

## Solid carbide end mills

## Ball nose end mills



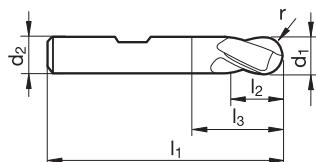
Catalog no. 64542

N	DIN 6527L	VHM	TiAlN	h10	R	HB	$30^\circ$
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P	M	K	N	S	H	
●	●	●	○	○		

Application  
recomm. p. 574

- centre cutting
- ball nose



d1 h10 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm	r mm	Z	Code no.
1.000	3.000	38.000	2.000	3.900	0.500	2	1.000
1.500	3.000	38.000	3.000	6.400	0.750	2	1.500
2.000	6.000	57.000	6.000	9.400	1.000	2	2.000
3.000	6.000	57.000	7.000	11.900	1.500	2	3.000
4.000	6.000	57.000	8.000	13.400	2.000	2	4.000
5.000	6.000	57.000	10.000	16.900	2.500	2	5.000
6.000	6.000	57.000	10.000	21.000	3.000	2	6.000
8.000	8.000	63.000	16.000	27.000	4.000	2	8.000
10.000	10.000	72.000	19.000	32.000	5.000	2	10.000
12.000	12.000	83.000	22.000	38.000	6.000	2	12.000
14.000	14.000	83.000	22.000	38.000	7.000	2	14.000
16.000	16.000	92.000	26.000	44.000	8.000	2	16.000
18.000	18.000	92.000	26.000	44.000	9.000	2	18.000
20.000	20.000	104.000	32.000	54.000	10.000	2	20.000

# Application recommend. for Carb. Slot Drills, End Mills, Ball Nose End Mills

		Feed column																	
Code-letter	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W			
tool-D mm	<b>2.00</b>	0.001	0.001	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.012	0.014	0.016	0.018	0.020	f (mm/tooth)	Feed
	<b>3.00</b>	0.002	0.002	0.003	0.003	0.004	0.007	0.010	0.010	0.015	0.016	0.013	0.019	0.022	0.024	0.030			
	<b>5.00</b>	0.005	0.006	0.007	0.009	0.010	0.014	0.020	0.020	0.025	0.026	0.026	0.028	0.030	0.032	0.038			
	<b>6.00</b>	0.006	0.008	0.009	0.011	0.013	0.017	0.024	0.025	0.027	0.031	0.029	0.033	0.039	0.036	0.041	0.047		
	<b>8.00</b>	0.010	0.012	0.014	0.016	0.019	0.024	0.032	0.032	0.035	0.042	0.042	0.047	0.053	0.052	0.058	0.064		
	<b>10.00</b>	0.013	0.015	0.018	0.021	0.025	0.030	0.038	0.039	0.044	0.050	0.053	0.059	0.065	0.066	0.073	0.080		
	<b>12.00</b>	0.010	0.018	0.022	0.026	0.030	0.036	0.046	0.048	0.052	0.059	0.063	0.072	0.079	0.085	0.090	0.100		
	<b>16.00</b>	0.020	0.023	0.027	0.032	0.038	0.045	0.054	0.058	0.063	0.071	0.079	0.088	0.095	0.100	0.110	0.120		
	<b>20.00</b>	0.023	0.028	0.033	0.038	0.045	0.057	0.066	0.073	0.080	0.090	0.097	0.100	0.110	0.120	0.130	0.140		
	<b>25.00</b>	0.030	0.035	0.040	0.045	0.055	0.065	0.075	0.100	0.120	0.130	0.140	0.150	0.165	0.170	0.180	0.190		

Feed rate codes in bold are the preferred choice for the respective material group.

## Oblique plunging and slot milling

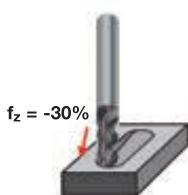
For oblique plunging the feed rate ( $v_f = \text{mm/min}$ ) should be reduced as illustrated.

In addition, chip evacuation is required for drilling depths in excess of  $1 \times D$ . This also applies to the transition to radial machining.

## slot milling

$a_p = \text{cut. depth } 0.5 \times D = f_z 100\%$

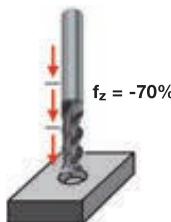
$a_p = \text{cut. depth } 1.0 \times D = f_z 75\%$



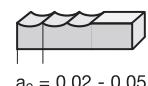
## Drilling

For drilling the feed rate ( $v_f = \text{mm/min}$ ) should be reduced as illustrated.

In addition, chip evacuation is required for larger drilling depths in excess of  $0.5 \times D$ .



$a_e = \text{Width of cut}$   
 $a_p = \text{Cutting depth}$



## Lubricants:

- cutting oil, highly activated
- soluble oil (emulsion)
- air only

Material group	Materials examples, new designations (old designation in brackets) Figures in bold = material no. to DIN EN	Tensile strength MPa (N/mm²)	Hardness	Coolant
General purpose steels	<b>1.0035</b> S185(SI33), <b>1.0486</b> P275N(SIe285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≥500-850		■
Free-cutting steels	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11Mn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 850-1000		■
Unalloyed tempering steels	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 700-850 850-1000		■
Alloyed tempering steels	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	850-≤1000 1000-1200		■
Unalloyed case hardened steels	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤750		■
Alloyed case hardened steels	<b>1.7043</b> 38Cr4 <b>1.5752</b> 15NiCr13 (15NiCr13), <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	850-≤1000 1000-1200		■ ■
Nitriding steels	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≥850-≤1000 >1000-1200		■
Tool steels	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 >850-1000		■ ■
High speed steels	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≥650-1000		■
Spring steels	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)	≤330 HB	■ ■	
Hardened steels	-	≤40-48 HRC >48-60 HRC	■ ■	
Stainless steels, sulphured austenitic martensitic	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A) <b>1.4057</b> X20CrNi17 2 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤850 ≤850 ≤850	■ ■	
Cast iron	<b>0.6010</b> EN-GJL-100(GG10), <b>0.6020</b> EN-GJL-200(GG20) <b>0.6025</b> EN-GJL-250(GG25), <b>0.6035</b> EN-GJL-350(GG35)	≤850-≤1000 1000-1200	■ ■	
Spheroidal graphite iron and malleable cast iron	<b>0.7050</b> EN-GJS-500-7(GGG50), <b>0.8035</b> EN-GJMW-350-4(GTW35) <b>0.7070</b> EN-GJS-700-2(GGG70), <b>0.8170</b> EN-GJMB-700-2(GTS70)	≤240 HB <300 HB		
Chilled cast iron	-	≤350 HB		■
New Cast iron GGV	EN-GJV250 (GGV25), EN-GJV350 (GGV35) EN-GJV400 (GGV40), EN-GJV500 (GGV50), SiMo6			■ ■
New Cast iron ADI	EN-GJS-800-8 (ADI800), EN-GJS-1000-5 (ADI1000) EN-GJS-1200-2 (ADI1200), EN-GJS-1400-1 (ADI1400)	800-1000 1200-1400	■ ■	
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		■
Ti and Ti-alloys	<b>3.7024</b> Ti99.5, <b>3.7114</b> TiAl5Sn2.5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2.5, - TiAl8Mo1V1	≤850 ≥850-1200		■ ■
Aluminium and Al-alloys	<b>3.0255</b> Al99.5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		■
Al wrought alloys	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤450		■
Al cast alloys < 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		■
> 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		■
Magnesium alloys	<b>3.5200</b> MgMn2, <b>3.5812</b> 0.05 G-MgAl8Zn1, <b>3.5612</b> 0.05 G-MgAl6Zn1	≤450		■
Copper, low alloyed	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤400		■ ■
Brass, short-chipping long-chipping	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2 <b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0.5	≤600 ≤600		■ ■
Bronze, short-chipping	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn	≤600		■ ■
Bronze, long-chipping	<b>2.0790</b> CuNi18Zn19Pb	>600-850		■ ■
Duroplastics	Epoxy resin, Resopal, Pertinax, Moltopren		-	□
Thermoplastics	Plexiglas, Hostalen, Novodur, Makralon		-	■ ■
Kevlar	Kevlar		-	□
Glass/carbon-concentr. plastics	GFK/CFK		-	□

## Super finishing

## Copy milling

Catalog no.	54205	54201	54206	54225	54221	54207	54227	74543	74531	64542	64532	74545	64545	64535
Tool mat.	Solid carbide													
Std.	Stock std.	Stock std.	Stock std.	Stock std.	Stock std.	Stock std.	Stock std.	6527 L	6528	6527 L	6528	Stock std.	Stock std.	Stock std.
Type	NH	NH	H	H	N	N	N	627	632	629/628	634/633	N	N	N
Page	615	616/614	617	618	619	620						630	631	635



v <sub>c</sub> m/min	Feed col.														
209	S	209	S					113	S	187	S	79	O	131	P
193	S	193	S					106	R	176	S	74	N	124	O
209	S	209	S					113	R	187	S	79	N	131	O
154	R	154	R					113	Q	187	R	79	M	131	N
209	S	209	S					99	R	165	S	70	N	116	O
187	S	187	S					99	R	165	S	70	N	116	O
154	R	154	R					86	Q	143	R	61	M	101	N
187	R	187	R					93	Q	154	R	65	M	108	N
154	Q	154	Q					113	P	187	Q	79	L	131	M
231	S	231	S					146	R	242	S	102	N	170	O
187	S	187	S					126	R	209	S	88	N	147	O
143	R	143	R					80	Q	132	R	55	M	93	N
209	S	209	S					106	R	176	S	74	N	124	O
187	Q	187	Q					99	P	165	Q	70	L	116	M
187	S	187	S					99	R	165	S	70	N	116	O
154	Q	154	Q	154	R	154	Q	86	P	143	Q	61	L	101	M
116	R	116	R	116	S	116	R	63	Q	105	R	44	N	74	N
116	Q	116	Q	116	R	116	Q			105	Q	44	L	74	M
61	O	61	O	61	P	61	O			61	P	26	L	43	L
				50	M	50	L								
116	R	116	R					63	Q	105	R	44	M	74	N
99	Q	99	Q					57	P	94	Q	40	L	66	M
94	R	94	R					50	Q	83	R	36	M	59	N
66	Q	66	Q					37	P	61	Q	26	L	43	M
270	S	270	S	270	S	270	S	146	R	242	S	102	N	170	O
248	R	248	R	248	S	248	R			231	R	97	M	162	N
220	S	220	S	220	S	220	S	126	R	209	S	88	N	147	O
193	R	193	R	193	S	193	R	106	Q	176	R	74	M	124	N

			121	Q	121	P			121	P	51	L	85	L	
116	Q	116	Q												
94	P	94	P												
990	T	990	T					528	T	880	T	370	Q	616	R
880	T	880	T					627	T	1045	T	439	Q	732	R
495	S	495	S					251	S	418	S	176	O	293	P
396	T	396	T					212	S	352	T	148	P	247	Q
550	T	550	T					297	T	495	T	208	Q	347	R
264	T	264	T					132	S	220	T	93	P	154	Q
242	S	242	S					126	S	209	S	88	O	147	P
198	S	198	S					119	S	198	S	84	O	139	P
242	S	242	S					132	S	220	S	93	O	154	P
187	S	187	S					126	R	209	S	88	N	147	O
187	S	187	S					146	R	242	S	102	N	170	O
154	R	154	R					139	Q	231	R	97	M	162	N
264	R	264	R												
242	R	242	R												