

치아보철 가공용 엔드밀

T Endmill

KORLOY
TECH-NEWS



- 피삭재별 재증 최적화를 통한 공구 성능 향상(*PC2510: Titanium, Co-Cr / *ND3000: Zirconia)
- 국내·외 치과 CAD/CAM용 가공기별 전용 공구의 차별화

치아보철 가공용 엔드밀

T Endmill

세계적으로 고령 인구 증가의 가속화와 더불어 치과 임플란트 분야는 지난 몇 년간 꾸준히 성장해 왔습니다. 이에 따라 많은 업체들이 치과 CAD/CAM용 가공기의 개발을 활발히 진행하고 있으며 각각의 업체는 차별화된 공구 형상으로 독자적인 가공 경쟁력을 갖추고 있습니다.

이러한 시장의 요구에 따라 T Endmill은 가공기별 전용 공구를 맞춤 제작하여 고객의 차별화된 경쟁력 확보에 도움을 드립니다.

치과 CAD/CAM은 X-ray 및 구강스캐너 등을 활용하여 지속 발전하고 있으며 현재 많은 업체에서 충분하게

상용화시켜 이전의 수동 임플란트 제작 과정을 자동화 하였습니다. 이에 따라 가공 시간이 현저히 줄었고 증가된 생산성만큼 공구 수명 향상이 요구되고 있습니다.

또한, 대표적인 치아보철 피삭재인 Zirconia, Titanium, Co-Cr, Wax, PMMA은 각각 다른 물성치와 기계적 성질을 가지고 있으며, 그에 적합한 최적의 공구 솔루션을 필요로 합니다.

T Endmill은 ND3000(Zirconia용)/PC2510(Titanium, Co-Cr) 재종을 각각의 피삭재에 전용 재종으로 적용 하였으며 그에 최적화된 인선 형상을 통하여 우수한 절삭성을 보장합니다.



가공 장비별 전용 공구 대응

- 다양화된 치과의료기기 시장의 요구 충족

최적의 인선형상 적용

- 절삭성 우수

피삭재별 맞춤 재종 대응

- 다양한 임플란트용 소재에서 최적의 가공 성능 확보

형번표기법

T	Z	BE	2	030	-	050	-	N100	S04	(Z-MATCH)
T Endmill DenTal	피삭재 Z: Zirconia T: Titanium, Co-Cr W: Wax, PMMA	구분 BE: Ball Endmill FE: Flat Endmill RE: Radius Endmill	날수 2: 2Flute	인경 030: 3.0mm		전장 050: 50mm		넥장 N100: 10.0 mm	상크경 S04: 4mm	가공기 메이커

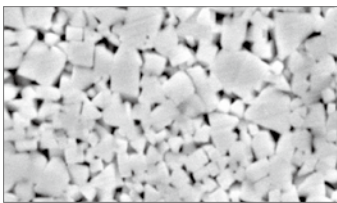
ET	RT	006	041	-	S	4	M200	-	T7
Electroplating Tool	형상	공구직경 006: 0.6 105: 10.5 005: 0.45	전장길이 041: 41.1 031: 31 100: 100		상크재질 S: SCM440 T: 스테인레스강 C: 초경 H: HSS	상크직경 4: Ø4 6: Ø6	입자단위 M: Mesh S: ISO(FEPA)		테이퍼 각도 無: 테이퍼 없음 T: 테이퍼 각도

Titanium, Co-Cr 재종

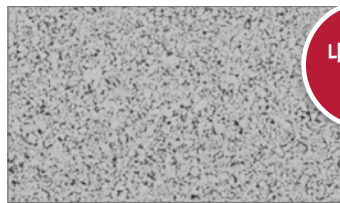
- 향상된 표면 조도를 제공하는 코팅 후처리 기술 적용
- 초미립 고인성 모재를 적용하여 안정적인 인성을 바탕으로 고경도강의 단속 및 열충격이 큰 습식 가공용에 최적화된 재종

PC2510 개발(고경도강용 코팅 재종)

1. 고인성 초미립 모재기술 적용



[미립 재종]

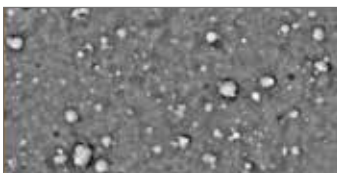


[초미립 재종]

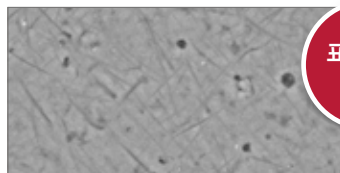
내마모성
향상

- ▶ 고인성과 우수한 내마모성을 갖춘 모재로 Titanium 가공 시 인선부 집중되는 열충격에 최적화

2. 코팅 후처리 기술 적용



[일반 코팅]



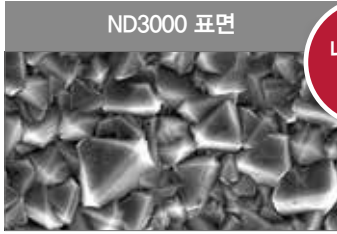
[코팅 후처리]

표면조도
향상

Zirconia 재종

- 흑연, 세라믹 가공에 우수한 고경도 다이아몬드 코팅
- 우수한 박막 밀착력으로 고속, 중(重) 절삭가공에 최적화

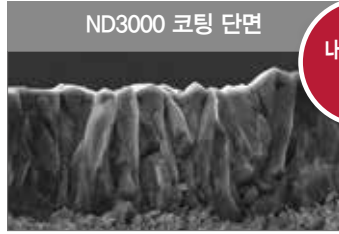
ND3000 개발(다이아몬드 코팅 재종)



ND3000 표면

내마모성
우수

고경도(Hv 10,000) 다이아몬드 코팅 적용하여 내마모성 우수



ND3000 코팅 단면

내박리성
향상

전용 모재 적용하여 밀착력 우수

▶ 세라믹 입자와 공구 여유면 마찰에 의한 과대 여유면 마모 억제 효과

제품특징

- Zirconia, Titanium, Co-Cr, Wax, PMMA 등 치아 보철 가공용 엔드밀
- 치아보철 종류별 맞춤 재종 대응으로 최적의 가공 성능 확보
- 인선 형상 최적화로 가공면 단차 발생 억지 및 가공 면조도 우수
- 가공기별 맞춤 형상 대응으로 차별화된 공구 제공

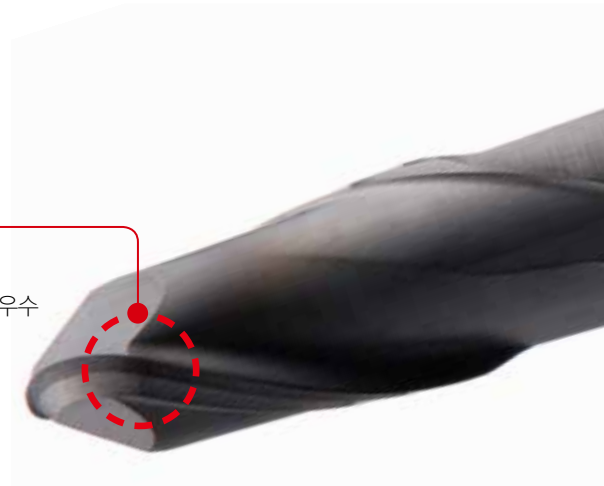


센터매치 볼 형상

- 센터형상 최적화로 볼 포인트부 여유각 확보
- 볼 포인트부 내마모성 우수 및 절삭성 확보

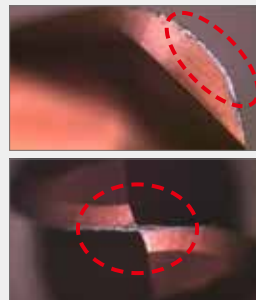
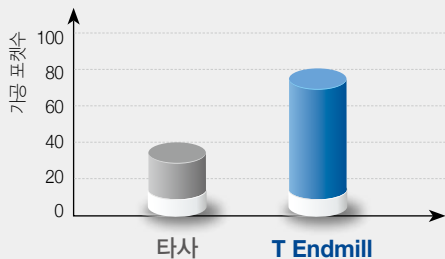
탄젠셜 커팅 엣지 형상

- One-Pass grinding 방식 적용
- 가공면 단차 발생 방지 가공 면조도 우수

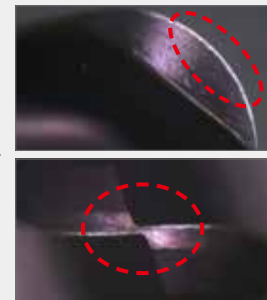


성능평가

- 피삭재 Co-Cr
- 절삭조건 $vc(m/min) = 150$, $fz(mm/t) = 0.08$, $ap(mm) = 0.13$, $ae(mm) = 0.7$, 습식(wet)
- 공구 TTBE2030-050



[타사]



[T Endmill]

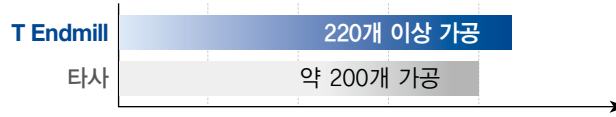
▶ 신규 PC2510 재종 적용으로 내인성 및 내마모성 우수

내마모성
우수

절삭평가 사례

임플란트 크라운

- 피삭재 Zirconia
- 절삭조건 $vc(m/min) = 140$, $fz(mm/t) = 0.05$, $ap(mm) = 0.1$, $ae(mm) = 0.6$, 건식(dry)
- 공구 TZBE2020-044-N200S03(DOF)



▶ 타사 대비 10% 이상 크라운 가공 수량 증가

추천절삭조건(Titanium, Co-Cr)

공구직경 (Ø)	가공 영역	절입 $ap(mm)$	절입 $ae(mm)$	회전속도 $n(min^{-1})$	테이블 이송 $vf(mm/min)$
3.0	황삭	0.12	0.7	10,500	1,150
2.5	중삭	0.08	0.53	11,500	850
2.0	중삭	0.08	0.42	14,500	850
1.5	정삭	0.04	0.32	19,000	850
1.0	정삭	0.02	0.07	28,500	850
0.6	정삭	0.02	0.07	28,500	850

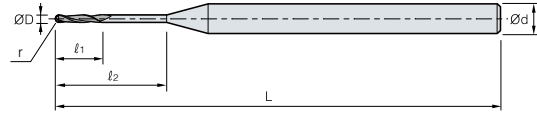
추천절삭조건(Zirconia)






공구직경 (Ø)	가공 영역	절입 $ap(mm)$	절입 $ae(mm)$	회전속도 $n(min^{-1})$	테이블 이송 $vf(mm/min)$
3.0	황삭	0.5	1.5	23,500	1,600
2.5	중삭	0.3	1.25	28,000	1,200
2.0	정삭	0.3	1.0	35,000	1,200
1.0	정삭	0.1	0.2	38,500	1,050
0.6	정삭	0.1	0.2	63,500	630

! 주의사항

- 절삭조건은 기계의 상태, 가공형태 및 목적에 알맞게 조정하여 사용하십시오
- 가공물 장착 시 강성을 필요로 하며 떨림이 발생할 경우 회전속도와 이송을 같은 비율로 낮추어 사용하십시오

ROLAND Type (DWX-30, DWX-50, DWX-51D, DWX-52D)



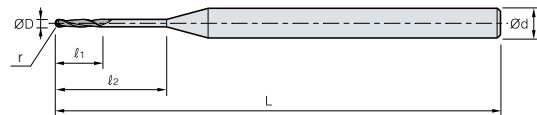











ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.3mm ROLAND	TZBE2003-050-N226(ROLAND)	-	0.3	1.8	22.6	50	4
	0.6mm ROLAND	TZBE2006-050-N12(ROLAND)	PVD	0.6	1.5	12	50	4
	1mm ROLAND	TZBE2010-050-N16(ROLAND)	DIA	1	2.2	16	50	4
	2mm ROLAND	TZBE2020-050-N20(ROLAND)	DIA	2	3.2	20	50	4
PMMA	1mm ROLAND PMMA	TWBE2010-050-N16(ROLAND)	-	1	2.2	16	50	4
	2mm ROLAND PMMA	TWBE2020-050-N20(ROLAND)	-	2	3.2	20	50	4
HYBRID	0.6mm ROLAND ULTIMATE	ETRE006050-S4M325-R(ROLAND)	전착 DIA	0.6	10	10	50	4
	1mm ROLAND ULTIMATE	ETRE010050-S4M170-R(ROLAND)	전착 DIA	1	12	12	50	4
	2mm ROLAND ULTIMATE	ETRE020050-S4M120-R(ROLAND)	전착 DIA	2	17	17	50	4

IMES-CORE Type (250i, 340i, 450i)



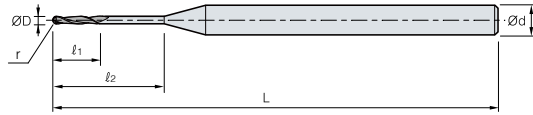






ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.3mm 250i 340i 450i	TZBE2003-048-N080S03(450i)	PVD	0.3	1.8	8	48	3
	0.6mm 250i 340i 450i	TZBE2006-048-N080S03(450i)	PVD	0.6	1.5	8	48	3
	1mm 250i 340i 450i	TZBE2010-048-N14(450i)	DIA	1	4.4	14	48	3
	2.5mm 250i 340i 450i	TZBE2025-048-N20(450i)	DIA	2.5	6	20	48	3
	0.6mm 250i 340i 450i-S6	TZBE2006-053-N090S06(450iS6)	PVD	0.6	3	9	53	6
	1mm 250i 340i 450i-S6	TZBE2010-053-N142S06(450iS6)	DIA	1	4.5	14.2	53	6
	2.5mm 250i 340i 450i-S6	TZBE2025-053-N201S06(450iS6)	DIA	2.5	7.5	20.1	53	6
PMMA	1mm 250i 340i 450i PMMA	TWBE2010-048-N140S03(250i340i450i)	-	1	4.4	14	48	3
	2.5mm 250i 340i 450i PMMA	TWBE2025-048-N200S03(250i340i450i)	-	2.5	6	20	48	3
METAL	1mm 250i 340i 450i TITAN	TTBE2010-040-N090S03(450i)	PVD	1	2	9	40	3
	2mm 250i 340i 450i TITAN	TTBE2020-040-N120S03(450i)	PVD	2	4	12	40	3
	3mm 250i 340i 450i TITAN	TTBE2030-0385-N120S03(450i)	PVD	3	4	12.4	40	3
HYBRID	0.6mm 250i 340i 450i ULTIMATE	ETND006039-S3M325-T5(450i)	전착 DIA	0.6	10.3	10.3	39.8	3
	1mm 250i 340i 450i ULTIMATE	ETRE010039-S3M230(450i)	전착 DIA	1	10.2	10.2	39.8	3
	2.5mm 250i 340i 450i ULTIMATE	ETRE025039-S3M120(450i)	전착 DIA	2.5	13	13	39.8	3

WIELAND SELECT Type

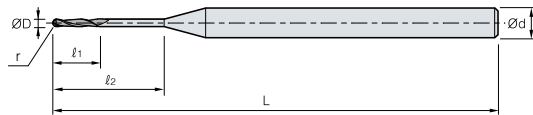


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.7mm WIELAND SELECT	TZBE2007-040-N145S03(WIELAND)	PVD	0.7	2.5	14.5	40	3
	1mm WIELAND SELECT	TZBE2010-040-N145S03(WIELAND)	DIA	1	4.5	14.5	40	3
	2.5mm WIELAND SELECT	TZBE2025-040-N200S03(WIELAND)	DIA	2.5	7.5	20	40	3
PMMA	1mm WIELAND SELECT PMMA	TWBE2010-040-N145S03(WIELAND)	-	1	4.5	14.5	40	3
	2.5mm WIELAND SELECT PMMA	TWBE2025-040-N200S03(WIELAND)	-	2.5	7.5	20	40	3

WIELAND MINI Type

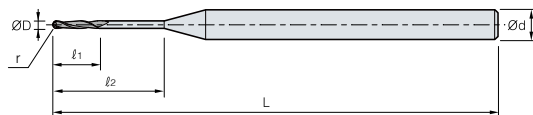


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	1mm WIELAND MINI	TZBE2010-035-N140S03(WIELAND MINI)	-	1	4.5	14.5	35	3
	2.5mm WIELAND MINI	TZBE2025-035-N200S03(WIELAND MINI)	-	2.5	6	20	35	3

AMANN GIRRBACH Type (CERA-MILL)

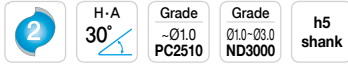
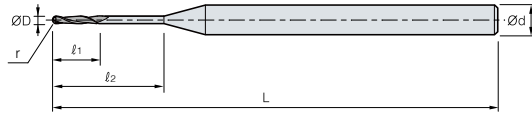


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.6mm CERA-MILL	TZBE2006-047-N135S03(CERAMILL)	PVD	0.6	2.4	13.5	47	3
	1mm CERA-MILL	TZBE2010-047-N165S03(CERAMILL)	DIA	1	2	12	47	3
	2.5mm CERA-MILL	TZBE2025-047-N180S03(CERAMILL)	DIA	2.5	4	18	47	3
PMMA	1mm CERA-MILL PMMA	TWBE2010-047-N165S03(CERAMILL)	-	1	2	16.5	47	3
	2.5mm CERA-MILL PMMA	TWBE2025-047-N180S03(CERAMILL)	-	2.5	4	18	47	3

VHF-S1 Type

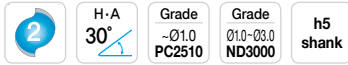
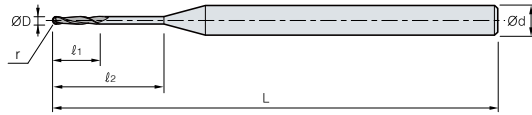


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.6mm VHF-S1	TZBE2006-035-N030S03(VHFS1)	PVD	0.6	1.5	3	35	3
	1mm VHF-S1	TZBE2010-040-N145S03(VHFS1)	DIA	1	5	14.5	40	3
	2mm VHF-S1	TZBE2020-040-N160S03(VHFS1)	DIA	2	4	16	40	3
PMMA	1mm VHF-S1 PMMA	TWBE2010-040-N145S03(VHFS1)	-	1	5	14.5	40	3
	2mm VHF-S1 PMMA	TWBE2020-040-N160S03(VHFS1)	-	2	4	16	40	3

VHF-K4/CM Type

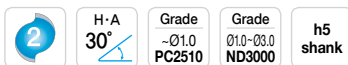
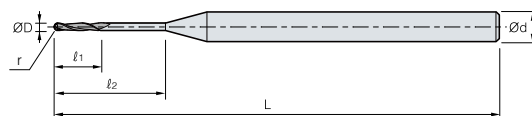


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.6mm VHF-K4	TWBE2006-035-N030S03(VHFK4)	-	0.6	1.4	3	35	3
	1mm VHF-K4	TWBE2010-035-N160S03(VHFK4)	-	1	2.2	16	35	3
	2mm VHF-K4	TWBE3020-035-N160S03(VHFK4)	-	2	4.2	16	35	3

CHARLY Type

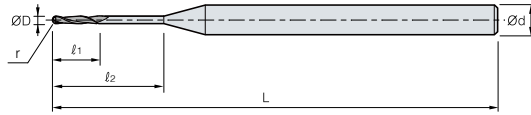







ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.5mm CHARLY	TZBE2005-0385-N100S03(CHARLY)	PVD	0.5	1.5	10	38.5	3
	1mm CHARLY	TZBE2010-0385-N120S03(CHARLY)	DIA	1	2	12	38.5	3
	1.5mm CHARLY	TZBE2015-0385-N120S03(CHARLY)	DIA	1.5	3	12	38.5	3
	3mm CHARLY	TZFE2030-0385-N060S03(CHARLY)	DIA	3	7	6	38.5	3
PMMA	1mm CHARLY PMMA	TZBE2010-0385-N120S03(CHARLY)-N	-	1	2	12	38.5	3
	1.5mm CHARLY PMMA	TZBE2015-0385-N120S03(CHARLY)-N	-	1.5	3	12	38.5	3
	3mm CHARLY PMMA	TZFE2030-0385-N060S03(CHARLY)-N	-	3	7	6	38.5	3

ZIRKONZAHN M5 Type

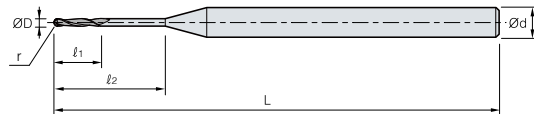













ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	1mm ZIRKONZHAN M5	TZBE2010-057-N120S03(ZIRKON)-DYD	DIA	1	6	12	57	3
	2mm ZIRKONZHAN M5	TZBE2020-057-N180S03(ZIRKON)-DYD	DIA	2	10	18	57	3
	0.3mm ZIRKONZHAN M5-N	TZBE2003-057-N060S03(ZIRKONZAHN)-DY	-	0.3	3	6	57	3
	0.5mm ZIRKONZHAN M5-N	TZBE2005-057-N100S03(ZIRKONZHAN)-DY	-	0.5	3	10	57	3
	1mm ZIRKONZHAN M5-N	TZBE2010-057-N120S03(ZIRKONZHAN)-DY	-	1	6	12	57	3
	2mm ZIRKONZHAN M5-N	TZBE2020-057-N180S03(ZIRKONZHAN)-DY	-	2	10	18	57	3

ZIRKONZAHN M1 / M4 Type

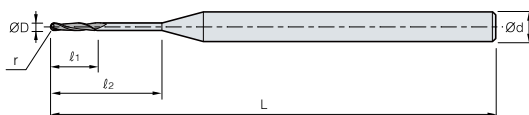


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.5mm ZIRKONZHAN M1/M4	TZBE2005-050-N108S06(ZIRKONM1)	PVD	0.5	3.5	10.8	50	6
	1mm ZIRKONZHAN M1/M4	TZBE2010-050-N120S06(ZIRKONM1)	DIA	1	6	12	50	6
	2mm ZIRKONZHAN M1/M4	TZBE2020-050-N180S06(ZIRKONM1)	DIA	2	10	18	50	6
	0.5mm ZIRKONZHAN M1/M4-N	TZBE2005-050-N095S06(ZIRKON M1)	-	0.5	3	9.5	50	6
	1mm ZIRKONZHAN M1/M4-N	TZBE2010-050-N120S06(ZIRKONM1)-N	-	1	6	12	50	6
	2mm ZIRKONZHAN M1/M4-N	TZBE2020-050-N180S06(ZIRKONM1)-N	-	2	10	18	50	6
METAL	1mm ZIRKONZHAN M1/M4 TITAN	TTBE2010-050-N120S06(ZIRKON M1)	PVD	1	4	12	50	6
	2mm ZIRKONZHAN M1/M4 TITAN	TTBE2020-050-N120S06(ZIRKON M1)	PVD	2	3	12	50	6
	3mm ZIRKONZHAN M1/M4 TITAN	TTBE2030-050-N180S06(ZIRKON M1)	PVD	3	4.4	18	50	6

SIRONA Type (MC-X5)

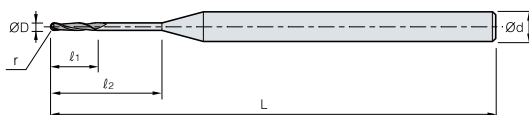


2	H·A 30°	Grade ~Ø1.0 PC2510	Grade Ø1.0~Ø3.0 ND3000	h5 shank	ØD	공구직경공차
					~Ø1.0	0.00 ~ -0.015
					Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.5mm MC-X5	TZBE2005-042-N060S03(MC-X5)	PVD	0.5	1	5	42	3
	1mm MC-X5	TZBE2010-043-N170S03(MC-X5)	DIA	1	3.4	17.2	43	3
	2.5mm MC-X5	TZBE4025-044-N240S03(MC-X5)	DIA	2.5	4.5	24	44	3
PMMA	1mm MC-X5 PMMA	TWBE2010-043-N170S03(MC-X5)	-	1	3.4	17.2	45	3
	2.5mm MC-X5 PMMA	TWBE2025-044-N240S3(MC-X5)	-	2.5	4.5	24	45	3

YENA Type

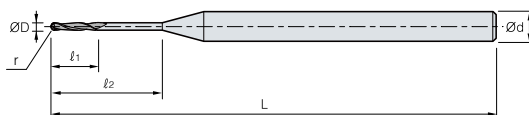


2	H·A 30°	Grade ~Ø1.0 PC2510	Grade Ø1.0~Ø3.0 ND3000	h5 shank	ØD	공구직경공차
					~Ø1.0	0.00 ~ -0.015
					Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	1mm YENA	TZBE2010-045-N160S04(YENA)-DY	DIA	1	1.8	16.5	45	4
	2mm YENA	TZBE2020-045-N160S04(YENA)-DY	DIA	2	3	16.5	45	4
PMMA	1mm YENA PMMA	TWBE2010-045-N160S04(YENA)-DY	-	1	1.8	16.5	45	4
	2mm YENA PMMA	TWBE2020-045-N160S04(YENA)-DY	-	2	3	16.5	45	4
METAL	2mm YENA TITAN	TTBE2020-045-N122S04(YENA)	PVD	2	3.6	12.2	45	4
	3mm YENA TITAN	TTBE2030-045-N125S04(YENA)	PVD	3	5.5	12.5	45	4

LEZIRTH Type

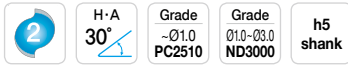
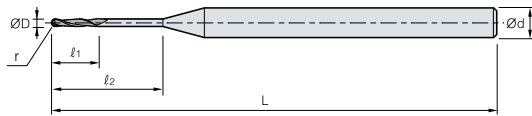


2	H·A 30°	Grade ~Ø1.0 PC2510	Grade Ø1.0~Ø3.0 ND3000	h5 shank	ØD	공구직경공차
					~Ø1.0	0.00 ~ -0.015
					Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
METAL	1mm 레저스(Co-Cr)	TTBE2010-050-V1.2N8S6	PVD	1	1.2	8	50	6
	1.5mm 레저스(Co-Cr)	TTBE2015-045-V1.7N8.5S6	PVD	1.5	1.7	8.5	45	6
	2mm 레저스(Co-Cr)	TTE2020-050-V2.2N12S6	PVD	2	2.2	12	50	6
	3mm 레저스(Co-Cr)	TTE2030-060-V3.5N16S6	PVD	3	3.5	16	60	6

ARUM Type (4X/5X-100)

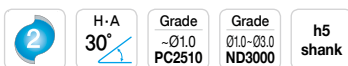
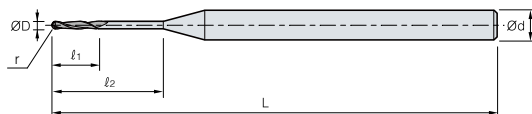


$\varnothing D$	공구직경공차
$\sim \varnothing 1.0$	0.00 ~ -0.015
$\varnothing 1.0 \sim \varnothing 3.0$	0.00 ~ -0.02

(mm)

용도	형번	코팅	$\varnothing D$	ℓ_1	ℓ_2	L	$\varnothing d$	
ZIRCONIA	0.6mm 4X-100	TZBE2006-063-N120S06(4X-100)	PVD	0.6	1.5	12	63	6
	1mm 4X-100	TZBE2010-063-N160S06(4X-100)	DIA	1	2.5	16	63	6
	2mm 4X-100	TZBE2020-063-N200S06(4X-100)	DIA	2	6	20	63	6
PMMA	1mm 4X-100 PMMA	TWBE2010-063-N160S06(4X-100)	-	1	2.5	16	63	6
	2mm 4X-100 PMMA	TWBE2020-063-N200S06(4X-100)	-	2	6	20	63	6

ARUM Type (5X-150)

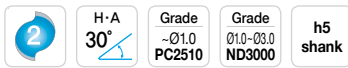
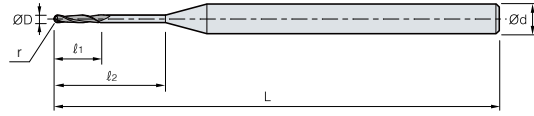


$\varnothing D$	공구직경공차
$\sim \varnothing 1.0$	0.00 ~ -0.015
$\varnothing 1.0 \sim \varnothing 3.0$	0.00 ~ -0.02

(mm)

용도	형번	코팅	$\varnothing D$	ℓ_1	ℓ_2	L	$\varnothing d$	
ZIRCONIA	0.6mm 5X-150	TZBE2006-045-N100S04(5X-150)	PVD	0.6	1.5	10	45	4
	1mm 5X-150	TZBE2010-050-N161S04(5X-150)-K	DIA	1	2.5	16.1	50	4
	2mm 5X-150	TZBE2020-050-N181S04(5X-150)	DIA	2	6.5	18.1	50	4
PMMA	1mm 5X-150 PMMA	TWBE2010-050-N161S04(5X-150)	-	1	2.5	16.1	50	4
	2mm 5X-150 PMMA	TWBE2020-050-N181S04(5X-150)	-	2	6.5	18.1	50	4
HYBRID	0.6mm 5X-150 ULTIMATE	ETND006041-C4M325-T7(5X-150)	전착 DIA	0.6	8	8	41	4
	1mm 5X-150 ULTIMATE	ETND010044-C4M170(5X-150)	전착 DIA	1	10	10	44	4
	1.5mm 5X-150 ULTIMATE	ETND015044-C4M140(5X-150)	전착 DIA	1.5	10	10	44	4
	2.5mm 5X-150 ULTIMATE	ETND025044-C4M120(5X-150)	전착 DIA	2.5	12	12	44	4

ARUM Type (5X-200)

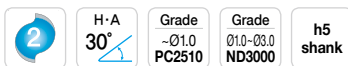
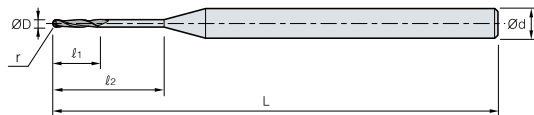


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ ₁	ℓ ₂	L	Ød	
ZIRCONIA	0.6mm 5X-200	TZBE2006-050-N080S06(5X-200)	PVD	0.6	1.6	8	50	6
	1mm 5X-200	TZBE2010-053-N140S06(5X-200)	DIA	1	2	14	53	6
	2mm 5X-200	TZBE2020-055-N200S06(5X-200)	DIA	2	6	20	55	6
PMMA	1mm 5X-200 PMMA	TWBE2010-053-N140S06(5X-200)	-	1	2	14	53	6
	2mm 5X-200 PMMA	TWBE2020-055-N200S06(5X-200)	-	2	6	20	55	6
HYBRID	0.6mm 5X-200 ULTIMATE	ETND006050-H6M270-T7(5X-200)	전착 DIA	0.6	8	8	50	6
	1mm 5X-200 ULTIMATE	ETRE010050-H6M200(5X-200)	전착 DIA	1	10	10	50	6
	1.5mm 5X-200 ULTIMATE	ETRE015050-H6M170(5X-200)	전착 DIA	1.5	10	10	50	6
	2.5mm 5X-200 ULTIMATE	ETRE025050-H6M140(5X-200)	전착 DIA	2.5	12	12	50	6

ARUM Type (5X-300)

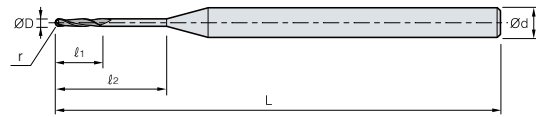


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ ₁	ℓ ₂	L	Ød	
ZIRCONIA	0.3mm 5X-300	TZBE2003-045-N120S04(5X-300)	PVD	0.3	0.6	12	45	4
	0.6mm 5X-300	TZBE2006-045-N100S04(5X-300)	PVD	0.6	1.2	10	45	4
	1mm 5X-300	TZBE2010-050-N160S04(5X-300)	DIA	1	2	16	50	4
	2mm 5X-300	TZBE2020-050-N180S04(5X-300)	DIA	2	6	18	50	4
PMMA	1mm 5X-300 PMMA	TWBE2010-050-N160S04(5X-300)	-	1	2	16	50	4
	2mm 5X-300 PMMA	TWBE2020-050-N180S04(5X-300)	-	2	6	18	50	4

ARUM Type (METAL TOOL)

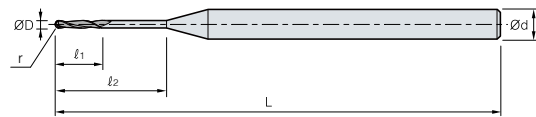


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
METAL	1mm ARUM TITAN	TTBE2010-050-N100S06(ARUM)-DY	PVD	1	2	10	50	6
	1.5mm ARUM TITAN	TTBE2015-050-N100S06(ARUM)-DY	PVD	1.5	3	10	50	6
	2mm ARUM TITAN	TTBE2020-050-N120S06(ARUM)-DY	PVD	2	4	12	50	6
	2.5mm ARUM TITAN	TTBE2025-050-N140S06(ARUM)C1	PVD	2.5	8	14	50	6
	3mm ARUM TITAN	TTBE2030-050-N120S06(ARUM)-DY	PVD	3	6	12	50	6

Z-MATCH/CAMELEON Type

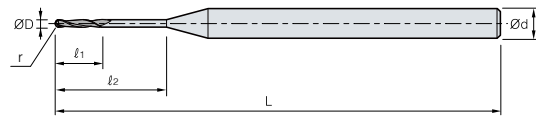


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.5mm Z-MATCH	TZBE2005-055-N8(Z-MATCH)	PVD	0.5	1.5	8	55	6
	1mm Z-MATCH	TZBE2010-055-N16(Z-MATCH)	DIA	1	3	16	55	6
	2mm Z-MATCH	TZBE2020-055-N20(Z-MATCH)	DIA	2	6	20	55	6
PMMA	1mm Z-MATCH PMMA	TWBE2010-055-N160S06(Z-MATCH)	-	1	3	16	55	6
	2mm Z-MATCH PMMA	TWBE2020-055-N200S06(Z-MATCH)	-	2	6	20	55	6

CAMELEON CS Type

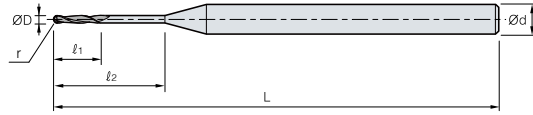


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.5mm CAMELEON CS	TZBE2005-040-N080S03(CAMELEON CS)	PVD	0.5	1	8	40	3
	1mm CAMELEON CS	TZBE2010-040-N160S03(CAMELEON CS)	DIA	1	2	16	40	3
	2mm CAMELEON CS	TZBE2020-040-N200S03(CAMELEON CS)	DIA	2	4	20	40	3
PMMA	1mm CAMELEON CS PMMA	TWBE2010-040-N160S03(CAMELEON CS)	-	1	2	16	40	3
	2mm CAMELEON CS PMMA	TWBE2020-040-N200S03(CAMELEON CS)	-	2	4	20	40	3

CAMELEON Type (METAL TOOL)

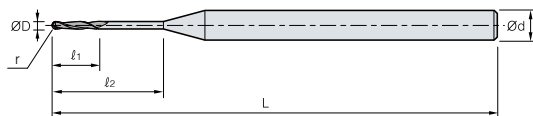


2	H-A 30°	Grade ~Ø1.0 PC2510	Grade Ø1.0~Ø3.0 ND3000	h5 shank	ØD	공구직경공차
					~Ø1.0	0.00 ~ -0.015
					Ø1.0 ~ Ø3.0	0.00 ~ -0.02

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
METAL	1.5mm CAMELEON TITAN	TTBE2015-045-N7(Z-MATCH-M)	PVD	1.5	3	8	45	6
	2mm CAMELEON TITAN	TTBE2020-045-N7(Z-MATCH-M)	PVD	2	4	8	45	6
	3mm CAMELEON TITAN	TTBE2030-045-N10(Z-MATCH-M)	PVD	3	6	10	45	6
	1.5mm CAMELEON TITAN-long	TTBE2015-055-N8(CAMELEON-M)	PVD	1.5	1.5	8	55	6
	2mm CAMELEON TITAN-long	TTBE2020-055-N8(CAMELEON-M)	PVD	2	2	8	55	6
	3mm CAMELEON TITAN-long	TTBE2030-055-N10(CAMELEON-M)	PVD	3	3	10	55	6

(mm)

RND Type (DS200-5Z, DM-100, DS-4WA)



2	H-A 30°	Grade ~Ø1.0 PC2510	Grade Ø1.0~Ø3.0 ND3000	h5 shank	ØD	공구직경공차
					~Ø1.0	0.00 ~ -0.015
					Ø1.0 ~ Ø3.0	0.00 ~ -0.02

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.6mm DS200-5Z	TZBE2006-045-N120S03(DS200-5Z)	PVD	0.6	1.5	12.3	45.3	3
	1mm DS200-5Z	TZBE2010-045-N180S03(DS200-5Z)	DIA	1	2.8	17.7	45.3	3
	2mm DS200-5Z	TZBE2020-045-N200S03(DS200-5Z)	DIA	2	4.3	19.7	45.3	3
PMMA	1mm DS200-5Z PMMA	TWBE2010-045-N180S03(DS200-5Z)	-	1	2.8	17.7	45.3	3
	2mm DS200-5Z PMMA	TWBE2020-045-N200S03(DS200-5Z)	-	2	4.3	19.7	45.3	3
METAL	1.5mm RND DM-100	TTBE2015-050-N100S06(RND)-DY	PVD	1.5	3	10	50	6
	2mm RND DM-100	TTBE2020-050-N130S06(RND)-DY	PVD	2	4	13	50	6
	3mm RND DM-100	TTBE2030-050-N120S06(RND)-DY	PVD	3	6	12	50	6

(mm)

MANIX Type (ZX-5SD, MA-4)

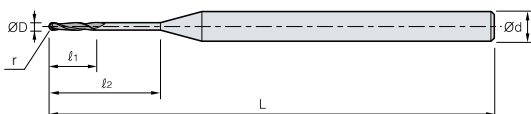


2	H-A 30°	Grade ~Ø1.0 PC2510	Grade Ø1.0~Ø3.0 ND3000	h5 shank	<table border="1"> <tr> <th>ØD</th> <th>공구직경공차</th> </tr> <tr> <td>~Ø1.0</td> <td>0.00 ~ -0.015</td> </tr> <tr> <td>Ø1.0 ~ Ø3.0</td> <td>0.00 ~ -0.02</td> </tr> </table>	ØD	공구직경공차	~Ø1.0	0.00 ~ -0.015	Ø1.0 ~ Ø3.0	0.00 ~ -0.02
ØD	공구직경공차										
~Ø1.0	0.00 ~ -0.015										
Ø1.0 ~ Ø3.0	0.00 ~ -0.02										

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød
ZIRCONIA	0.6mm ZX-5SD	PVD	0.6	0.6	12.2	45	4
	1mm ZX-5SD	DIA	1	2.8	16.5	50	4
	2mm ZX-5SD	DIA	2	5	20	50	4
PMMA	1mm MANIX ZX-5SD PMMA	-	1	2.8	16.5	50	4
	2mm MANIX ZX-5SD PMMA	-	2	5	20	50	4
METAL	1.5mm MANIX TITAN	PVD	1.5	2	10.5	45	6
	2mm MANIX TITAN	PVD	2	4.8	12.5	45	6
	2.5mm MANIX TITAN	PVD	2.5	3	12	45	6
	3mm MANIX TITAN	PVD	3	4	12.5	45	6

승원 DI Type

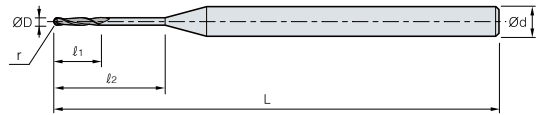


2	H-A 30°	Grade ~Ø1.0 PC2510	Grade Ø1.0~Ø3.0 ND3000	h5 shank	<table border="1"> <tr> <th>ØD</th> <th>공구직경공차</th> </tr> <tr> <td>~Ø1.0</td> <td>0.00 ~ -0.015</td> </tr> <tr> <td>Ø1.0 ~ Ø3.0</td> <td>0.00 ~ -0.02</td> </tr> </table>	ØD	공구직경공차	~Ø1.0	0.00 ~ -0.015	Ø1.0 ~ Ø3.0	0.00 ~ -0.02
ØD	공구직경공차										
~Ø1.0	0.00 ~ -0.015										
Ø1.0 ~ Ø3.0	0.00 ~ -0.02										

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød
METAL	1.5mm 승원 DI TITAN	PVD	1.5	7.4	10.2	50	6
	2mm 승원 DI TITAN	PVD	2	7.6	12.1	50	6

PROTECH INNOTION Type (PRODEN, PRODIA, NEXUS)

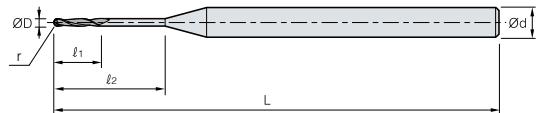


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.6mm PRODEN	TZBE2006-060-N115S06(PRODEN)	PVD	0.6	2.2	11.5	60	6
	1mm PRODEN	TZBE2010-060-N180S06(PRODEN)	DIA	1	2.4	18	60	6
	2mm PRODEN	TZBE2020-060-N200S06(PRODEN)	DIA	2	4.8	20	60	6
PMMA	1mm PRODEN PMMA	TWBE2010-060-N180S06(PRODEN)	-	1	2.4	18	60	6
	2mm PRODEN PMMA	TWBE2020-060-N200S06(PRODEN)	-	2	4.8	20	60	6

PROTECH INNOTION Type (METAL TOOL-MONSTER, NEXUS, PROTECH)



ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
METAL	1mm NEXUS Co-Cr	TTBE2010-051-N100S06(NEXUS)	PVD	1	2	10	51	6
	1.5mm NEXUS Co-Cr	TTBE2015-051-N100S06(NEXUS)	PVD	1.5	2	10	51	6
	2mm NEXUS Co-Cr	TTBE2020-051-N120S06(NEXUS)	PVD	2	3	12	51	6
	3mm NEXUS Co-Cr	TTBE2030-051-N120S06(NEXUS)	PVD	3	4.5	12	51	6

CERACUBE / TRION-Z Type

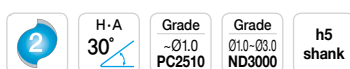
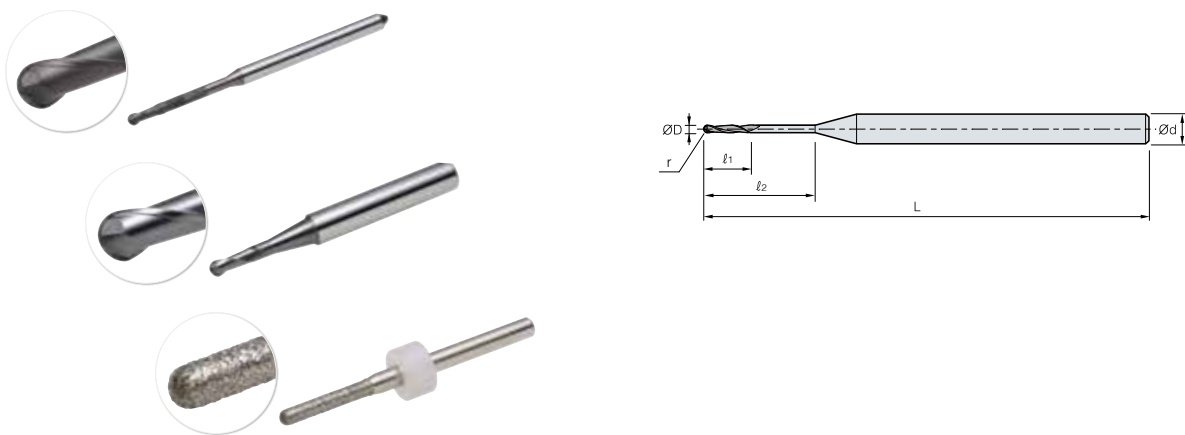


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.5mm CERACUBE/TRION-Z	TZBE2005-050-N22(TRION-Z)	PVD	0.5	2.2	22	50	4
	1mm CERACUBE/TRION-Z	TZBE2010-050-N18(TRION-Z)	DIA	1	3	18	50	4
	2mm CERACUBE/TRION-Z	TZBE2020-050-N20(TRION-Z)	DIA	2	7	20	50	4
PMMA	1mm CERACUBE/TRION-Z PMMA	TWBE2010-050-N180S04(TRION-Z)	-	1	3	18	50	4
	2mm CERACUBE/TRION-Z PMMA	TWBE2020-050-N200S04(TRION-Z)	-	2	7	20	50	4

DENTIUM Type (RAINBOW, RAINBOW-MILL, RAINBOW-MILL Zr 2ND)

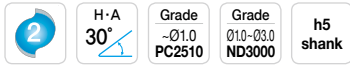
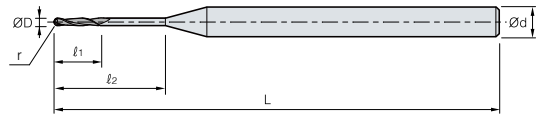


ØD	공구직경공차
~Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.5mm RAINBOW	TZBE2005-050-N080S06(DENTIUM)	DIA	0.5	2	8	50	6
	1mm RAINBOW	TZBE2010-050-N160S06(DENTIUM)	DIA	1	3	16	50	6
	2mm RAINBOW	TZBE2020-050-N180S06(DENTIUM)	DIA	2	6	18	50	6
	0.5mm RAINBOW-MILL	TZBE2005-043-N080S03(DENTIUM)	DIA	0.5	2	8	43	3
	1mm RAINBOW-MILL	TZBE2010-050-N160S03(DENTIUM)	DIA	1	3	16	50	3
	2mm RAINBOW-MILL	TZBE2020-050-N180S03(DENTIUM)	DIA	2	6	18	50	3
	0.5mm RAINBOW-MILL Zr 2ND	TZBE2005-045-N080S04(DENTIUM)	DIA	0.5	2	8	45	4
	1mm RAINBOW-MILL Zr 2ND	TZBE2010-045-N160S04(DENTIUM)	DIA	1	3	16	45	4
PMMA	2.5mm RAINBOW-MILL Zr 2ND	TZBE2025-045-N180S04(DENTIUM)	DIA	2.5	6	18	45	4
	0.5mm RAINBOW PMMA	TWBE2005-050-N080S06(DENTIUM)	-	0.5	2	8	50	6
	1mm RAINBOW PMMA	TWBE2010-050-N160S06(DENTIUM)	-	1	3	16	50	6
	2mm RAINBOW PMMA	TWBE2020-050-N180S06(DENTIUM)	-	2	6	18	50	6
	1mm RAINBOW-MILL PMMA	TWBE2010-050-N160S03(DENTIUM)	-	1	3	16	50	3
	2mm RAINBOW-MILL PMMA	TWBE2020-050-N180S03(DENTIUM)	-	2	6	18	50	3
METAL	1mm RAINBOW-MILL Zr 2ND PMMA	TWBE2010-045-N160S04(DENTIUM)	-	1	3	16	45	4
	2.5mm RAINBOW-MILL Zr 2ND PMMA	TWBE2025-045-N180S04(DENTIUM)	-	2.5	6	18	45	4
	1mm RAINBOW TITAN	TTBE2010-050-N100S06(DENTIUM)	PVD	1	2	10	50	6
	1.5mm RAINBOW TITAN	TTBE2015-050-N100S06(DENTIUM)	PVD	1.5	3	10	50	6
HYBRID	2mm RAINBOW TITAN	TTBE2020-050-N120S06(DENTIUM)	PVD	2	4	12	50	6
	3mm RAINBOW TITAN	TTBE2030-050-N120S06(DENTIUM)	PVD	3	6	12	50	6
	0.6mm RAINBOW ULTIMATE	ETRE006050-H6M325-D	전착 DIA	0.6	6	6	50	6
	1mm RAINBOW ULTIMATE	ETRE010050-H6M170-D	전착 DIA	1	10	10	50	6
	2mm RAINBOW ULTIMATE	ETRE020050-H6M120-D	전착 DIA	2	12	12	50	6
	0.6mm RAINBOW-MILL ULTIMATE	ETRE006040-H3M325-D	전착 DIA	0.6	6	6	40	3
	1mm RAINBOW-MILL ULTIMATE	ETRE010045-H3M170-D	전착 DIA	1	10	10	45	3
	2mm RAINBOW-MILL ULTIMATE	ETRE020045-H3M120-D	전착 DIA	2	12	12	45	3
	0.6mm RAINBOW-MILL Zr 2ND ULTIMATE	ETRE006045-H4M325-D	전착 DIA	0.6	6	6	45	4
	1mm RAINBOW-MILL Zr 2ND ULTIMATE	ETRE010045-H4M170-D	전착 DIA	1	10	10	45	4
2mm RAINBOW-MILL Zr 2ND ULTIMATE	ETRE020045-H4M120-D	전착 DIA	2	12	12	45	4	

DOF Type

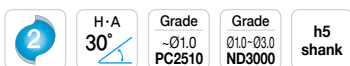
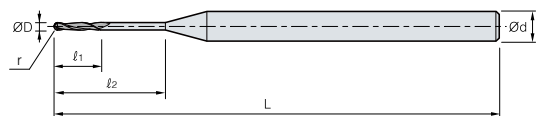


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ ₁	ℓ ₂	L	Ød
ZIRCONIA	1mm DOF	DIA	1	5.8	19	45	3
	2mm DOF	DIA	2	8	20	45	3
PMMA	1mm DOF PMMA	-	1	5.8	19	45	3
	2mm DOF PMMA	-	2	8	20	45	3

ELBEN Type

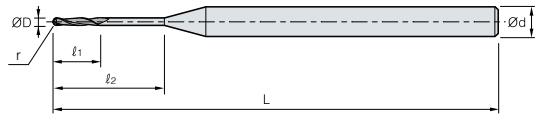


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ ₁	ℓ ₂	L	Ød
ZIRCONIA	0.6mm ELBEN	PVD	0.6	1.2	8	43	6
	1mm ELBEN	DIA	1	3	16	50	6
	2mm ELBEN	DIA	2	6	20	50	6
PMMA	1mm ELBEN PMMA	-	1	3	16	50	6
	2mm ELBEN PMMA	-	2	6	20	50	6
METAL	1mm ELBEN TITAN	PVD	1	2	5	45	6
	2mm ELBEN TITAN	PVD	2	4	12	45	6
	3mm ELBEN TITAN	PVD	3	6	15	45	6

CEREC Type (MC-XL)

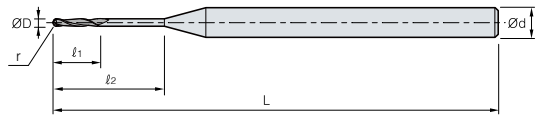


ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	MC-XL12	ETRE018038-T35M230-12	DIA	1.73	8	12	38.1	3.5
	MC-XL12S	ETRE009038-T35M230-12S	DIA	0.9	4	12	38.1	3.5

UGINT Type (D-100, D-200)



ØD	공구직경공차
~ Ø1.0	0.00 ~ -0.015
Ø1.0 ~ Ø3.0	0.00 ~ -0.02

(mm)

용도	형번	코팅	ØD	ℓ1	ℓ2	L	Ød	
ZIRCONIA	0.7mm D-100	TZBE2007-040-N145S03(D-100)	PVD	0.7	2.5	14.5	40	3
	1mm D-100	TZBE2010-040-N145S03(D-100)	DIA	1	5	14.5	40	3
	2mm D-100	TZBE2020-040-N160S03(D-100)	DIA	2	4	16	40	3
	0.6mm D-200	TZBE2006-043-N080S06(D-200)	PVD	0.6	1.2	8	43	6
	1mm D-200	TZBE2010-050-N160S06(D-200)	DIA	1	3	16	50	6
	2mm D-200	TZBE2020-050-N200S06(D-200)	DIA	2	6	20	50	6
PMMA	1mm D-100 PMMA	TWBE2010-040-N145S03(D-100)	-	1	5	14.5	40	3
	2mm D-100 PMMA	TWBE2020-040-N160S03(D-100)	-	2	4	16	40	3
	1mm D-200 PMMA	TWBE2010-050-N160S06(D-200)	-	1	3	16	50	6
	2mm D-200 PMMA	TWBE2020-050-N200S06(D-200)	-	2	6	20	50	6
METAL	1.5mm D-200 TITAN	TTBE2015-050-N100S06(D-200)	PVD	1.5	7.4	10.2	50	6
	2mm D-200 TITAN	TTBE2020-050-N120S06(D-200)	PVD	2	7.6	12.1	50	6

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