



# SOLID CARBIDE CRX S END MILLS

DLC Coated Carbide End Mills for Copper

◎ : Excellent ○ : Good

Recommended cutting conditions : P 539

ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc	SGED28	SGED27	SGED29	SGED31	SGED30
P	1	Non-alloy steel	About 0.15% C Annealed	125						
	2		About 0.45% C Annealed	190	13					
	3		About 0.45% C Quenched & Tempered	250	25					
	4		About 0.75% C Annealed	270	28					
	5		About 0.75% C Quenched & Tempered	300	32					
	6	Low alloy steel	Annealed	180	10					
	7		Quenched & Tempered	275	29					
	8		Quenched & Tempered	300	32					
	9		Quenched & Tempered	350	38					
	10	High alloyed steel, and tool steel	Annealed	200	15					
	11		Quenched & Tempered	325	35					
M	12	Stainless steel	Ferritic / Martensitic Annealed	200	15					
	13		Martensitic Quenched & Tempered	240	23					
	14		Austenitic	180	10					
K	15	Grey cast iron	Pearlitic / ferritic	180	10					
	16		Pearlitic (Martensitic)	260	26					
	17	Nodular cast iron	Ferritic	160	3					
	18		Pearlitic	250	25					
	19	Malleable cast iron	Ferritic	130						
20	Pearlitic		230	21						
N	21	Aluminum-wrought alloy	Not Curable	60		○	○	○	○	○
	22		Curable Hardened	100		○	○	○	○	○
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable	75						
	24		≤ 12% Si, Curable Hardened	90						
	25		> 12% Si, Not Curable	130						
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%	110		◎	◎	◎	◎	◎
	27		CuZn, CuSnZn (Brass)	90		◎	◎	◎	◎	◎
	28		CuSn, lead-free copper and electrolytic copper	100		◎	◎	◎	◎	◎
	29	Non Metallic Materials	Duroplastic, Fiber Reinforced Plastic			○	○	○	○	○
30	Rubber, Wood, etc.									
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15				
	32			Cured	280	30				
	33		Ni or Co Based	Annealed	250	25				
	34			Cured	350	38				
	35			Cast	320	34				
36	Titanium Alloys	Pure Titanium	400 Rm							
37		Alpha + Beta Alloys Hardened	1050 Rm							
H	38	Hardened steel	Hardened	550	55					
	39			630	60					
	40	Hardened Cast Iron	Cast	400	42					
	41			Hardened	550	55				

◎ : Excellent ○ : Good



PLAIN SHANK **SGED28** SERIES

## CARBIDE, 2 FLUTE BALL NOSE DLC COATING

● VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS DLC BESCHICHTUNG

● Fraise carbure, 2 dents, hémisphérique, revêtue DLC

● 2 TAGLIENTI, SEMISFERICA, RIVESTIMENTO DLC

- ▶ Designed for copper, copper alloys, soft graphite, reinforced plastics and materials affiliated with non-ferrous metals.
- ▶ Tight radius tolerance is applied ( $\pm 0.005\text{mm}$  tolerance under R3).
- ▶ Excellent surface roughness from Mirror Face of cutting edges

- ▶ Entwickelt für die Bearbeitung von Kupfer, Kupferlegierungen, sowie faserverstärkten Kunststoffen, NE- Metallen
- ▶ Hochgenaue Raduistoleranz ( $\pm 0.005\text{mm}$  Toleranz unter R3mm)
- ▶ Sehr gute Oberflächenrauigkeit wird durch die besonders behandelte Schneide erreicht



Unit : mm

EDP No.	Radius of Ball Nose R( $\pm 0.005$ )	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
SGED28010	R0.5	1.0	6	2.5	50
SGED28015	R0.75	1.5	6	4	50
SGED28020	R1.0	2.0	6	5	50
SGED28030	R1.5	3.0	6	8	60
SGED28040	R2.0	4.0	6	8	70
SGED28050	R2.5	5.0	6	12	90
SGED28060	R3.0	6.0	6	12	90
SGED28080	R4.0	8.0	8	16	100
SGED28100	R5.0	10.0	10	20	100
SGED28120	R6.0	12.0	12	25	110

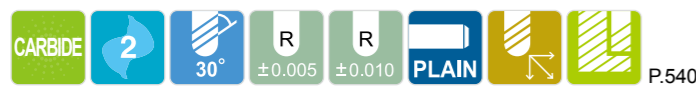
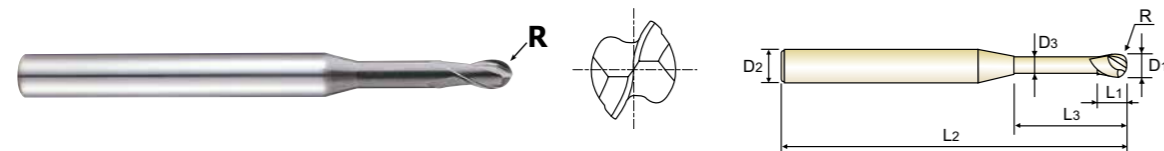
Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	$\pm 0.005$	0 ~ - 0.012	h5
over R3		0 ~ - 0.015	

ISO	P										M				K						
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel		Stainless steel		Grey cast iron	Nodular cast iron	Malleable cast iron				
Material Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
HRc	125	13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25			
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	
Recommend																					
ISO	N									S					H						
	Aluminum-wrought alloy	Aluminum-cast, alloyed				Copper and Copper Alloys (Bronze / Brass)				Non Metallic Materials	Heat Resistant Super Alloys					Titanium Alloys	Hardened steel	Chilled Cast Iron	Hardened Cast Iron		
Material Description	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend	○	○				◎	◎	◎	○												

**CARBIDE, 2 FLUTE BALL NOSE DLC COATING with EXTENDED NECK**

- VOLLHARTMETALL, 2 SCHNEIDEN STIRNRADIUS DLC BESCHICHTUNG mit ABGESETZTEM SCHAFTTETEL
- Fraise carbure, 2 dents, hémisphérique, détalonnée, revêtue DLC
- 2 TAGLIENTI, SEMISFERICA CON SCARICO ESTESO, RIV. DLC

- ▶ Designed for copper, copper alloys soft graphite, reinforced plastics and the materials affiliated with non-ferrous metals.
- ▶ Tight radius tolerance is applied ( $\pm 0.005\text{mm}$  tolerance under R3).
- ▶ Excellent surface roughness thanks to Mirror Face of cutting edges
- ▶ High strength and minimized vibration are available due to two step taper neck(under R0.5).
- ▶ Entwickelt für die Bearbeitung von Kupfer, Kupferlegierungen, sowie faserverstärkten Kunststoffen, NE- Metallen
- ▶ Hochgenaue Raduistoleranz ( $\pm 0.005\text{mm}$  Toleranz unter R3mm)
- ▶ Sehr gute Oberflächenrauhigkeit wird durch die besonders behandelte Schneide erreicht
- ▶ Hohe Zähigkeit und verminderte Vibrationen werden durch den besonderen kegelförmigen Hals erreicht, (unter R 0,5mm)



EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter
	R( $\pm 0.005$ )	D1	D2	L1	L3	L2	D3
SGED2700502	R0.25	0.5	4	0.5	2	45	0.45
SGED2700504	R0.25	0.5	4	0.5	4	45	0.45
SGED2700506	R0.25	0.5	4	0.5	6	45	0.45
SGED2700508	R0.25	0.5	4	0.5	8	45	0.45
SGED2700510	R0.25	0.5	4	0.5	10	45	0.45
SGED2700602	R0.3	0.6	4	0.6	2	45	0.55
SGED2700604	R0.3	0.6	4	0.6	4	45	0.55
SGED2700606	R0.3	0.6	4	0.6	6	45	0.55
SGED2700608	R0.3	0.6	4	0.6	8	45	0.55
SGED2700610	R0.3	0.6	4	0.6	10	45	0.55
SGED2700804	R0.4	0.8	4	0.8	4	45	0.75
SGED2700806	R0.4	0.8	4	0.8	6	45	0.75
SGED2700808	R0.4	0.8	4	0.8	8	45	0.75
SGED2700810	R0.4	0.8	4	0.8	10	45	0.75
SGED2700812	R0.4	0.8	4	0.8	12	45	0.75
SGED2701004	R0.5	1.0	4	1	4	45	0.95
SGED2701006	R0.5	1.0	4	1	6	45	0.95
SGED2701008	R0.5	1.0	4	1	8	45	0.95
SGED2701010	R0.5	1.0	4	1	10	45	0.95
SGED2701012	R0.5	1.0	4	1	12	45	0.95
SGED2701506	R0.75	1.5	4	1.5	6	45	1.45
SGED2701508	R0.75	1.5	4	1.5	8	45	1.45
SGED2701510	R0.75	1.5	4	1.5	10	45	1.45
SGED2701512	R0.75	1.5	4	1.5	12	45	1.45

▶ NEXT PAGE

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	$\pm 0.005$	0 ~ - 0.012	h5
over R3	$\pm 0.010$	0 ~ - 0.015	

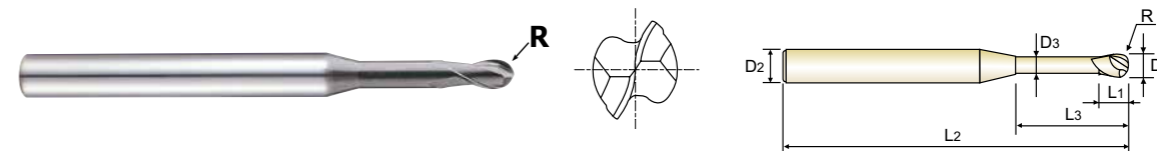
◎ : Excellent ○ : Good

ISO Material Description	P										M				K						
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel		Stainless steel		Grey cast iron	Nodular cast iron		Malleable cast iron			
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
HRc	13	25	28	32	30	10	29	32	38	15	35	15	23	10	10	26	3	25	21	21	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	
Recommend																					

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- ▶ Tight radius tolerance is applied ( $\pm 0.005\text{mm}$  tolerance under R3).
- ▶ Excellent surface roughness thanks to Mirror Face of cutting edges
- ▶ High strength and minimized vibration are available due to two step taper neck(under R0.5).
- ▶ Entwickelt für die Bearbeitung von Kupfer, Kupferlegierungen, sowie faserverstärkten Kunststoffen, NE- Metallen
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- ▶ Sehr gute Oberflächenrauhigkeit wird durch die besonders behandelte Schneide erreicht
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EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter
	R( $\pm 0.005$ )	D1	D2	L1	L3	L2	D3
SGED2701516	R0.75	1.5	4	1.5	16	50	1.45
SGED2702006	R1.0	2.0	4	3	6	45	1.95
SGED2702008	R1.0	2.0	4	3	8	45	1.95
SGED2702010	R1.0	2.0	4	3	10	45	1.95
SGED2702012	R1.0	2.0	4	3	12	45	1.95
SGED2702016	R1.0	2.0	4	3	16	50	1.95
SGED2703010	R1.5	3.0	6	4	10	50	2.85
SGED2703012	R1.5	3.0	6	4	12	50	2.85
SGED2703016	R1.5	3.0	6	4	16	60	2.85
SGED2703020	R1.5	3.0	6	4	20	60	2.85
SGED2704010	R2.0	4.0	6	5	10	50	3.85
SGED2704012	R2.0	4.0	6	5	12	50	3.85
SGED2704016	R2.0	4.0	6	5	16	60	3.85
SGED2704020	R2.0	4.0	6	5	20	60	3.85
SGED2704025	R2.0	4.0	6	5	25	60	3.85
SGED2706020	R3.0	6.0	6	8	20	60	5.85
SGED2706030	R3.0	6.0	6	8	30	90	5.85
SGED2708020	R4.0	8.0	8	10	20	70	7.70
SGED2710025	R5.0	10.0	10	12	25	80	9.70
SGED2712025	R6.0	12.0	12	14	25	80	11.70

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	$\pm 0.005$	0 ~ - 0.012	h5
over R3	$\pm 0.010$	0 ~ - 0.015	

◎ : Excellent ○ : Good

ISO Material Description	P										M				K						
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel		Stainless steel		Grey cast iron	Nodular cast iron		Malleable cast iron			
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
HRc	13	25	28	32	30	10	29	32	38	15	35	15	23	10	10	26	3	25	21	21	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	
Recommend																					



**CARBIDE, 2 FLUTE DLC COATING**

- VOLLHARTMETALL, 2 SCHNEIDEN DLC BESCHICHTUNG
- Ⓢ Fraise carbure, 2 dents, revêtue DLC
- Ⓜ 2 TAGLIENTI, RIVESTIMENTO DLC

- ▶ Designed for copper, copper alloys, soft graphite, reinforced plastics and materials affiliated with non-ferrous metals.
- ▶ Excellent surface roughness from special flute geometry for removing burrs

- ▶ Entwickelt für die Bearbeitung von Kupfer, Kupferlegierungen, sowie faserverstärkten Kunststoffen, NE- Metallen
- ▶ Hervorragende Oberflächenrauheit durch speziell behandelte Nutengeometrie was zur verminderten Gratbildung führt



CARBIDE 2 30° PLAIN P.540

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
SGED31010	1.0	6	2.5	50
SGED31015	1.5	6	4	50
SGED31020	2.0	6	6	50
SGED31025	2.5	6	8	50
SGED31030	3.0	6	10	50
SGED31040	4.0	6	12	50
SGED31050	5.0	6	15	60
SGED31060	6.0	6	15	60
SGED31080	8.0	8	20	65
SGED31100	10.0	10	25	70
SGED31120	12.0	12	30	80

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	0 ~ - 0.012	h5
over Ø6	0 ~ - 0.015	

◎ : Excellent ○ : Good

ISO Material Description	P										M				K					
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel				Stainless steel		Grey cast iron	Nodular cast iron		Malleable cast iron
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc	13	25	28	32	30	10	29	32	38	15	35	15	23	10	10	26	3	25	21	21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend																				

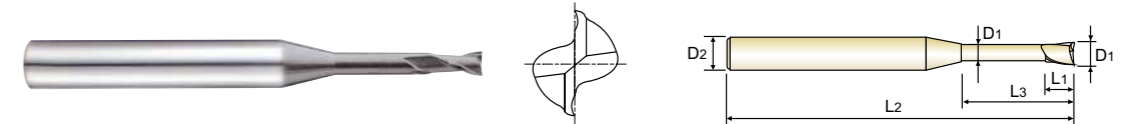
ISO Material Description	N										S					H					
	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)					Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel	Chilled Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend	○	○				◎	◎	◎	○												

**CARBIDE, 2 FLUTE DLC COATING with EXTENDED NECK**

- VOLLHARTMETALL, 2 SCHNEIDEN DLC BESCHICHTUNG mit ABGESETZTEM SCHAFTTETL
- Ⓢ Fraise carbure, 2 dents, détalonnée, revêtue DLC
- Ⓜ 2 TAGLIENTI, SCARICO ESTESO, RIVESTIMENTO DLC

- ▶ Designed for copper, copper alloys, soft graphite, reinforced plastics and materials affiliated with non-ferrous metals.
- ▶ High toughness and minimized vibration applied from two step taper neck (under dia. 1.0mm)
- ▶ Excellent surface roughness from special flute geometry for removing burrs

- ▶ Entwickelt für die Bearbeitung von Kupfer, Kupferlegierungen, sowie faserverstärkten Kunststoffen, NE- Metallen
- ▶ Hohe Zähigkeit und verminderte Vibrationen werden durch den besonderen kegelförmigen Hals erreicht, (unter Ø 1mm)
- ▶ Hervorragende Oberflächenrauheit durch speziell behandelte Nutengeometrie



CARBIDE 2 30° PLAIN P.540

Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter
	D1	D2	L1	L3	L2	D3
SGED3000502	0.5	4	0.7	2	45	0.45
SGED3000504	0.5	4	0.7	4	45	0.45
SGED3000506	0.5	4	0.7	6	45	0.45
SGED3000508	0.5	4	0.7	8	45	0.45
SGED3000510	0.5	4	0.7	10	45	0.45
SGED3000602	0.6	4	0.9	2	45	0.55
SGED3000604	0.6	4	0.9	4	45	0.55
SGED3000606	0.6	4	0.9	6	45	0.55
SGED3000608	0.6	4	0.9	8	45	0.55
SGED3000610	0.6	4	0.9	10	45	0.55
SGED3000804	0.8	4	1.2	4	45	0.75
SGED3000806	0.8	4	1.2	6	45	0.75
SGED3000808	0.8	4	1.2	8	45	0.75
SGED3000810	0.8	4	1.2	10	45	0.75
SGED3000812	0.8	4	1.2	12	45	0.75
SGED3001004	1.0	4	1.5	4	45	0.95
SGED3001006	1.0	4	1.5	6	45	0.95
SGED3001008	1.0	4	1.5	8	45	0.95
SGED3001010	1.0	4	1.5	10	45	0.95
SGED3001012	1.0	4	1.5	12	45	0.95
SGED3001506	1.5	4	2.3	6	45	1.45
SGED3001508	1.5	4	2.3	8	45	1.45
SGED3001510	1.5	4	2.3	10	45	1.45
SGED3001512	1.5	4	2.3	12	45	1.45

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	0 ~ - 0.012	h5
over Ø6	0 ~ - 0.015	

◎ : Excellent ○ : Good

ISO Material Description	P										M				K					
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel				Stainless steel		Grey cast iron	Nodular cast iron		Malleable cast iron
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc	13	25	28	32	30	10	29	32	38	15	35	15	23	10	10	26	3	25	21	21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend																				

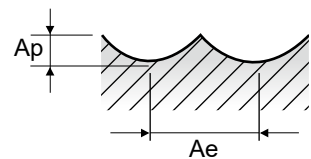
ISO Material Description	N										S					H					
	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)					Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel	Chilled Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend	○	○				◎	◎	◎	○												



**SGED27 SERIES 2 FLUTE BALL**

Vc = m/min.  
fz = mm/tooth  
RPM = rev./min.  
FEED = mm/min.

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						0.5	0.6	0.8	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	21	Aluminum-wrought alloy	0.05D	0.02D	Vc	80	95	125	155	250	245	240	240	245	250	250	250
					fz	0.005	0.007	0.009	0.01	0.022	0.03	0.042	0.052	0.061	0.079	0.1	0.122
					RPM	50930	50399	49736	49338	39789	25995	19099	15279	12998	9947	7958	6631
	26-28	Copper and Copper Alloys (Bronze / Brass)	0.05D	0.02D	Vc	80	95	110	110	125	125	120	120	125	125	125	125
					fz	0.005	0.007	0.009	0.011	0.02	0.028	0.038	0.047	0.055	0.072	0.091	0.111
					RPM	50930	50399	43768	35014	19894	13263	9549	7639	6631	4974	3979	3316
	29.1	Duroplastic	0.05D	0.02D	Vc	80	95	125	155	315	370	360	365	370	375	375	375
					fz	0.004	0.005	0.006	0.006	0.013	0.019	0.027	0.033	0.039	0.05	0.064	0.077
					RPM	50930	50399	49736	49338	50134	39258	28648	23237	19629	14921	11937	9947
FEED	509	706	895	987	1751	1560	1604	1589	1586	1572	1592	1592	1618				
FEED	509	706	788	770	796	743	726	718	729	716	724	736					
FEED	407	504	597	592	1303	1492	1547	1534	1531	1492	1528	1532					



**SGED30, SGED31 SERIES**

**2 FLUTE - SLOTTING**

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)										
						0.5	0.6	0.8	1.0	2.0	3.0	4.0	6.0	8.0	10.0	12.0
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	Vc	80	95	125	155	315	330	325	325	330	325	330
					fz	0.005	0.006	0.008	0.01	0.01	0.023	0.032	0.048	0.064	0.081	0.097
					RPM	50930	50399	49736	49338	50134	35014	25863	17242	13130	10345	8754
	26-28	Copper and Copper Alloys (Bronze / Brass)	1.0D	0.5D	Vc	80	95	105	110	160	165	160	165	165	160	165
					fz	0.005	0.006	0.008	0.01	0.01	0.023	0.032	0.048	0.064	0.081	0.097
					RPM	50930	50399	41778	35014	25465	17507	12732	8754	6565	5093	4377
	29.1	Duroplastic	1.0D	0.5D	Vc	80	95	125	155	315	470	490	490	500	490	495
					fz	0.001	0.002	0.002	0.003	0.004	0.007	0.009	0.014	0.018	0.023	0.028
					RPM	50930	50399	49736	49338	50134	49869	38993	25995	19894	15597	13130
FEED	509	605	796	987	1003	1611	1655	1655	1681	1676	1698					
FEED	509	605	668	700	509	805	815	840	840	825	849					
FEED	102	202	199	296	401	698	702	728	716	717	735					

**2 FLUTE - SIDE CUTTING**

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)										
						0.5	0.6	0.8	1.0	2.0	3.0	4.0	6.0	8.0	10.0	12.0
N	21-22	Aluminum-wrought alloy	0.5D	1.0D	Vc	80	95	125	130	260	260	265	270	265	265	270
					fz	0.005	0.006	0.008	0.01	0.011	0.025	0.034	0.053	0.069	0.086	0.107
					RPM	50930	50399	49736	41380	41380	27587	21088	14324	10544	8435	7162
	26-28	Copper and Copper Alloys (Bronze / Brass)	0.5D	1.0D	Vc	80	85	85	85	170	175	175	180	175	175	180
					fz	0.005	0.006	0.008	0.01	0.01	0.023	0.032	0.05	0.064	0.08	0.1
					RPM	50930	45094	33820	27056	27056	18568	13926	9549	6963	5570	4775
	29.1	Duroplastic	0.5D	1.0D	Vc	80	95	125	155	315	350	350	360	350	350	360
					fz	0.004	0.005	0.006	0.008	0.009	0.018	0.026	0.04	0.051	0.064	0.08
					RPM	50930	50399	49736	49338	50134	37136	27852	19099	13926	11141	9549
FEED	509	605	796	828	910	1379	1434	1518	1455	1451	1533					
FEED	509	541	541	541	541	854	891	955	891	891	955					
FEED	407	504	597	789	902	1337	1448	1528	1420	1426	1528					

