GRAVAGE

GRAVIEREN

ENGRAVING

INCISIONE

GRAVÍROZÁS

GRAVADO

swiss made since 1946

SELECTION OF ENGRAVING TOOLS

✓ = item from stock

∗ = for non-ferrous material

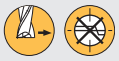
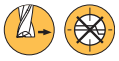
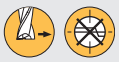
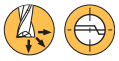
		Page	D / D_1	CARBIDE ☐	DLC* ■	DINAC ■	DIA ◆	PCD ●
FINISHED ENGRAVING TOOLS								
1/2 ENGRAVING TOOLS								
DIXI 7017		220	D = 3.00 - 4.00 D_1 = 0.05-0.20	✓	✓*	✓		
2/3 ENGRAVING TOOLS								
DIXI 7027		221	D = 3.00 D_1 = 0.05-0.15	✓		✓		
3/4 ENGRAVING TOOLS								
DIXI 7007		222	D = 3.00 D_1 = 0.05-0.20 R 0.05 - R 0.20	✓		✓		
DIAMOND ENGRAVING TOOLS								
DIXI 70170 DIA		223	D = 6.00 D_1 = 0.05-0.10				✓	
DIXI 70170 PCD		223	D = 6.00 D_1 = 0.10-0.20					✓
HELICAL ENGRAVING TOOLS								
DIXI 7025		224	D = 3.00-4.00 D_1 = 0.10-0.15	✓				
SEMI-FINISHED ENGRAVING TOOLS								
DIXI 7012		224	D = 3.00-8.00 D_1 = 1.00-2.60	✓				
DIXI 7016		225	D = 2.00-8.00	✓				
DIXI 7020		225	D = 2.00-10.00	✓				
DIXI 7024		226	D = 3.00-6.00	✓				

○ good ◎ excellent

Steel +Pb	Low alloyed steel	High alloyed steel	DUPLEX stainless steel	Steel Hardened cast iron 45-55 HRC	Cast iron	Refractory alloy	Titanium, titanium alloy	Cu alloy Silver Gold	Cu alloy difficult to machine	Al	Graphite	Plastic
◎	○	○	○		◎	○	○	◎	○	◎	◎	○
◎	○	○	◎				◎	◎	◎	◎		◎
○	◎	◎	◎	○	○	◎	◎	○	◎	○	○	○
								◎	◎	◎		◎
								◎	◎	◎	○	◎
					◎			◎		◎		

SELECTION OF CHAMFERING TOOLS

✓ = item from stock

CHAMFERING TOOLS		Page			CARBIDE	TiAIN	CUTINOX	DIA	
DIXI 7623 Ø 0.80 - 12.00		227			✓	✓			
DIXI 7625		227			✓				
DIXI 76230 DIA Ø 0.10 - 0.30		228						✓	
DIXI 7624 Ø 0.20 - 5.70		228			✓				
DIXI 7656 R 0.10 - 1.00		229			✓	✓			
MULTIFUNCTIONS END MILLS									
DIXI 7632 Ø 0.10 - 12.00		230			✓		✓		

○ good ◎ excellent

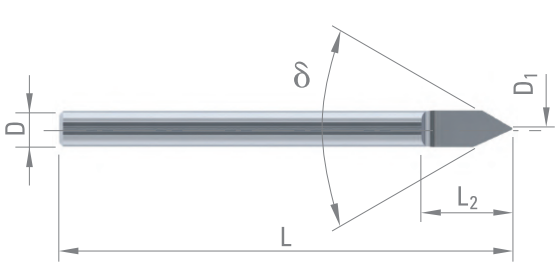
Steel + Pb	Low alloyed steel	High alloyed steel	DUPLEX stainless steel	Steel Hardened cast iron > 45 HRC	Cast iron	Refractory alloy	Titanium, titanium alloy	Cu alloy Silver Gold	Cu alloy difficult to machine	Al	Graphite	Plastic
◎	○	○	○		◎	○	◎	◎	◎	◎		◎
◎	○	○	○		◎	○	◎	◎	◎	◎		◎
								◎	○	◎		◎
◎	○	○	○		◎	○	◎	◎	◎	◎		◎
◎	○	○	○		◎	○	◎	◎	◎	◎		◎

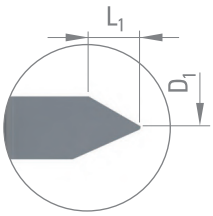
○	○	○	○		◎		○	○	○	○		○

DIXI 7017

1/2 ENGRAVING TOOLS
FINISHED STYLE

P. 232



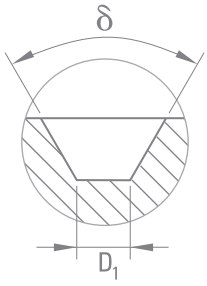


Steel +Pb | Low alloyed steel | High alloyed steel | DUPLEX stainless steel | Cast iron

Refractory alloy | Titanium, titanium alloy | Cu alloy Silver Gold | Cu alloy difficult to machine | Alu

Graphite | Plastic

δ	L_1	L_2	D_{h6}	L	$D_{1\ \pm0.01}$	CARBIDE	DINAC	DLC*
30°	4.0	5.2	3	38	0.05	961336	962814	961337
					0.10	961338	962813	961339
					0.15	961340	962812	961342
					0.20	961341	962116	961343
50°	3.0	6	3	38	0.05	961326	961327	
					0.08	961328	961333	
					0.10	961329	961332	
					0.15	961330	961334	
					0.20	961331	961335	
60°	2.4	6	3	38	0.05	43536	959712	
					0.08	972400	972401	
					0.10	40939	959713	
					0.15	953721	960610	
					0.20	954292	960611	
60°	3.3	8	4	50	0.05	43537	959714	
					0.10	45813	959716	
					0.20	45814	959717	
90°	1.45	8	3	38	0.05	961246	961248	
					0.10	961247	961249	
120°	0.84	8	3	38	0.05	961322	961323	
					0.10	961324	961325	



* for non-ferrous material

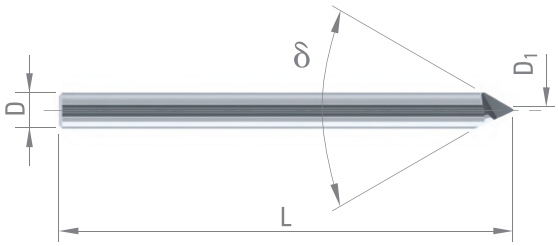
Ordering examples

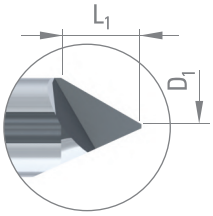
DIXI 7017 / 50° D_1 = 0.10 DINAC or **Art. 961332** **DIXI 7017 / 30° D_1 = 0.05 DLC** or **Art. 961337**

DIXI 7027

2/3 ENGRAVING TOOLS
FINISHED STYLE

P. 232



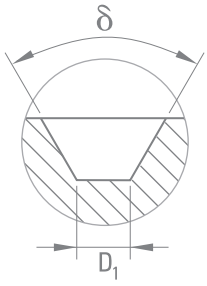


Steel +Pb | Low alloyed steel | High alloyed steel | DUPLEX stainless steel | Cast iron

Refractory alloy | Titanium, titanium alloy | Cu alloy Silver Gold | Cu alloy difficult to machine | Alu

Graphite | Plastic

δ	L_1	D_{h5}	L	$D_{1\ \pm 0.008}$	CARBIDE	DINAC
35°	4.6	3	38	0.05	326662	326682
				0.07	326663	326683
				0.08	326664	326684
				0.10	326665	326685
40°	3.9	3	38	0.05	326666	326686
				0.07	326667	326687
				0.08	326668	326688
				0.10	326669	326689
				0.15	326670	326690
50°	3.1	3	38	0.05	326671	326691
				0.07	326672	326692
				0.08	326673	326693
				0.10	326674	326694
				0.15	326675	326695
60°	2.5	3	38	0.05	326676	326696
				0.06	326677	326697
				0.07	326678	326698
				0.08	326679	326699
				0.10	326680	326700
				0.15	326681	326701

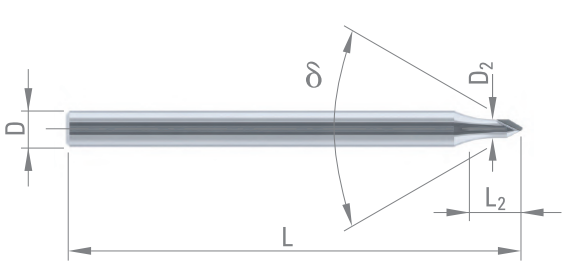


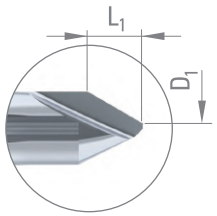
Ordering examples

DIXI 7027 / 40° D_1 = 0.08 DINAC or **Art. 326688** **DIXI 7027 / 50° D_1 = 0.07 CARBIDE** or **Art. 326672**

3/4 ENGRAVING TOOLS
FINISHED STYLE

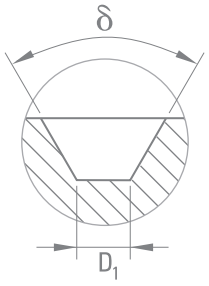
P. 232

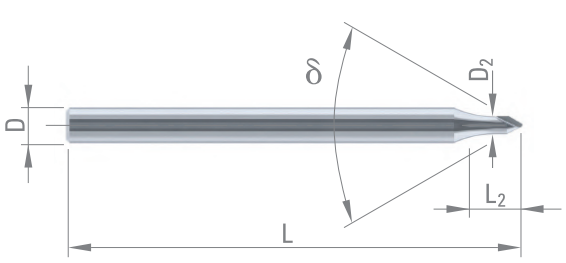


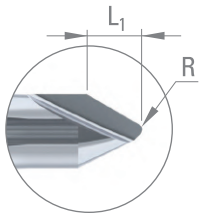


Steel +Pb	Low alloyed steel	High alloyed steel	DUPLEX stainless steel	Steel Cast iron 45-55 HRC
Cast iron	Refractory alloy	Titanium, titanium alloy	Cu alloy Silver Gold	Cu alloy difficult to machine
Alu	Graphite	Plastic		

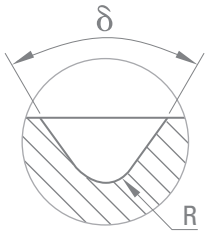
δ	L_1	L_2	D_2	D_{h6}	L	$D_{1\ \pm0.01}$	CARBIDE	DINAC
30°	2.5	3.4	1.5	3	38	0.05	976370	976374
						0.08	976371	976375
						0.10	976372	976376
						0.15	976373	976377
35°	2.0	3.4	1.5	3	38	0.05	65846	959722
						0.08	961244	961245
						0.10	65848	959724
						0.15	65850	959725
						0.20	65852	959726
40°	1.7	3.2	1.5	3	38	0.05	961225	961238
						0.08	961242	961243
						0.10	961226	961239
						0.15	961227	961240
						0.20	961228	961241
50°	1.4	2.3	1.5	3	38	0.05	976258	976264
						0.08	976260	976265
						0.10	976261	976266
						0.15	976263	976267
60°	1.1	2.3	1.5	3	38	0.05	976361	976365
						0.08	976362	976366
						0.10	976363	976367
						0.15	976364	976368







δ	L_1	L_2	D_2	D_{h6}	L	$R_{\pm0.01}$	CARBIDE	DINAC
35°	1.9	3.4	1.5	3	38	0.05	51736	959718
						0.10	51625	959719
						0.15	51734	959720
						0.20	51735	959721



Ordering examples

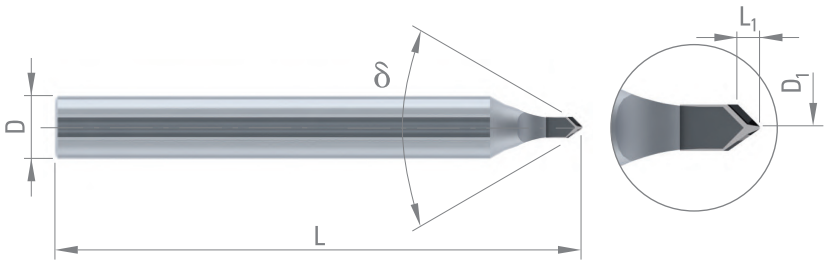
DIXI 7007 / 30° D_1 = 0.08 DINAC or **Art. 976375** **DIXI 7007 / 35° R = 0.15 CARBIDE** or **Art. 51734**

DIXI 70170 DIA

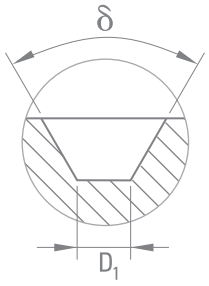
MONOCRISTALLINE DIAMOND ENGRAVING TOOLS

P. 408

Cu alloy Silver Gold | Cu alloy difficult to machine | Al | Plastic



δ	L_1	D_{h5}	L	D_1	DIA
60°	1.40	6	50	0.05	302597
				0.10	302598
90°	0.80	6	50	0.05	302599
				0.10	302600

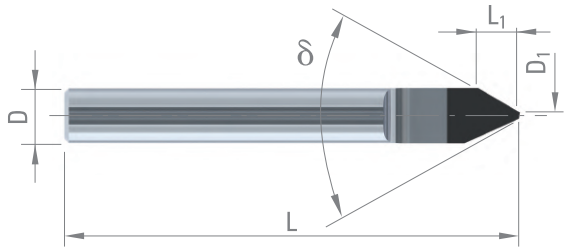


DIXI 70170 PCD

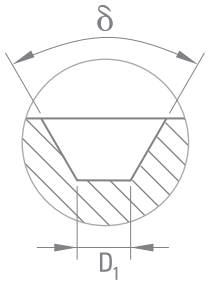
PCD ENGRAVING TOOLS

P. 408

Cu alloy Silver Gold | Cu alloy difficult to machine | Al | Graphite | Unsitered carbide Ceramics | Plastic | Carbon fibres



δ	L_1	D_{h5}	L	D_1	PCD
60°	5.0	6	50	0.10	303081
				0.20	303082
90°	2.9	6	50	0.10	303083
				0.20	303084



Ordering examples

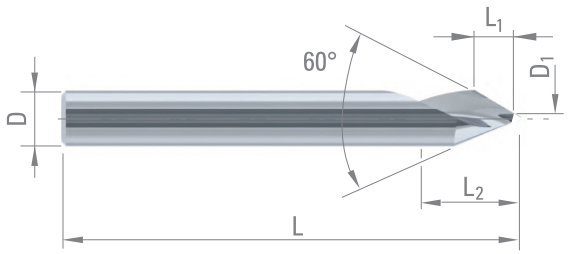
DIXI 70170 / 60° DIA D_1 = 0.05 or **Art. 302597** **DIXI 70170 / 90° PCD D_1 = 0.10** or **Art. 303083**

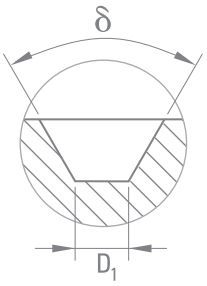
DIXI 7025

SPIRAL ENGRAVING TOOLS, 60°
FINISHED STYLE

P. 233

Cast iron | Cu alloy Silver Gold | Al



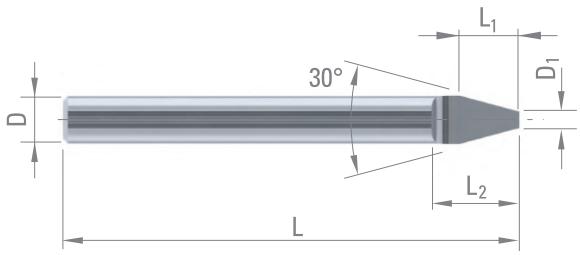


$D_{1\ \pm 0.02}$	L_1	L_2	D_{h5}	L	CARBIDE
0.10	2.5	9	3	38	43624
0.15	3.3	12	4	50	45812

DIXI 7012

1/2 ENGRAVING TOOLS, 30°
SEMI-FINISHED STYLE

P. 231



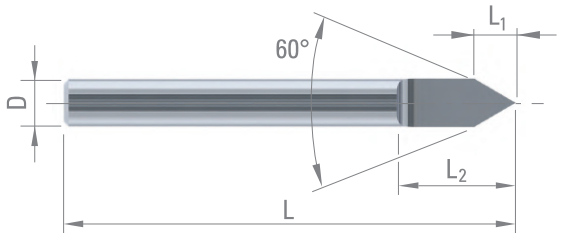
D_1	L_1	L_2	D_{h5}	L	CARBIDE
* 1.00	3.7	4	3	38	35505
* 1.30	5.0	5	4	50	35666
* 2.00	7.5	8	6	57	35506
* 2.60	10.0	10	8	63	35668

* not cutting

DIXI 7016

1/2 ENGRAVING TOOLS, 60°
SEMI-FINISHED STYLE

P. 231

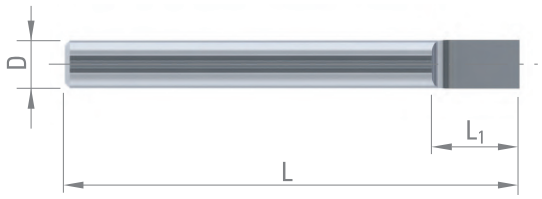


D_{h5}	L_1	L_2	L	CARBIDE
2	1.7	4	25	32852
3	2.6	6	38	23585
4	3.5	8	50	23586
5	4.3	10	50	35082
6	5.2	12	57	29726
8	6.9	14	63	29727

DIXI 7020

1/2 ENGRAVING TOOLS, 180°
SEMI-FINISHED STYLE

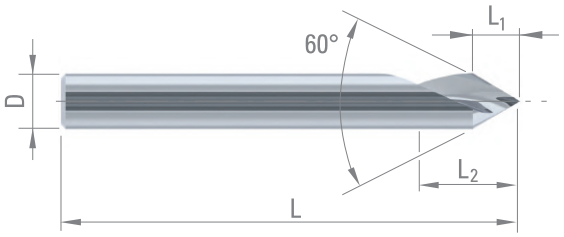
P. 231



D_{h5}	L_1	L	CARBIDE
2	3	25	35671
3	4	38	35672
4	5	50	35673
5	6	50	35674
6	8	57	35675
8	10	63	35676
10	12	72	35677

SPIRAL ENGRAVING TOOLS, 60°
SEMI-FINISHED STYLE

P. 231



D_{h5}	L_1	L_2	L	CARBIDE
3	2.6	9	38	35678
4	3.5	12	50	35679
6	5.2	15	50	35680

DIXI 7623

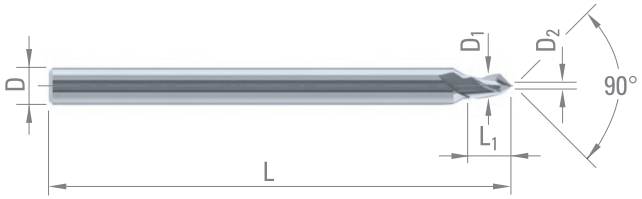
CHAMFERING TOOLS

Z = 3

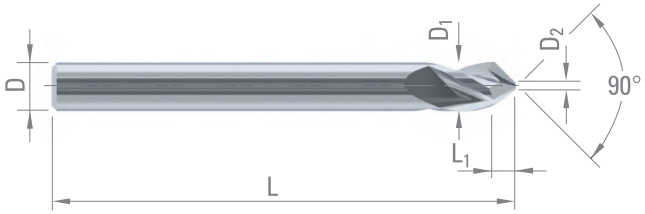
P. 234

Steel + Pb | Low alloyed steel | High alloyed steel | DUPLEX stainless steel | Cast iron | Refractory alloy | Titanium, titanium alloy | Cu alloy Silver Gold | Cu alloy difficult to machine | Al | Plastic

Ø 0.80 ≤ Ø 4.00



Ø 5.00 ≤ Ø 12.00



$D_{1\ e8}$ Ø<2.00 - 0/-0.01 Ø<3.00 - 0/-0.02 Ø<5.00 - e8	L_1	$D_{2\ \pm 0.05}$	D_{h5}	L	CARBIDE	TiAlN
* 0.50	1.5	0.05	3	38	983778	
* 0.80	1.5	0.08	3	38	956868	956870
* 1.00	2.0	0.10	3	38	956867	956869
* 2.00	3.0	0.20	3	38	956865	956866
* 3.00	5.0	0.30	3	38	956861	956862
* 4.00	6.0	0.40	4	50	956863	956864

* cutting

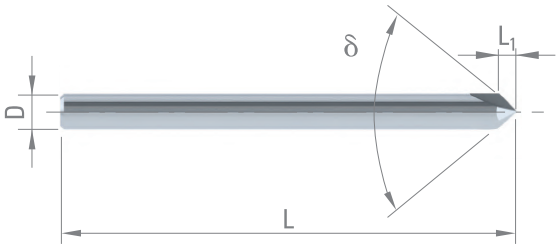
$D_{1\ h5}$	L_1	$D_{2\ \pm 0.05}$	D_{h5}	L	CARBIDE	TiAlN
5.00	2.25	0.50	5	50	49019	952294
6.00	2.7	0.60	6	57	49020	63603
8.00	3.6	0.80	8	63	49021	950927
10.00	4.5	1.00	10	72	49022	63604
12.00	5.4	1.20	12	73	49023	952295

DIXI 7625

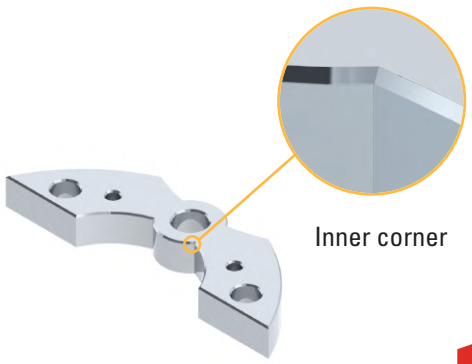
CHAMFERING TOOLS INNER CORNERS

Z = 3

Steel + Pb | Low alloyed steel | Cast iron | Cu alloy Silver Gold | Cu alloy difficult to machine | Alu | Plastic



δ	L_1	D_{h5}	L	CARBIDE
60°	2.6	3	38	310782
90°	1.5	3	38	306130
120°	0.9	3	38	312243

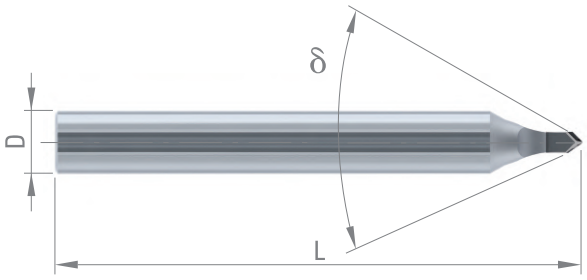


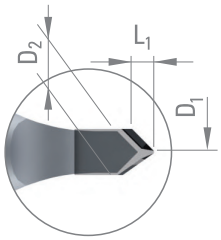
Inner corner

DIXI 76230 DIA

MONOCRISTALLINE DIAMOND CHAMFERING TOOLS

Z = 1





Cu alloy Silver Gold | Cu alloy difficult to machine | Al | Plastic

δ	L_1	D_2	D_1	D_{h5}	L	DIA
30°	2.80	2	* 0.30	6	50	978382
60°	1.40	3	* 0.10	6	50	302596
	1.30	3	* 0.30	6	50	978381
90°	0.80	3	* 0.10	6	50	302595
	0.70	3	* 0.30	6	50	977871

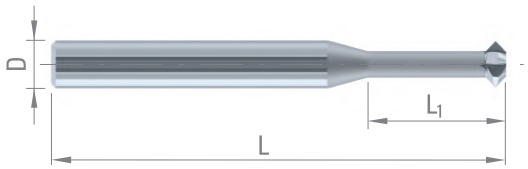
*not cutting

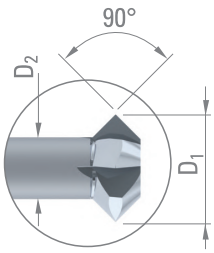
DIXI 7624

CHAMFERING TOOLS DOUBLE TAPER

Z = 1-4

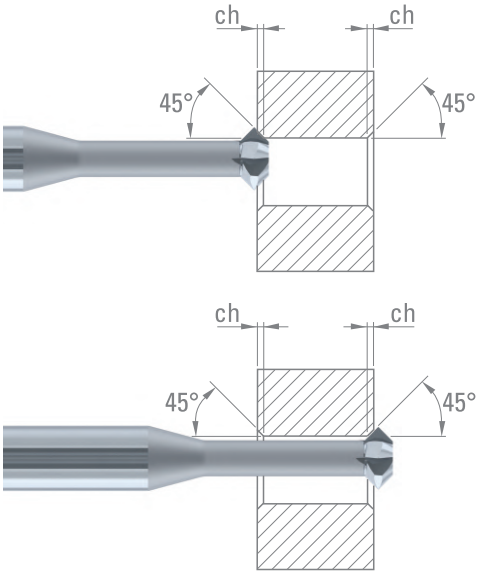
P. 234





Steel + Pb | Low alloyed steel | High alloyed steel | DUPLEX stainless steel | Cast iron | Refractory alloy | Titanium, titanium alloy | Cu alloy Silver Gold | Cu alloy difficult to machine | Al | Plastic

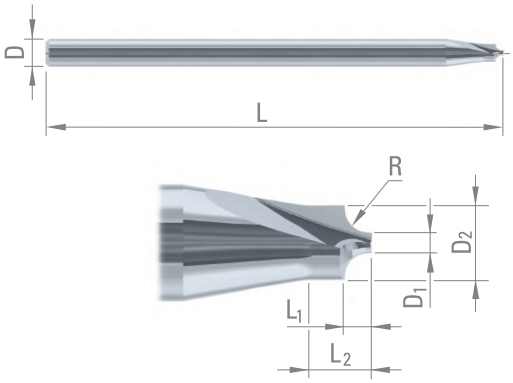
D_1	L_1	D_2	ch	D_{h5}	L	Z	CARBIDE
0.20	0.4	0.12	0.04	3	38	1	997990
0.25	0.5	0.15	0.05	3	38	1	997991
0.30	0.6	0.18	0.06	3	38	1	997992
0.40	0.8	0.24	0.08	3	38	1	997993
0.50	1.0	0.30	0.10	3	38	1	997994
0.60	1.2	0.36	0.12	3	38	3	997995
0.70	1.4	0.42	0.14	3	38	3	997996
0.80	1.6	0.48	0.16	3	38	3	997997
0.90	1.8	0.54	0.18	3	38	3	997998
1.00	2.0	0.60	0.20	3	38	3	997999
1.20	2.4	0.70	0.25	3	38	4	998000
1.30	2.6	0.70	0.30	3	38	4	998001
1.80	5.4	1.00	0.40	3	38	4	998002
2.80	8.4	1.60	0.60	3	38	4	998003
3.70	11.1	2.10	0.80	6	57	4	998004
5.70	17.1	3.30	1.20	6	57	4	998005



CORNER ROUNDING END MILLS

Z = 2

P. 234



Steel + Pb | Low alloyed steel | High alloyed steel | DUPLEX stainless steel | Cast iron

Refractory alloy | Titanium, titanium alloy | Cu alloy Silver Gold | Cu alloy difficult to machine | Al

Plastic

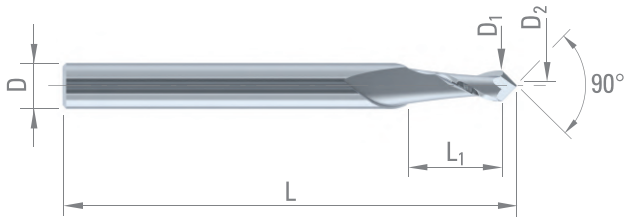
$R_{\pm 0.02}$	D_1	L_1	D_2	L_2	D_{h5}	L	CARBIDE	TiAlN
0.10	0.50	0.12	0.74	0.8	3	38	969577	969578
0.15	0.50	0.18	0.86	0.8	3	38	969586	969597
0.20	0.50	0.24	0.98	0.8	3	38	969587	969598
0.25	0.50	0.30	1.10	1.0	3	38	969588	969599
0.30	0.50	0.36	1.22	1.0	3	38	969589	969600
0.40	0.50	0.48	1.46	1.0	3	38	969590	969601
0.50	0.50	0.60	1.70	1.5	3	38	969591	969602
0.60	0.50	0.70	1.90	1.5	3	38	969592	969603
0.70	0.50	0.80	2.10	1.5	3	38	969593	969604
0.80	0.80	0.90	2.60	2.0	3	38	969594	969605
0.90	0.80	1.00	2.80	2.0	3	38	969595	969606
1.00	0.80	1.10	-	-	3	38	969596	969607

DIXI 7632

MULTIFUNCTION END MILLS

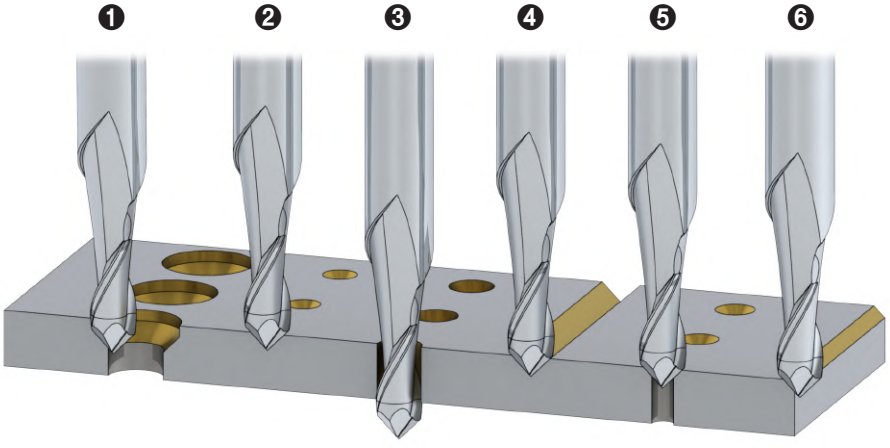
Z = 2

P. 236



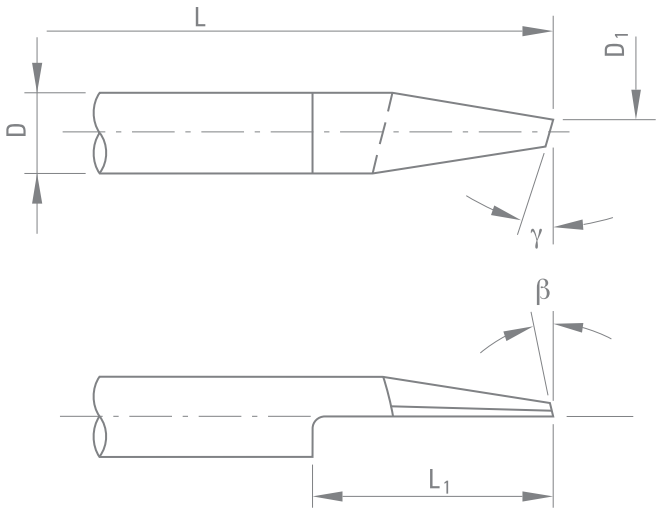
Steel + Pb	Low alloyed steel	High alloyed steel	DUPLEX stainless steel	Cast iron
Titanium, titanium alloy	Cu alloy Silver Gold	Cu alloy difficult to machine	Al	Plastic

$D_{1\ e8}$	L_1	D_2	D_{h5}	L	CARBIDE	CUTINOX
0.10	0.2	0.01	3	38	333883	333907
0.20	0.4	0.02	3	38	333884	333908
0.30	0.6	0.03	3	38	333885	333909
0.40	0.8	0.04	3	38	333886	333910
0.50	1.0	0.05	3	38	333887	333911
0.60	1.2	0.06	3	38	333888	333912
0.70	1.4	0.07	3	38	333889	333913
0.80	1.6	0.08	3	38	333890	333914
0.90	1.8	0.09	3	38	333891	333915
1.00	2.0	0.10	3	38	333892	333916
1.10	2.2	0.11	3	38	333893	333917
1.20	2.4	0.12	3	38	333894	333918
1.30	2.6	0.13	3	38	333895	333919
1.40	2.8	0.14	3	38	333896	333920
1.50	3.0	0.15	3	38	333897	333921
2.00	4.0	0.20	3	38	333898	333922
2.50	5.0	0.25	3	38	333899	333923
3.00	6.0	0.30	4	50	333900	333924
4.00	8.0	0.40	5	50	333901	333925
5.00	10.0	0.50	6	50	333902	333926
6.00	12.0	0.60	8	60	333903	333927
8.00	16.0	0.80	10	70	333904	333928
10.00	18.0	1.00	12	70	333905	333929
12.00	20.0	1.20	12	70	333906	333930



❶ Counterbore
❷ Spotting
❸ Drilling
❹ Engraving
❺ ❻ Chamfering

GEOMETRY OF ENGRAVING TOOLS



Materials	β	γ
Tool steel	10°	3° - 5°
Steel	15°	3° - 5°
Stainless steel	15°	3° - 5°
Cast iron	15°	3° - 5°
Copper	20°	3° - 5°
Brass	15°	3° - 5°
Nickel-silver	15°	3° - 5°
Duralumin	20°	3° - 5°
Aluminium	20°	3° - 5°
Gold	15°	3° - 5°
Pure titanium	15°	3° - 5°
Celluloïd	25°	3° - 5°
Plastic	20°	3° - 5°
Wood	25°	3° - 5°

Mainly used for engraving symbols and texts, these tools can also be used for machining contours (cutting of profiles) and for copying operations for moulds and dies.

FINISHED EXECUTIONS

On request, DIXI POLYTOOL will supply these tools ground according to the customer's specifications.
The grinding angles will correspond to the opposite table.
Please indicate D_1 and material to be machined when ordering.

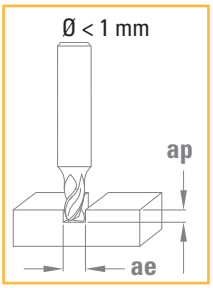
CUTTING CONDITIONS

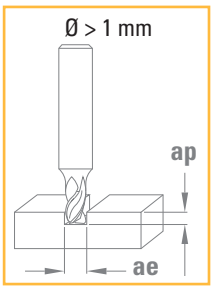
	Materials to be machined		CARBIDE n [rev/min]	DINAC n [rev/min]	Ø D_1 0.05 - 0.10 Vf[mm/min]	Ø D_1 0.05 - 0.10 ap[mm]	Ø D_1 0.15 - 0.40 Vf[mm/min]	Ø D_1 0.15 - 0.40 ap[mm]
P	Unalloyed steel / Low alloyed steel	< 600 N/mm²	**20** - 35'000	**20** - 35'000	**50** - 250	**0.05** - 0.30	**100** - 300	**0.10** - 0.40
P	Unalloyed steel / Low alloyed steel	600 – 1500 N/mm²		**20** - 35'000	**50** - 200	**0.05** - 0.25	**80** - 250	**0.10** - 0.35
P	Lead alloyed cutting steel			**20** - 35'000	**50** - 250	**0.05** - 0.30	**100** - 300	**0.10** - 0.40
P	High alloyed steel	700 – 1500 N/mm²		**20** - 35'000	**50** - 150	**0.05** - 0.15	**80** - 250	**0.10** - 0.30
M	Stainless steel	400 – 700 N/mm²		**20** - 35'000	**50** - 150	**0.05** - 0.20	**80** - 250	**0.10** - 0.30
M	DUPLEX stainless steel	> 800 N/mm²		**20** - 35'000	**50** - 150	**0.05** - 0.15	**80** - 250	**0.10** - 0.30
H	Tool steel and cast iron	> 1500 N/mm² (45 - 55 HRC)		**20** - 35'000			**80** - 250	**0.02** - 0.05
K	Grey cast iron / Nodular pearlitic iron	< 250 HB	**20** - 35'000	**20** - 35'000	**50** - 250	**0.05** - 0.30	**100** - 300	**0.10** - 0.40
K	Alloyed cast iron / Nodular pearlitic iron	> 250 HB	**20** - 35'000	**20** - 35'000	**50** - 200	**0.05** - 0.25	**80** - 250	**0.10** - 0.35
K	Nodular ferritic cast iron / Malleable cast iron		**20** - 35'000	**20** - 35'000	**50** - 200	**0.05** - 0.25	**80** - 250	**0.10** - 0.35
S	Special alloys / Heat resistant stainless steel	Inconel Nimonic Hastelloy		**15** - 25'000			**80** - 200	**0.03** - 0.10
S	Titanium, titanium alloys		**20** - 35'000	**20** - 35'000	**50** - 200	**0.05** - 0.25	**100** - 250	**0.10** - 0.35
N	Copper alloys - easy to machine (brass - bronze)		**20** - 35'000	**20** - 35'000	**50** - 300	**0.05** - 0.30	**150** -450	**0.10** - 0.40
N	Copper alloys - difficult to machine / Aluminium bronze	(CuAlFe) (Ampco)	**20** - 35'000	**20** - 35'000	**50** - 200	**0.05** - 0.30	**100** - 300	**0.10** - 0.45
N	Aluminium alloys	Si < 8%	**20** - 35'000	**20** - 35'000	**50** - 300	**0.05** - 0.30	**150** - 450	**0.10** - 0.45
N	Cast aluminium	Si > 8%	**20** - 35'000	**20** - 35'000	**50** - 300	**0.05** - 0.30	**150** - 450	**0.10** - 0.45
N	Graphite		**20** - 35'000	**20** - 35'000	**50** - 300	**0.05** - 0.30	**150** - 450	**0.10** - 0.45
N	Plastic		**20** - 35'000	**20** - 35'000	**50** - 300	**0.05** - 0.30	**150** - 450	**0.10** - 0.45
N	Gold, silver		**20** - 35'000	**20** - 35'000	**50** - 300	**0.05** - 0.30	**150** - 450	**0.10** - 0.45

CUTTING CONDITIONS

	Materials to be machined		CARBIDE n [tr/min]	DINAC n [tr/min]	Ø D_1 0.05 - 0.10 Vf[mm/min]	Ø D_1 0.05 - 0.10 ap[mm]	Ø D_1 0.15 - 0.50 Vf[mm/min]	Ø D_1 0.15 - 0.50 ap[mm]
P	Unalloyed steel / Low alloyed steel	< 600 N/mm²	**25** - 35'000		**75** - 250	**0.05** - 0.35	**100** - 350	**0.10** - 0.45
P	Unalloyed steel / Low alloyed steel	600 – 1500 N/mm²		**25** - 35'000	**60** - 250	**0.05** - 0.30	**80** - 300	**0.10** - 0.40
P	Lead alloyed cutting steel		**30** - 35'000		**75** - 250	**0.05** - 0.35	**100** - 350	**0.10** - 0.45
P	High alloyed steel	700 – 1500 N/mm²		**15** - 35'000	**50** - 200	**0.05** - 0.10	**80** - 300	**0.10** - 0.35
M	Stainless steel	400 – 700 N/mm²		**20** - 35'000	**50** - 200	**0.05** - 0.25	**80** - 300	**0.10** - 0.35
M	DUPLEX stainless steel	> 800 N/mm²		**15** - 35'000	**50** - 200	**0.05** - 0.20	**80** - 300	**0.10** - 0.35
H	Tool steel and cast iron	> 1500 N/mm² (45 - 55 HRC)		**20** - 35'000			**80** - 250	**0.02** - 0.07
K	Grey cast iron / Nodular pearlitic iron	< 250 HB	**25** - 35'000		**50** - 300	**0.05** - 0.35	**100** - 350	**0.10** - 0.45
K	Alloyed cast iron / Nodular pearlitic iron	> 250 HB	**15** - 35'000	**15** - 35'000	**50** - 250	**0.05** - 0.30	**80** - 300	**0.10** - 0.40
K	Nodular ferritic cast iron / Malleable cast iron		**15** - 35'000	**15** - 35'000	**50** - 250	**0.05** - 0.30	**80** - 300	**0.10** - 0.40
S	Special alloys / Heat resistant stainless steel	Inconel Nimonic Hastelloy		**10** - 15'000			**80** - 250	**0.05** - 0.10
S	Titanium, titanium alloys		**20** - 35'000		**75** - 200	**0.05** - 0.20	**100** - 300	**0.10** - 0.40
N	Copper alloys - easy to machine (brass - bronze)		**30** - 35'000		**75** - 300	**0.05** - 0.20	**150** - 450	**0.20** - 0.30
N	Copper alloys - difficult to machine / Aluminium bronze	(CuAlFe) (Ampco)	**20** - 35'000		**75** - 350	**0.05** - 0.15	**150** - 300	**0.10** - 0.20
N	Aluminium alloys	Si < 8%	**25** - 35'000		**75** - 300	**0.05** - 0.30	**150** - 450	**0.15** - 0.50
N	Cast aluminium	Si > 8%	**20** - 35'000		**75** - 350	**0.05** - 0.20	**150** - 450	**0.15** - 0.45
N	Graphite		**20** - 35'000		**75** - 350	**0.05** - 0.20	**150** - 450	**0.15** - 0.40
N	Plastic		**30** - 35'000		**100** - 350	**0.05** - 0.30	**180** - 450	**0.15** - 0.50
N	Gold, silver		**25** - 35'000		**75** - 350	**0.05** - 0.20	**150** - 450	**0.15** - 0.40

CUTTING CONDITIONS





	Materials to be machined		CARBIDE		TiAlN					
			Vc [m/min]		Vc [m/min]		ap [mm]	ae [mm]	ap [mm]	ae [mm]
P	Unalloyed steel / Low alloyed steel	< 600 N/mm²	**70**	100	**90**	110	< 0.5 x ØD1	1 x ØD1	< 1 x ØD1	1 x ØD1
P	Unalloyed steel / Low alloyed steel	600 – 1500 N/mm²	**50**	80	**70**	90	< 0.3 x ØD1	1 x ØD1	< 0.6 x ØD1	1 x ØD1
P	Lead alloyed cutting steel		**70**	100			< 0.5 x ØD1	1 x ØD1	< 1 x ØD1	1 x ØD1
P	High alloyed steel	700 – 1500 N/mm²			**40**	70	< 0.2 x ØD1	1 x ØD1	< 0.5 x ØD1	1 x ØD1
M	Stainless steel	400 – 700 N/mm²	**40**	60	**70**	90	< 0.5 x ØD1	1 x ØD1	< 0.8 x ØD1	1 x ØD1
M	DUPLEX stainless steel	> 800 N/mm²			**40**	70	< 0.2 x ØD1	1 x ØD1	< 0.5 x ØD1	1 x ØD1
K	Grey cast iron / Nodular pearlitic iron	< 250 HB	**70**	100	**90**	110	< 0.5 x ØD1	1 x ØD1	< 1 x ØD1	1 x ØD1
K	Alloyed cast iron / Nodular pearlitic iron	> 250 HB	**40**	70	**70**	90	< 0.3 x ØD1	1 x ØD1	< 0.6 x ØD1	1 x ØD1
K	Nodular ferritic cast iron / Malleable cast iron		**70**	100	**90**	110	< 0.3 x ØD1	1 x ØD1	< 0.6 x ØD1	1 x ØD1
S	Special alloys / Heat resistant stainless steel	Inconel Nimonic Hastelloy			**25**	35			< 0.4 x ØD1	1 x ØD1
S	Titanium, titanium alloys		**30**	45			< 0.3 x ØD1	1 x ØD1	< 0.5 x ØD1	1 x ØD1
N	Copper alloys - easy to machine (brass - bronze)		**140**	160			< 0.5 x ØD1	1 x ØD1	< 1 x ØD1	1 x ØD1
N	Copper alloys - difficult to machine / Aluminium bronze	(CuAlFe) (Ampco)	**120**	140	**170**	190	< 0.3 x ØD1	1 x ØD1	< 0.7 x ØD1	1 x ØD1
N	Aluminium alloys	Si < 8%	**180**	260	**230**	340	< 0.6 x ØD1	1 x ØD1	< 1.2 x ØD1	1 x ØD1
N	Cast aluminium	Si > 8%	**140**	160	**210**	230	< 0.4 x ØD1	1 x ØD1	< 0.9 x ØD1	1 x ØD1
N	Graphite		**140**	160	**200**	220	< 0.6 x ØD1	1 x ØD1	< 0.9 x ØD1	1 x ØD1
N	Plastic		**240**	260	**300**	340	< 0.6 x ØD1	1 x ØD1	< 1.2 x ØD1	1 x ØD1
N	Gold, silver		**140**	160	**200**	220	< 0.6 x ØD1	1 x ØD1	< 0.9 x ØD1	1 x ØD1

$$n\ [tr/min] = \frac{Vc\ [m/min] \times 1000}{\pi \times D_1\ [mm]}$$

$$Vf\ [mm/min] = n\ [tr/min] \times fz\ [mm] \times Z$$

Feed per tooth **fz [mm]**

Ø D_1 0.30 - 1.00	Ø D_1 1.00 - 1.50	Ø D_1 1.50 - 3.00	Ø D_1 3.00 - 5.00	Ø D_1 5.00 - 7.00	Ø D_1 7.00 - 10.00	Ø D_1 10.00 - 14.00	Ø D_1 14.00 - 16.00	Ø D_1 16.00 - 20.00
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.14
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.12	**0.05** - 0.14	**0.07** - 0.16	**0.08** - 0.20
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
	0.012 - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.14	**0.07** - 0.16	**0.08** - 0.20
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.11	**0.05** - 0.11	**0.06** - 0.12	**0.07** - 0.13
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.12	**0.05** - 0.14	**0.07** - 0.16	**0.08** - 0.20
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.12	**0.05** - 0.14	**0.07** - 0.16	**0.08** - 0.20
0.006 - 0.015	**0.005** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.12	**0.05** - 0.14	**0.07** - 0.16	**0.08** - 0.20
0.006 - 0.015	**0.012** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.12	**0.05** - 0.21	**0.10** - 0.24	**0.11** - 0.30
0.006 - 0.015	**0.005** - 0.020	**0.016** - 0.04	**0.02** - 0.06	**0.03** - 0.09	**0.04** - 0.12	**0.05** - 0.14	**0.07** - 0.16	**0.08** - 0.20

CUTTING CONDITIONS

Routing

	Materials to be machined		CARBIDE Vc [m/min]		CUTINOX Vc [m/min]	
P	Unalloyed steel / Low alloyed steel	< 600 N/mm²	**40**	60	**60**	75
P	Unalloyed steel / Low alloyed steel	600 – 1500 N/mm²	**30**	50	**40**	60
P	Lead alloyed cutting steel		**54**	60	**60**	75
P	High alloyed steel	700 – 1500 N/mm²	**30**	40	**35**	50
M	Stainless steel	400 – 700 N/mm²	**20**	30	**30**	35
M	DUPLEX stainless steel	> 800 N/mm²	**20**	25	**25**	30
K	Grey cast iron / Nodular pearlitic iron	< 250 HB	**45**	60	**60**	75
K	Alloyed cast iron / Nodular pearlitic iron	> 250 HB	**28**	40	**35**	50
K	Nodular ferritic cast iron / Malleable cast iron		**28**	40	**35**	50
S	Special alloys / Heat resistant stainless steel		**20**	24	**25**	30
S	Titanium, titanium alloys		**32**	48	**40**	60
N	Copper alloys - easy to machine (brass - bronze)		**80**	120	**90**	130
N	Copper alloys - difficult to machine / Aluminium bronze		**50**	80	**60**	90
N	Aluminium alloys	Si < 8%	**80**	150	**90**	160
N	Cast aluminium	Si > 8%	**60**	110	**70**	120
N	Plastic		**100**	200	**110**	220
N	Gold, silver		**50**	80	**60**	90

Routing

	Materials to be machined		CARBIDE Vc [m/min]		CUTINOX Vc [m/min]	
P	Unalloyed steel / Low alloyed steel	< 600 N/mm²	**30**	50	**60**	75
P	Unalloyed steel / Low alloyed steel	600 – 1500 N/mm²	**54**	60	**40**	60
P	Lead alloyed cutting steel		**30**	40	**60**	75
P	High alloyed steel	700 – 1500 N/mm²	**20**	30	**35**	50
M	Stainless steel	400 – 700 N/mm²	**20**	25	**30**	35
M	DUPLEX stainless steel	> 800 N/mm²	**45**	60	**25**	30
K	Grey cast iron / Nodular pearlitic iron	< 250 HB	**28**	40	**60**	75
K	Alloyed cast iron / Nodular pearlitic iron	> 250 HB	**28**	40	**35**	50
K	Nodular ferritic cast iron / Malleable cast iron		**20**	24	**35**	50
S	Special alloys / Heat resistant stainless steel		**32**	48	**25**	30
S	Titanium, titanium alloys		**80**	120	**40**	60
N	Copper alloys - easy to machine (brass - bronze)		**50**	80	**90**	130
N	Copper alloys - difficult to machine / Aluminium bronze		**80**	150	**60**	90
N	Aluminium alloys	Si < 8%	**60**	110	**90**	160
N	Cast aluminium	Si > 8%	**100**	200	**70**	120
N	Plastic		**50**	80	**110**	220
N	Gold, silver		**80**	150	**60**	90

$$n\ [tr/min] = \frac{Vc\ [m/min] \times 1000}{\pi \times D_1\ [mm]}$$

$$Vf\ [mm/min] = n\ [tr/min] \times f\ [mm] \times Z$$

Feed per tooth **f [mm]**

Ø D_1 0.30 - 0.50	Ø D_1 0.50 - 1.00	Ø D_1 1.00 - 3.00	Ø D_1 3.00 - 5.00	Ø D_1 5.00 - 8.00	Ø D_1 8.00 - 12.00
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.004	**0.002** - 0.008	**0.003** - 0.038	**0.015** - 0.08	**0.03** - 0.11	**0.05** - 0.23
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.004 - 0.008	**0.005** - 0.016	**0.006** - 0.078	**0.031** - 0.16	**0.06** - 0.23	**0.09** - 0.47
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.005 - 0.009	**0.006** - 0.019	**0.008** - 0.094	**0.038** - 0.19	**0.08** - 0.28	**0.11** - 0.5
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38

Feed per tooth **fz [mm]** **Vf [mm/min] = n [tr/min] x fz [mm] x Z**

Ø D_1 0.30 - 0.50	Ø D_1 0.50 - 1.00	Ø D_1 1.00 - 3.00	Ø D_1 3.00 - 5.00	Ø D_1 5.00 - 8.00	Ø D_1 8.00 - 12.00
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19
0.001 - 0.002	**0.002** - 0.005	**0.002** - 0.023	**0.009** - 0.05	**0.02** - 0.07	**0.03** - 0.14
0.001 - 0.002	**0.002** - 0.005	**0.002** - 0.023	**0.009** - 0.05	**0.02** - 0.07	**0.03** - 0.14
0.001 - 0.002	**0.002** - 0.005	**0.002** - 0.023	**0.009** - 0.05	**0.02** - 0.07	**0.03** - 0.14
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19
0.001 - 0.002	**0.002** - 0.005	**0.002** - 0.023	**0.009** - 0.05	**0.02** - 0.07	**0.03** - 0.14
0.001 - 0.002	**0.002** - 0.005	**0.002** - 0.023	**0.009** - 0.05	**0.02** - 0.07	**0.03** - 0.14
0.001 - 0.002	**0.001** - 0.004	**0.002** - 0.019	**0.008** - 0.04	**0.02** - 0.06	**0.02** - 0.11
0.001 - 0.002	**0.002** - 0.005	**0.002** - 0.023	**0.009** - 0.05	**0.02** - 0.07	**0.03** - 0.14
0.002 - 0.004	**0.003** - 0.008	**0.003** - 0.039	**0.016** - 0.08	**0.03** - 0.12	**0.05** - 0.23
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.003	**0.002** - 0.006	**0.003** - 0.031	**0.013** - 0.06	**0.03** - 0.09	**0.04** - 0.19

DIXI 7632

CUTTING CONDITIONS

Routing

Materials to be machined			CARBIDE		CUTINOX	
			Vc [m/min]		Vc [m/min]	
P	Unalloyed steel / Low alloyed steel	< 600 N/mm²	**30**	50	**60**	75
P	Unalloyed steel / Low alloyed steel	600 – 1500 N/mm²	**54**	60	**40**	60
P	Lead alloyed cutting steel		**30**	40	**60**	75
P	High alloyed steel	700 – 1500 N/mm²	**20**	30	**35**	50
M	Stainless steel	400 – 700 N/mm²	**20**	25	**30**	35
M	DUPLEX stainless steel	> 800 N/mm²	**45**	60	**25**	30
K	Grey cast iron / Nodular pearlitic iron	< 250 HB	**28**	40	**60**	75
K	Alloyed cast iron / Nodular pearlitic iron	> 250 HB	**28**	40	**35**	50
K	Nodular ferritic cast iron / Malleable cast iron		**20**	24	**35**	50
S	Special alloys / Heat resistant stainless steel		**32**	48	**25**	30
S	Titanium, titanium alloys		**80**	120	**40**	60
N	Copper alloys - easy to machine (brass - bronze)		**50**	80	**90**	130
N	Copper alloys - difficult to machine / Aluminium bronze		**80**	150	**60**	90
N	Aluminium alloys	Si < 8%	**60**	110	**90**	160
N	Cast aluminium	Si > 8%	**100**	200	**70**	120
N	Plastic		**50**	80	**110**	220
N	Gold, silver		**80**	150	**60**	90

DIXI 7625

CUTTING CONDITIONS

Materials to be machined			CARBIDE		ENGRAVING		ROUTING	
			n [rev/min]		Vf[mm/min]	ap[mm]	Vf[mm/min]	ap[mm]
P	Unalloyed steel / Low alloyed steel	< 600 N/mm²	**10 -** 35'000		50 - 200	< 0.05	80 - 250	< 0.1
N	Copper alloys - easy to machine (brass - bronze)		**10 -** 35'000		50 - 250	< 0.08	100 - 280	< 0.15
N	Copper alloys - difficult to machine / Aluminium bronze		**10 -** 35'000		50 - 250	< 0.05	80 - 250	< 0.1
N	Aluminium alloys	Si < 8%	**10 -** 35'000		50 - 250	< 0.08	100 - 280	< 0.15
N	Gold, silver		**10 -** 35'000		50 - 250	< 0.08	100 - 280	< 0.15

$$n\ [tr/min] = \frac{Vc\ [m/min] \times 1000}{\pi \times D_1\ [mm]}$$

$$Vf\ [mm/min] = n\ [tr/min] \times fz\ [mm] \times Z$$

Feed per tooth **fz [mm]**

Ø D_1 0.30 - 0.50	Ø D_1 0.50 - 1.00	Ø D_1 1.00 - 3.00	Ø D_1 3.00 - 5.00	Ø D_1 5.00 - 8.00	Ø D_1 8.00 - 12.00
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.002 - 0.004	**0.002** - 0.008	**0.003** - 0.038	**0.015** - 0.08	**0.03** - 0.11	**0.05** - 0.23
0.002 - 0.005	**0.003** - 0.009	**0.004** - 0.047	**0.019** - 0.09	**0.04** - 0.14	**0.06** - 0.28
0.004 - 0.008	**0.005** - 0.016	**0.006** - 0.078	**0.031** - 0.16	**0.06** - 0.23	**0.09** - 0.47
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38
0.005 - 0.009	**0.006** - 0.019	**0.008** - 0.094	**0.038** - 0.19	**0.08** - 0.28	**0.11** - 0.5
0.003 - 0.006	**0.004** - 0.013	**0.005** - 0.063	**0.025** - 0.13	**0.05** - 0.19	**0.08** - 0.38