60	2,50	6	1,45	2	<0,5°	10,0	HMC521C10015015
								15,0	HMC521C15015015
								20,0	HMC521C20015015
								25,0	HMC521C25015015
							<1°	10,0	HMC521B10015015
								15,0	HMC521B15015015
								20,0	HMC521B20015015
								25,0	HMC521B25015015
							<1,5°	10,0	HMC521A10015015
								15,0	HMC521A15015015
								20,0	HMC521A20015015
								25,0	HMC521A25015015
1,5	0,30	60	2,50	6	1,45	2	<0,5°	10,0	HMC521C10015030
								15,0	HMC521C15015030
								20,0	HMC521C20015030
								25,0	HMC521C25015030
							<1°	10,0	HMC521B10015030
								15,0	HMC521B15015030
								20,0	HMC521B20015030
								25,0	HMC521B25015030
							<1,5°	10,0	HMC521A10015030
								15,0	HMC521A15015030
								20,0	HMC521A20015030
								25,0	HMC521A25015030
1,8	0,18	60	2,50	6	1,70	2	<0,5°	10,0	HMC521C10018018
								15,0	HMC521C15018018
								20,0	HMC521C20018018
								25,0	HMC521C25018018
							<1°	10,0	HMC521B10018018
								15,0	HMC521B15018018
								20,0	HMC521B20018018
								25,0	HMC521B25018018
							<1,5°	10,0	HMC521A10018018
								15,0	HMC521A15018018
								20,0	HMC521A20018018
								25,0	HMC521A25018018
1,8	0,50	60	2,50	6	1,70	1	<0,5°	10,0	HMC521C10018050
								15,0	HMC521C15018050
								20,0	HMC521C20018050
								25,0	HMC521C25018050
							<1°	10,0	HMC521B10018050
								15,0	HMC521B15018050
								20,0	HMC521B20018050
								25,0	HMC521B25018050
							<1,5°	10,0	HMC521A10018050
								15,0	HMC521A15018050
								20,0	HMC521A20018050
								25,0	HMC521A25018050

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Acciaio
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Acciaio
Inox
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Nervature / Stiffening Ribs

NEW

521

Fresa 2 taglienti torica per nervature con collarino conico e gambo rinforzato
2 flute corner radius end mill for deep milling with tapered neck and reinforced shank



D	Cr	L	l _{ap}	d	d1	Z	α	l1	Balinit® Latuma						
+0/-0,02	+/-0,005			h5											
2,0	0,20	60	5,00	6	1,90	1	<0,5°	15,0	HMC521C15020020						
								20,0	HMC521C20020020						
								25,0	HMC521C25020020						
							<1°	15,0	HMC521B15020020						
								20,0	HMC521B20020020						
								25,0	HMC521B25020020						
		<1,5°	15,0	HMC521A15020020											
			20,0	HMC521A20020020											
			25,0	HMC521A25020020											
		78	5,00	6	1,90	1	<0,5°	30,0	HMC521C30020020						
								35,0	HMC521C35020020						
								40,0	HMC521C40020020						
	<1°						45,0	HMC521C45020020							
							30,0	HMC521B30020020							
							35,0	HMC521B35020020							
	<1,5°	40,0	HMC521B40020020												
		45,0	HMC521B45020020												
		30,0	HMC521A30020020												
	35,0	HMC521A35020020	40,0	HMC521A40020020	45,0	HMC521A45020020									
							0,50	60	5,00	6	1,90	1	<0,5°	15,0	HMC521C15020050
														20,0	HMC521C20020050
	25,0	HMC521C25020050													
	<1°	15,0	HMC521B15020050												
		20,0	HMC521B20020050												
25,0		HMC521B25020050													
<1,5°	15,0	HMC521A15020050													
	20,0	HMC521A20020050													
	25,0	HMC521A25020050													
78	5,00	6	1,90	1	<0,5°	30,0		HMC521C30020050							
						35,0		HMC521C35020050							
						40,0		HMC521C40020050							
					<1°	45,0	HMC521C45020050								
						30,0	HMC521B30020050								
						35,0	HMC521B35020050								
<1,5°	40,0	HMC521B40020050													
	45,0	HMC521B45020050													
	30,0	HMC521A30020050													
35,0	HMC521A35020050	40,0	HMC521A40020050	45,0	HMC521A45020050										
						2,5	60	5,00	6	2,40	2	<0,5°	15,0	HMC521C15025020	
													20,0	HMC521C20025020	
25,0	HMC521C25025020														
<1°	15,0	HMC521B15025020													
	20,0	HMC521B20025020													
	25,0	HMC521B25025020													
<1,5°	15,0	HMC521A15025020													
	20,0	HMC521A20025020													
	25,0	HMC521A25025020													
0,50	60	5,00	6	2,40	2		<0,5°	15,0	HMC521C15025050						
								20,0	HMC521C20025050						
								25,0	HMC521C25025050						
						<1°	15,0	HMC521B15025050							
							20,0	HMC521B20025050							
							25,0	HMC521B25025050							
<1,5°	15,0	HMC521A15025050													
	20,0	HMC521A20025050													
	25,0	HMC521A25025050													

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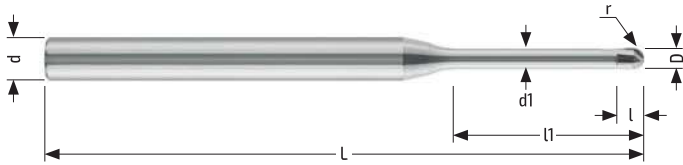
Fresa 2 taglienti torica per nervature con collarino conico e gambo rinforzato
2 flute corner radius end mill for deep milling with tapered neck and reinforced shank

D	Cr	L	l _{ap}	d	d1	Z	α	l1	Balinit® Latuma	
+0/-0,02	+/-0,005			h5						
3,0	0,20	60	5,00	6	2,90	2	<0,5°	15,0	HMC521C15030020	
								20,0	HMC521C20030020	
								25,0	HMC521C25030020	
							<1°	15,0	HMC521B15030020	
								20,0	HMC521B20030020	
								25,0	HMC521B25030020	
		<1,5°	15,0	HMC521A15030020						
			20,0	HMC521A20030020						
			25,0	HMC521A25030020						
		0,50	60	5,00	6	2,90	2	<0,5°	30,0	HMC521C30030020
									35,0	HMC521C35030020
									40,0	HMC521C40030020
	<1°							45,0	HMC521C45030020	
								30,0	HMC521B30030020	
								35,0	HMC521B35030020	
	<1,5°		40,0	HMC521B40030020						
			45,0	HMC521B45030020						
			30,0	HMC521A30030020						
	78		5,00	6	2,90	2	<1°	35,0	HMC521A35030020	
								40,0	HMC521A40030020	
								45,0	HMC521A45030020	
		<1,5°					30,0	HMC521A30030050		
							35,0	HMC521A35030050		
							40,0	HMC521A40030050		
0,50	60	5,00	6	2,90	2	<0,5°	45,0	HMC521A45030050		
							15,0	HMC521C15030050		
							20,0	HMC521C20030050		
						<1°	25,0	HMC521C25030050		
							15,0	HMC521B15030050		
							20,0	HMC521B20030050		
	<1,5°	25,0	HMC521B25030050							
		15,0	HMC521A15030050							
		20,0	HMC521A20030050							
	78	5,00	6	2,90	2	<0,5°	25,0	HMC521A25030050		
							30,0	HMC521C30030050		
							35,0	HMC521C35030050		
<1°						40,0	HMC521C40030050			
						45,0	HMC521C45030050			
						30,0	HMC521B30030050			
<1,5°	35,0	HMC521B35030050								
	40,0	HMC521B40030050								
	45,0	HMC521B45030050								
0,50	78	5,00	6	2,90	2	<1,5°	30,0	HMC521A30030050		
							35,0	HMC521A35030050		
							40,0	HMC521A40030050		
						<1,5°	45,0	HMC521A45030050		
							30,0	HMC521A30030050		
							35,0	HMC521A35030050		
<1,5°	40,0	HMC521A40030050								
	45,0	HMC521A45030050								
	45,0	HMC521A45030050								

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Acciaio
Steel2
Ghise
Cast
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Acciai
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Nervature / Stiffening Ribs

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Fresa 2 taglienti semisferica per nervature
2 flute ball nose end mill for ribbing $\lambda 0^\circ$ 

D	r +/-0,005	L	l ap	d h5	d1	Z	l1	Balinit® Latuma
0,2	0,10	45	0,16	4	0,18	2	0,5	HMC72200502
							1,5	HMC72201502
0,3	0,15	45	0,26	4	0,28	2	2,0	HMC72202003
0,4	0,20	45	0,30	4	0,37	2	1,5	HMC72201504
							3,0	HMC72203004
0,5	0,25	45	0,40	4	0,47	2	2,0	HMC72202005
							4,0	HMC72204005
							6,0	HMC72206005
							8,0	HMC72208005
0,6	0,30	45	0,50	4	0,57	2	2,0	HMC72202006
							4,0	HMC72204006
							6,0	HMC72206006
							8,0	HMC72208006
0,8	0,40	45	0,60	4	0,77	2	4,0	HMC72204008
							6,0	HMC72206008
							8,0	HMC72208008
							10,0	HMC72210008
1,0	0,50	50	0,80	4	0,96	2	4,0	HMC72204010
							6,0	HMC72206010
							8,0	HMC72208010
							10,0	HMC72210010
							12,0	HMC72212010
1,2	0,60	50	1,00	4	1,15	2	16,0	HMC72216010
							6,0	HMC72206012
1,4	0,70	50	1,10	4	1,34	2	12,0	HMC72212012
							8,0	HMC72208014
1,5	0,75	50	1,20	4	1,44	2	16,0	HMC72216014
							8,0	HMC72208015
							12,0	HMC72212015
1,6	0,80	50	1,30	4	1,54	2	16,0	HMC72216015
							8,0	HMC72208016
							12,0	HMC72212016
1,8	0,90	50	1,40	4	1,73	2	16,0	HMC72216016
							8,0	HMC72208018
							12,0	HMC72212018
2,0	1,00	62	1,60	4	1,92	2	16,0	HMC72216018
							6,0	HMC72206020
							10,0	HMC72210020
							12,0	HMC72212020
							16,0	HMC72216020
3,0	1,50	80	2,40	6	2,88	2	20,0	HMC72220020
							25,0	HMC72225020
							10,0	HMC72210030
							16,0	HMC72216030
							20,0	HMC72220030
							25,0	HMC72225030
							30,0	HMC72230030

Notes

NEW

622

Fresa 2 taglienti semisferica per nervature con gambo rinforzato
2 flute ball nose end mill for ribbing with reinforced shankSilmax
NORM

λ 30°



1

2

3



D	r +/-0,005	L	l ap	d h5	d1	Z	l1	Balinit® Latuma
0,5	0,25	50	1,20	6	0,45	2	2,0	HMC62202005
							5,0	HMC62205005
0,6	0,30	50	1,20	6	0,55	2	2,0	HMC62202006
							5,0	HMC62205006
1,0	0,50	50	2,50	6	0,95	2	5,0	HMC62205010
							7,5	HMC62207510
							10,0	HMC62210010
1,5	0,75	50	2,50	6	1,45	2	5,0	HMC62205015
							7,5	HMC62207515
							10,0	HMC62210015
1,8	0,90	50	2,50	6	1,70	2	5,0	HMC62205018
							7,5	HMC62207518
							10,0	HMC62210018
2,0	1,00	60	5,00	6	1,90	2	10,0	HMC62210020
							15,0	HMC62215020
							17,5	HMC62217520
							20,0	HMC62220020
							25,0	HMC62225020
2,5	1,25	60	5,00	6	2,40	2	10,0	HMC62210025
							15,0	HMC62215025
							17,5	HMC62217525
							20,0	HMC62220025
3,0	1,50	60	5,00	6	2,90	2	10,0	HMC62210030
							15,0	HMC62215030
							17,5	HMC62217530
							20,0	HMC62220030
							25,0	HMC62225030

31



UNV

Universali
Universal Line

53



HPC

Alto Rendimento
High Performance

75



HRC

Stampi
Molds

113



TIS

Titanox e Superleghe
Titanox & Superalloys

137



ALU

Leghe Leggere
Light Alloys

155



CMP

Materiali Compositi
Composite Materials1
Acciaio
Steel2
Ghise
Cast
Iron3
Acciai
Temprati
Hardened
Steel4
Acciaio
Inox
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Steel5
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Nervature / Stiffening Ribs

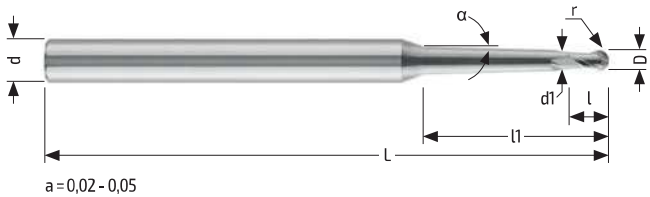
NEW

522

Fresa 2 taglienti semisferica per nervature con collarino conico e gambo rinforzato
2 flute ball nose end mill for ribbing with tapered neck and reinforced shank



λ 30°



D	r +/-0,005	L	l ap	d h5	d1	Z	α	l1	Balinit® Latuma
0,5	0,25	50	1,20	6	0,45	2	<0,5°	5,0	HMC522A05005
								7,5	HMC522A07505
								10,0	HMC522A10005
							<1°	5,0	HMC522B05005
								7,5	HMC522B07505
								10,0	HMC522B10005
							<2°	5,0	HMC522D05005
								7,5	HMC522D07505
								10,0	HMC522D10005
0,6	0,30	50	1,20	6	0,55	2	<0,5°	5,0	HMC522A05006
								7,5	HMC522A07506
								10,0	HMC522A10006
							<1°	5,0	HMC522B05006
								7,5	HMC522B07506
								10,0	HMC522B10006
							<2°	5,0	HMC522D05006
								7,5	HMC522D07506
								10,0	HMC522D10006
0,8	0,40	50	2,50	6	0,75	2	<0,5°	5,0	HMC522A05008
								7,5	HMC522A07508
								10,0	HMC522A10008
							<1°	5,0	HMC522B05008
								7,5	HMC522B07508
								10,0	HMC522B10008
							<2°	5,0	HMC522D05008
								7,5	HMC522D07508
								10,0	HMC522D10008
1,0	0,50	60	2,50	6	0,95	2	<0,5°	10,0	HMC522A10010
								15,0	HMC522A15010
								17,5	HMC522A17510
								20,0	HMC522A20010
								25,0	HMC522A25010
							<1°	10,0	HMC522B10010
								15,0	HMC522B15010
								17,5	HMC522B17510
								20,0	HMC522B20010
								25,0	HMC522B25010
							<1,5°	10,0	HMC522C10010
								15,0	HMC522C15010
								17,5	HMC522C17510
								20,0	HMC522C20010
								25,0	HMC522C25010

Notes

522

Fresa 2 taglienti semisferica per nervature con collarino conico e gambo rinforzato
2 flute ball nose end mill for ribbing with tapered neck and reinforced shank

D	r +/-0,005	L	l ap	d h5	d1	Z	α	l1	Balinit® Latuma
1,5	0,75	60	2,50	6	1,45	2	<0,5°	10,0	HMC522A10015
								15,0	HMC522A15015
								17,5	HMC522A17515
								20,0	HMC522A20015
								25,0	HMC522A25015
							<1°	10,0	HMC522B10015
								15,0	HMC522B15015
								17,5	HMC522B17515
								20,0	HMC522B20015
								25,0	HMC522B25015
							<1,5°	10,0	HMC522C10015
								15,0	HMC522C15015
								17,5	HMC522C17515
								20,0	HMC522C20015
								25,0	HMC522C25015
1,8	0,90	60	2,50	6	1,70	2	<0,5°	10,0	HMC522A10018
								15,0	HMC522A15018
								17,5	HMC522A17518
								20,0	HMC522A20018
								25,0	HMC522A25018
							<1°	10,0	HMC522B10018
								15,0	HMC522B15018
								17,5	HMC522B17518
								20,0	HMC522B20018
								25,0	HMC522B25018
							<1,5°	10,0	HMC522C10018
								15,0	HMC522C15018
								17,5	HMC522C17518
								20,0	HMC522C20018
								25,0	HMC522C25018
2,0	1,00	60	5,00	6	1,90	2	<0,5°	15,0	HMC522A15020
								20,0	HMC522A20020
								25,0	HMC522A25020
							<1°	15,0	HMC522B15020
								20,0	HMC522B20020
								25,0	HMC522B25020
							<1,5°	15,0	HMC522C15020
								20,0	HMC522C20020
								25,0	HMC522C25020
		78	5,00	6	1,90	2	<0,5°	30,0	HMC522A30020
								35,0	HMC522A35020
								40,0	HMC522A40020
							<1°	30,0	HMC522B30020
								35,0	HMC522B35020
								40,0	HMC522B40020
<1,5°	30,0	HMC522C30020							
	35,0	HMC522C35020							
	40,0	HMC522C40020							
45,0	HMC522C45020								

1
Acciaio
Steel2
Ghise
Cast
Iron3
Acciai
Temprati
Hardened
Steel4
Acciaio
Inox
Stainless
Steel5
Titanio
Titanium6
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Nervature / Stiffening Ribs

NEW

522

Fresa 2 taglienti semisferica per nervature con collarino conico e gambo rinforzato
2 flute ball nose end mill for ribbing with tapered neck and reinforced shank



D	r +/-0,005	L	l ap	d h5	d1	Z	α	l1	Balinit® Latuma
2,5	1,25	60	5,00	6	2,40	2	<0,5°	15,0	HMC522A15025
								20,0	HMC522A20025
								25,0	HMC522A25025
							<1°	15,0	HMC522B15025
								20,0	HMC522B20025
								25,0	HMC522B25025
		<1,5°	15,0	HMC522C15025					
			20,0	HMC522C20025					
			25,0	HMC522C25025					
		78	5,00	6	2,40	2	<0,5°	30,0	HMC522A30025
								35,0	HMC522A35025
								40,0	HMC522A40025
							<1°	45,0	HMC522A45025
								30,0	HMC522B30025
								35,0	HMC522B35025
							40,0	HMC522B40025	
								45,0	HMC522B45025
								<1,5°	30,0
35,0	HMC522C35025								
40,0	HMC522C40025								
45,0	HMC522C45025								
3,0	1,50	60	5,00	6	2,90	2	<0,5°	15,0	HMC522A15030
								20,0	HMC522A20030
								25,0	HMC522A25030
							<1°	15,0	HMC522B15030
								20,0	HMC522B20030
								25,0	HMC522B25030
		<1,5°	15,0	HMC522C15030					
			20,0	HMC522C20030					
			25,0	HMC522C25030					
		78	5,00	6	2,90	2	<0,5°	30,0	HMC522A30030
								35,0	HMC522A35030
								40,0	HMC522A40030
							<1°	45,0	HMC522A45030
								30,0	HMC522B30030
								35,0	HMC522B35030
							40,0	HMC522B40030	
								45,0	HMC522B45030
								<1,5°	30,0
35,0	HMC522C35030								
40,0	HMC522C40030								
45,0	HMC522C45030								

Notes

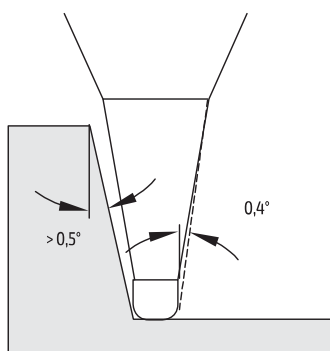
724

Fresa 4 taglienti torica per nervature
4 flute corner radius end mill for ribbingSilmax
NORM

λ 45°



D h8	Cr +/-0,01	L	l ap	d h5	d1	Z	l1	Balinit® Latuma
1,5	0,30	80	2,30	6	1,44	4	10,0	HMC72410015030
							16,0	HMC72416015030
							20,0	HMC72420015030
2,0	0,50	80	3,00	6	1,94	4	10,0	HMC72410020050
							16,0	HMC72416020050
							20,0	HMC72420020050
2,5	0,50	80	3,70	6	2,44	4	10,0	HMC72410025050
							16,0	HMC72416025050
							20,0	HMC72420025050
3,0	0,50	80	4,50	6	2,94	4	10,0	HMC72410030050
							16,0	HMC72416030050
							20,0	HMC72420030050
4,0	0,50	80	6,00	6	3,94	4	10,0	HMC72410040050
							16,0	HMC72416040050
							20,0	HMC72420040050



Parte ribassata con rastremazione per consentire la lavorazione di pareti con inclinazione superiore ad 0,5°.

Increased stability with 0,4° neck angle. Allowed machining with inclination of the rib >0,5°.

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Acciaio
Steel2
Ghise
Cast
Iron3
Acciai
Temprati
Hardened
Steel4
Acciaio
Inox
Stainless
Steel5
Titanio
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Nervature / Stiffening Ribs



Frese toriche per Nervature
Corner radius end mills for ribbing

Parametri di lavoro
Working Parameters

521/621/721/724*	HRC < 35				HRC 35 ÷ 45				HRC 45 ÷ 55				HRC 55 ÷ 65			
L1/D <4	ae	0,25D	ap	0,05D	ae	0,25D	ap	0,05D	ae	0,2D	ap	0,05D	ae	0,18D	ap	0,05D
L1/D <8	ae	0,2D	ap	0,04D	ae	0,2D	ap	0,04D	ae	0,18D	ap	0,04D	ae	0,14D	ap	0,04D
L1/D <12	ae	0,16D	ap	0,03D	ae	0,16D	ap	0,03D	ae	0,14D	ap	0,03D	ae	0,12D	ap	0,01D
L1/D >12	ae	0,12D	ap	0,02D	ae	0,12D	ap	0,02D	ae	0,1D	ap	0,02D	ae	0,1D	ap	0,01D

D	cr	L1	L1/D	Vc	fz	F	n	Vc	fz	F	n	Vc	fz	F	n	Vc	fz	F	n
0,2	0,05	0,5	2,50	31	0,013	1296	49500	26	0,011	991	42075	23	0,010	777	37125	21	0,009	635	34650
0,2	0,05	1,5	7,50	31	0,010	1080	49500	24	0,010	792	39550	30	0,009	634	34897	30	0,007	477	32571
0,3	0,05	1,5	5,00	46	0,015	1558	49500	34	0,012	927	36352	34	0,010	693	32076	27	0,009	558	29937
0,4	0,05	2	5,00	59	0,017	1658	47520	42	0,015	1057	33660	44	0,013	829	29700	35	0,012	677	27720
0,4	0,05	4	10,00	53	0,015	1343	42768	38	0,015	952	30294	44	0,013	746	26730	35	0,012	609	24948
0,5	0,05	2	4,00	77	0,022	2250	49500	55	0,019	1354	35452	49	0,016	1021	31282	39	0,013	796	29196
0,5	0,05	4	8,00	64	0,020	1719	41057	45	0,017	990	29082	49	0,014	738	25660	39	0,012	595	23950
0,5	0,05	6	12,00	57	0,018	1337	36495	45	0,017	990	29082	39	0,012	567	22809	29	0,010	445	21288
0,6	0,05	2	3,33	93	0,029	2880	49500	66	0,022	1611	35452	58	0,019	1251	31282	46	0,016	954	29196
0,6	0,05	4	6,67	77	0,026	2150	41057	54	0,021	1237	29082	53	0,017	923	25660	42	0,015	744	23950
0,6	0,05	6	10,00	77	0,026	2150	41057	54	0,021	1237	29082	53	0,017	923	25660	42	0,015	744	23950
0,7	0,05	2	2,86	108	0,029	2880	49500	75	0,021	1466	34556	64	0,018	1044	28710	51	0,015	900	28458
0,7	0,05	4	5,71	90	0,026	2150	41057	68	0,020	1279	31371	58	0,017	980	27680	46	0,015	753	24449
0,7	0,05	6	8,57	90	0,026	2150	41057	65	0,020	1213	29688	58	0,017	928	26195	46	0,015	757	24449
0,8	0,05	4	5,00	119	0,021	2073	47520	84	0,019	1322	33660	66	0,017	1036	29700	53	0,015	846	27720
0,8	0,05	6	7,50	107	0,020	1710	42768	76	0,019	1189	30294	66	0,017	933	26730	53	0,015	762	24948
0,8	0,05	8	10,00	107	0,019	1679	42768	76	0,019	1211	30294	66	0,017	923	26730	53	0,015	771	24948
1,0	0,10	6	6,00	120	0,029	2267	38412	85	0,029	1606	27264	73	0,026	1260	24057	58	0,022	1028	22453
1,0	0,10	8	8,00	120	0,029	2267	38412	85	0,029	1606	27264	73	0,026	1260	24057	58	0,022	1028	22453
1,0	0,10	10	10,00	120	0,029	2267	38412	85	0,029	1606	27264	73	0,026	1260	24057	58	0,022	1028	22453
1,0	0,10	12	12,00	107	0,026	1791	34214	76	0,022	1110	24235	58	0,022	980	21384	43	0,019	783	19958
1,2	0,10	6	5,00	134	0,030	2160	35640	95	0,030	1521	25268	74	0,026	1191	22077	59	0,023	977	20599
1,2	0,10	8	6,67	134	0,030	2160	35640	93	0,029	1463	24841	74	0,026	1148	21918	59	0,022	937	20457
1,2	0,10	12	10,00	119	0,027	1773	31680	93	0,029	1463	24841	74	0,026	1148	21918	59	0,022	937	20457
1,4	0,10	6	4,29	148	0,032	2160	33660	102	0,030	1437	23272	74	0,027	1123	20097	59	0,024	927	18746
1,4	0,10	8	5,71	148	0,026	1764	33660	98	0,029	1320	22417	74	0,026	1036	19780	59	0,022	845	18461
1,4	0,10	12	8,57	137	0,028	1764	31185	98	0,029	1320	22417	74	0,026	1036	19780	59	0,022	845	18461
1,5	0,10	6	4,00	149	0,033	2094	31680	104	0,031	1395	22275	74	0,028	1089	19107	59	0,025	901	17820
1,5	0,10	8	5,33	141	0,029	1764	29937	99	0,029	1249	21205	74	0,026	980	18711	59	0,022	800	17463
1,5	0,10	10	6,67	141	0,029	1764	29937	99	0,029	1249	21205	74	0,026	980	18711	59	0,022	800	17463
1,5	0,10	12	8,00	141	0,029	1764	29937	99	0,029	1249	21205	74	0,026	980	18711	59	0,022	800	17463
1,5	0,10	16	10,70	125	0,026	1393	26532	88	0,022	864	18849	59	0,022	762	16632	44	0,019	609	15523
1,6	0,20	6	3,75	139	0,042	2340	27720	107	0,036	1549	21354	82	0,031	1177	18404	65	0,028	917	17166
1,6	0,20	12	7,50	129	0,034	1791	25740	101	0,033	1350	20145	74	0,029	1059	17775	59	0,027	918	16590
1,6	0,20	16	10,00	129	0,034	1791	25740	91	0,028	1042	18260	74	0,027	885	16112	59	0,023	712	15038
1,8	0,20	6	3,33	148	0,051	2700	26334	110	0,047	1859	19512	82	0,039	1354	16998	65	0,035	1110	15859
1,8	0,20	12	6,67	136	0,044	2135	24096	101	0,043	1553	18024	74	0,038	1218	15904	59	0,038	1153	14844
1,8	0,20	16	8,89	136	0,044	2135	24096	96	0,040	1399	17082	74	0,037	1131	15072	59	0,032	918	14067
2,0	0,20	6	3,00	156	0,061	3061	24948	111	0,061	2169	17671	82	0,049	1530	15592	65	0,042	1250	14553
2,0	0,20	12	6,00	141	0,055	2480	22453	99	0,055	1756	15904	74	0,049	1377	14033	59	0,053	1389	13097
2,0	0,20	16	8,00	141	0,055	2480	22453	99	0,055	1756	15904	74	0,049	1377	14033	59	0,042	1125	13097
2,0	0,20	20	10,00	141	0,055	2480	22453	99	0,055	1756	15904	74	0,049	1377	14033	59	0,042	1125	13097
2,5	0,20	10	4,00	162	0,058	2406	20730	115	0,058	1704	14684	74	0,049	1272	12957	59	0,042	1038	12092
2,5	0,20	16	6,40	162	0,058	2406	20730	115	0,058	1704	14684	74	0,049	1272	12956	59	0,042	1038	12092
2,5	0,20	20	8,00	155	0,055	2185	19780	110	0,055	1547	14010	74	0,049	1213	12362	59	0,042	991	11538
2,5	0,20	25	10,00	139	0,061	2185	17820	110	0,055	1548	14011	74	0,049	1214	12363	59	0,042	991	11538
3,0	0,30	10	3,33	179	0,061	2332	19008	126	0,061	1652	13464	82	0,049	1166	11880	65	0,042	952	11088
3,0	0,30	16	5,33	179	0,061	2332	19008	126	0,061	1652	13464	74	0,049	1166	11880	59	0,042	952	11088
3,0	0,30	20	6,67	161	0,055	1890	17107	114	0,055	1338	12117	74	0,049	1049	10692	59	0,042	857	9979
3,0	0,30	25	8,33	161	0,055	1890	17107	114	0,055	1338	12117	74	0,049	1049	10692	59	0,042	857	9979
3,0	0,30	30	10,00	161	0,055	1890	17107	114	0,055	1338	12117	74	0,049	1049	10692	59	0,042	857	9979

(*) Considerare avanzamento F / Consider feed speed F



Frese Semisferiche per Nervature
Ball nose end mills for ribbing

Parametri di lavoro
Working Parameters

522/622/722	HRC < 35				HRC 35 > 45				HRC 45 ÷ 55				HRC 55 ÷ 65			
L1/D <4	ae	0,25D	ap	0,05D	ae	0,25D	ap	0,05D	ae	0,18D	ap	0,05D	ae	0,16D	ap	0,01D
L1/D <8	ae	0,2D	ap	0,04D	ae	0,2D	ap	0,04D	ae	0,14D	ap	0,04D	ae	0,12D	ap	0,01D
L1/D <12	ae	0,15D	ap	0,03D	ae	0,15D	ap	0,03D	ae	0,12D	ap	0,01D	ae	0,1D	ap	0,01D
L1/D >12	ae	0,1D	ap	0,02D	ae	0,1D	ap	0,02D	ae	0,1D	ap	0,01D	ae	0,1D	ap	0,01D

D	d	L1	L1/D	Vc	fz	F	n	Vc	fz	F	n	Vc	fz	F	n	Vc	fz	F	n
0,2	0,10	0,5	2,50	31	0,020	2025	49500	27	0,020	1822	44550	23	0,016	1215	37125	21	0,014	992	34650
0,2	0,10	1,5	7,50	24	0,018	1458	39600	22	0,018	1312	35640	18	0,016	972	29700	17	0,014	793	27720
0,3	0,15	2,0	6,67	46	0,018	1822	49500	41	0,018	1640	44550	34	0,016	1215	37125	32	0,014	992	34650
0,4	0,20	1,5	3,75	49	0,027	2160	39600	44	0,027	1944	35640	37	0,021	1296	29700	34	0,019	1058	27720
0,4	0,20	3,0	7,50	44	0,024	1749	35640	40	0,024	1575	32076	33	0,021	1166	26730	31	0,019	952	24948
0,5	0,25	2,0	4,00	62	0,027	2160	39600	55	0,027	1944	35640	46	0,021	1296	29700	43	0,019	1058	27720
0,5	0,25	4,0	8,00	55	0,024	1749	35640	50	0,024	1575	32076	41	0,021	1166	26730	39	0,019	952	24948
0,5	0,25	6,0	12,00	49	0,021	1382	31680	43	0,022	1243	27720	37	0,019	907	23760	34	0,016	725	22176
0,5	0,25	8,0	16,00	49	0,021	1382	31680	43	0,022	1243	27720	37	0,019	907	23760	34	0,016	725	22176
0,6	0,30	2,0	3,33	74	0,034	2700	39600	67	0,034	2430	35640	55	0,027	1620	29700	52	0,023	1323	27720
0,6	0,30	4,0	6,67	67	0,030	2187	35640	60	0,030	1968	32076	50	0,027	1458	26730	47	0,023	1190	24948
0,6	0,30	6,0	10,00	59	0,027	1728	31680	52	0,028	1555	27720	44	0,023	1134	23760	41	0,020	907	22176
0,6	0,30	8,0	13,30	59	0,027	1728	31680	52	0,028	1555	27720	44	0,023	1134	23760	41	0,020	907	22176
0,8	0,40	4,0	5,00	99	0,034	2700	39600	89	0,034	2430	35640	74	0,027	1620	29700	69	0,023	1323	27720
0,8	0,40	6,0	7,50	89	0,030	2187	35640	80	0,030	1968	32076	67	0,027	1458	26730	62	0,023	1190	24948
0,8	0,40	8,0	10,00	79	0,027	1728	31680	69	0,028	1555	27720	59	0,023	1134	23760	55	0,020	907	22176
0,8	0,40	10,0	12,50	79	0,027	1728	31680	69	0,028	1555	27720	59	0,023	1134	23760	55	0,020	907	22176
1,0	0,50	4,0	4,00	111	0,040	2916	35640	100	0,040	2624	32076	83	0,032	1749	26730	78	0,028	1429	24948
1,0	0,50	6,0	6,00	100	0,036	2361	32076	90	0,036	2125	28868	75	0,032	1575	24057	70	0,028	1286	22453
1,0	0,50	8,0	8,00	100	0,036	2361	32076	90	0,036	2125	28868	75	0,032	1575	24057	70	0,028	1286	22453
1,0	0,50	10,0	10,00	100	0,036	2361	32076	90	0,036	2125	28868	75	0,032	1575	24057	70	0,028	1286	22453
1,0	0,50	12,0	12,00	89	0,032	1866	28512	80	0,032	1679	25660	67	0,028	1224	21384	62	0,024	980	19958
1,0	0,50	16,0	16,00	89	0,028	1632	28512	80	0,028	1469	25660	67	0,024	1049	21384	62	0,020	816	19958
1,2	0,60	6,0	5,00	120	0,036	2361	32076	108	0,036	2125	28868	90	0,032	1575	24057	84	0,028	1286	22453
1,2	0,60	12,0	10,00	107	0,036	2099	28512	96	0,036	1890	25660	80	0,032	1399	21384	75	0,028	1143	19958
1,4	0,70	8,0	5,71	109	0,036	1836	24948	98	0,036	1653	22453	82	0,032	1224	18711	76	0,028	999	17463
1,4	0,70	16,0	11,40	97	0,032	1451	22176	87	0,032	1306	19958	73	0,028	952	16632	68	0,024	762	15523
1,5	0,75	8,0	5,33	117	0,036	1836	24948	105	0,036	1653	22453	88	0,032	1224	18711	82	0,028	999	17463
1,5	0,75	12,0	8,00	117	0,036	1836	24948	105	0,036	1653	22453	88	0,032	1224	18711	82	0,028	999	17463
1,5	0,75	16,0	10,70	104	0,032	1451	22176	94	0,032	1306	19958	78	0,028	952	16632	73	0,024	762	15523
1,6	0,80	8,0	5,00	129	0,045	2340	25740	116	0,045	2106	23166	97	0,036	1404	19305	90	0,031	1146	18018
1,6	0,80	12,0	7,50	116	0,040	1895	23166	104	0,040	1705	20849	87	0,036	1263	17374	81	0,031	1032	16216
1,6	0,80	16,0	10,00	103	0,036	1497	20592	93	0,036	1348	18532	77	0,031	982	15444	72	0,027	786	14414
1,8	0,90	8,0	4,44	131	0,040	1895	23166	131	0,045	2106	23166	109	0,036	1404	19305	101	0,031	1146	18018
1,8	0,90	12,0	6,67	131	0,040	1895	23166	117	0,040	1705	20849	98	0,036	1263	17374	91	0,031	1032	16216
1,8	0,90	16,0	8,89	131	0,040	1895	23166	117	0,040	1705	20849	98	0,036	1263	17374	91	0,031	1032	16216
2,0	1,00	6,0	3,00	130	0,068	2835	20790	117	0,068	2551	18711	97	0,054	1701	15592	91	0,047	1389	14553
2,0	1,00	10,0	5,00	130	0,068	2835	20790	117	0,068	2551	18711	97	0,054	1701	15592	91	0,047	1389	14553
2,0	1,00	12,0	6,00	117	0,061	2296	18711	105	0,061	2066	16839	88	0,054	1530	14033	82	0,047	1250	13097
2,0	1,00	16,0	8,00	117	0,061	2296	18711	105	0,061	2066	16839	88	0,054	1530	14033	82	0,047	1250	13097
2,0	1,00	20,0	10,00	117	0,061	2296	18711	105	0,061	2066	16839	88	0,054	1530	14033	82	0,047	1250	13097
2,0	1,00	25,0	12,50	104	0,054	1814	16632	94	0,054	1632	14968	78	0,047	1190	12474	73	0,040	952	11642
3,0	1,50	10,0	3,33	149	0,068	2160	15840	134	0,068	1944	14256	111	0,054	1296	11880	104	0,047	1058	11088
3,0	1,50	16,0	5,33	134	0,059	1710	14256	120	0,061	1575	12830	100	0,054	1166	10692	94	0,047	952	9979
3,0	1,50	20,0	6,67	134	0,059	1710	14256	120	0,061	1575	12830	100	0,054	1166	10692	94	0,047	952	9979
3,0	1,50	25,0	8,33	134	0,059	1710	14256	120	0,061	1575	12830	100	0,054	1166	10692	94	0,047	952	9979
3,0	1,50	30,0	10,00	119	0,054	1382	12672	107	0,054	1243	11404	89	0,047	907	9504	83	0,040	725	8870