

# CUTTING TOOLS ENDMILL AND DRILL



- 3 **Solid end mills and drills naming rules**  
엔드밀 형번표기법
- 4 **Standard solid end mills naming rules**  
드릴 형번표기법
- 5 **DIN & Coating instructions**  
DIN & 코팅 분류
- 6 **Identification instructions**  
형상 분류
- 8 **ZEUS series for general machining**  
ZEUS 범용 엔드밀
- 56 **ZEUS PRO series for high-performance machining**  
ZEUS PRO 고성능 범용 엔드밀

# CONTENTS



- HADES series for quenched steel machining** 86  
HADES 고경도용 엔드밀
- HADES PRO series for high-hardened steel machining** 106  
HADES PRO 고성능 고경도용 엔드밀
- EROS series for high temperature alloy machining** 132  
EROS 난삭재(HSRA)용 엔드밀
- APOLLON series for stainless steel machining** 148  
APOLLON 스테인레스용 엔드밀
- GAIA series for aluminum machining** 156  
GAIA 알루미늄용 엔드밀
- DYNAMIC drill series for high-performance general machining** 176  
DYNAMIC 고성능 범용 드릴



# SOLID END MILLS AND DRILLS NAMING RULES

## 엔드밀 / 드릴 형번표기법



### 01 Standard Solid End Mills Naming Rules

엔드밀 형번표기법

\* Default 무기호

WORKPIECE MATERIAL 피삭재	NUMBER OF FLUTE 날수	NECK 넥	CUTTING EDGE & SHANK LENGTH 플루트 / 샹크 길이
P Steel 강용	2 / 3	N Neck 넥	L Long cutting edge 롱 플루트
M Stainless steel 스테인레스용	4 / 6	Default Standard 스탠다드	H Long shank 롱 샹크
H Hardened steel 고경도용 ((HRC 55))	5 / 7		G Extra long shank 엑스트라 롱 샹크
HI High-hardened steel 고경도용 ((HRC 65))			X Extra long cutting edge 엑스트라 롱 플루트
S High-temperature alloy titanium alloy 난삭재용 (HSRA)			M Short cutting edge 숏 플루트
A Aluminum alloy 알루미늄용			Default Standard 표준

ZE- SG P 4 040- N S H- DIN

**ENDMILL SERIES**  
엔드밀 시리즈

ZE	ZEUS	제우스
ZP	ZEUS PRO	제우스 프로
AP	APOLLEN	아폴론
HA	HADES	하데스
HP	HADES PRO	하데스 프로
GA	GAIA	가이아
ER	EROS	에로스

**ENDMILL TYPE**  
엔드밀 종류

SG	Square with Gash Land	스퀘어 (Gash land)
SF	Square with Sharp flattened	스퀘어 일반
RA	Radius	레디우스
BA	Ball nose	볼

**SHANK DIAMETER**  
샹크경

S	Shank Dia. D4	샹크경 4mm
F	Shank Dia. D3	샹크경 3mm
Default	Endmill Dia. = Shank Dia.	엔드밀 직경 = 샹크경

**STANDARD**  
표준규격

DIN	DIN 6535-HB	DIN 규격
Default	Standard	스탠다드

**ENDMILL DIAMETER**  
엔드밀 직경

040 4.0mm

### 02 Standard Solid Drills Naming Rules

드릴 형번표기법

\* Default 무기호

ASPECT RATIO 세장비	WORKPIECE MATERIAL 피삭재	NUMBER OF FLUTE 드릴 날수	DRILLING DIAMETER 드릴 직경
S 3 x D	Default Steel 강용		0420 4.20mm
L 5 x D	K Cast iron 주철용		
E 8 x D	M Stainless steel 스테인레스용		
	N Aluminum alloy 알루미늄용		

D S D K 2 0420 -C -DIN

**DRILL SERIES**  
드릴 시리즈

D	Dynamic Twist Drill	다이내믹 트위스트 드릴
DP	Dynamic Pro Twist Drill	다이내믹 프로 트위스트 드릴
DF	Dynamic Straight Flute Drill	다이내믹 스트레이트 드릴
DT	Dynamic Center Drill	다이내믹 센터 드릴
DH	Dynamic Deep Hole Drill	다이내믹 딥 홀 드릴

**LENGTH STANDARD**  
길이 타입 (DIN)

D	According to DIN6537-K
H	According to DIN6537-L
X	According to DIN6539

**COOLANT TYPE**  
오일홀 타입

N	External cooling	외부급유
C	Internal cooling	내부급유

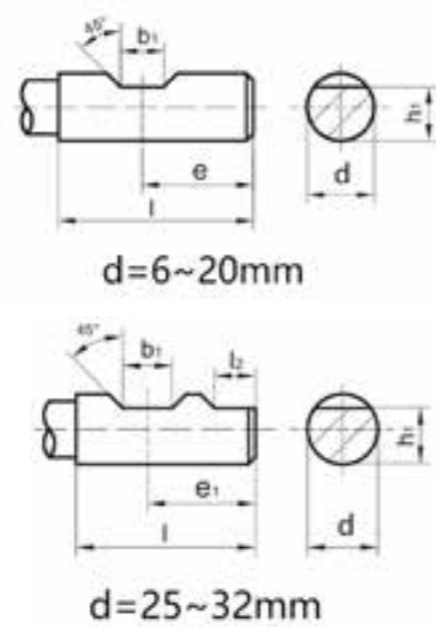
**STANDARD**  
표준규격

DIN	DIN 6535-HB	DIN 규격
Default	Standard	스탠다드



➤ **DIN6535-HB Standard DIN 분류**

SIZE 크기	BASIC DIMENSION 치수(mm)				
d	b	e	h	l	l <sub>2</sub>
6	4.2	18	5.1	36	-
8	5.5	18	6.9	36	-
10	7	20	8.5	40	-
12	8	22.5	10.4	45	-
14	8	22.5	12.7	45	-
16	10	24	14.2	48	-
18	10	24	16.2	48	-
20	11	25	18.2	50	-
25	12	32	23	56	17
32	14	36	30	60	19



➤ **Coating Instructions 코팅분류**

SERIES 시리즈	COATING 코팅	HARDNESS 경도 (HV)	COLOR 색깔	MAX (°C) TEMPERATURE 최대적용 절삭온도	WORK PIECE 파삭재
[ZE] - JEUS (OLD)	AlTiN	3500	Dark Grey 진회색	1000	Under HRc 38 for P,M,K P,M,K 영역 적용 (HRc38이하)
[ZE] - JEUS (NEW) [ZP] - JEUS PRO	AlCrSiN	3100	Dark Grey 진회색	1100	Under HRc 55 for P,M,K P,M,K,S 영역 적용 (HRc55이하)
[HA] - HADES	AlCrN	2900	Light Grey 밝은회색	900	Under HRc 55 for the free hardened steel and Quenched steel 열처리된 고경도 금형강 전용 사용 (HRc55이하)
[HP] - HADES PRO	TiAlSiN	4300	Bronze 구리빛	1000	Under HRc 65 for the free hardened steel 열처리된 고경도 금형강 전용 사용 (HRc65이하)
[ER] - EROS	AlCrSiN	3600	Dark Grey 진회색	1250	HRSA, Inconel, Titanium Alloy HASA, 인코넬, 티타늄 합금등의 S영역 적용
[AP] - APOLLON	TiAlSiN	4300	Dark Bronze 어두운 구리빛	1100	Stainless Steel (M) 스테인레스 스틸 황정삭 전용 사용
[GA] - GAIA	C	5000	Multicolor Uncoated 멀티칼라/비코팅	500	Aluminium alloy and Nonferrous metal 알루미늄 합금 & 비철금속 전용 사용
[DRILL] - DYNAMIC	TiSiN	3500	Bronze 구리빛	1300	Various workpiece for P,M,K,S P,M,K,S 모든 영역에 적용 가능한 드릴 전용 코팅

➤ **Identification Instructions 형상 분류**

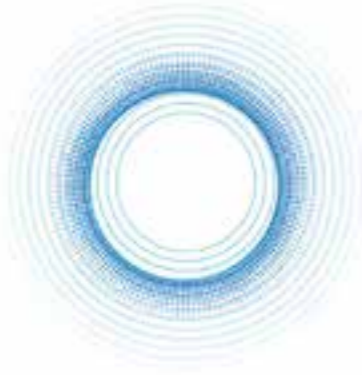
IDENTIFICATION 현상	INSTRUCTIONS 분류	IDENTIFICATION 현상	INSTRUCTIONS 분류	IDENTIFICATION 현상	INSTRUCTIONS 분류	
Shank type 샹크타입	ISO standard shank ISO 표준 샹크	Helical angle 헬리컬 각도	20°helical angle 좌측 20°헬리컬 각도	Helical angle 헬리컬 각도	15°/40° Double-helical angle 15°/40°더블 헬리컬 각도	
	ISO standard shank ISO 표준 샹크		15°helical angle 15°헬리컬 각도		35°/38° Double-helical angle 35°/38°더블 헬리컬 각도	
	DIN6535HA shank DIN6535HA 샹크		20°helical angle 20°헬리컬 각도		38°/40° Double-helical angle 38°/40°더블 헬리컬 각도	
Coating 코팅종류	AlCrN coating AlCrN 코팅		28°helical angle 28°헬리컬 각도		36°/38° Double-helical angle 36°/38°더블 헬리컬 각도	
	AlCrSiN coating AlCrSiN 코팅		30°helical angle 30°헬리컬 각도		41°/43° Double-helical angle 41°/43°더블 헬리컬 각도	
	TiAlN coating TiAlN 코팅		35°helical angle 35°헬리컬 각도		38°/41° Double-helical angle 38°/41°더블 헬리컬 각도	
	AlTiN nano coating AlTiN nano 코팅		38°helical angle 38°헬리컬 각도		End tooth type 엔드밀 종류	Flat 평 엔드밀
	AlCrN/TiSiN multi-layer coating AlCrN / TiSiN 다층 코팅		40°helical angle 40°헬리컬 각도			Corner radius 코너 레디우스 엔드밀
	AlTiN/TiSiN nano multi-layer coating AlTiN / TiSiN nano 다층 코팅		45°helical angle 45°헬리컬 각도			Ball nose 볼 엔드밀
	TiAlCrSiN coating TiAlCrSiN 코팅		Unequal helical angle 부등변 헬리컬 각도			Chamfered corner 코너 엔드밀
	TiAlSiN coating TiAlSiN 코팅	Number of flute 날수	1-flute end mills 1날 엔드밀			
	Coarse grain diamond coating 미립 다이아몬드 코팅		2-flute end mills 2날 엔드밀			
	Ultra-fine grain diamond coating 초미립 다이아몬드 코팅		3-flute end mills 3날 엔드밀			
Nose corner type 코너 엣지처리	Corner protection flattened 코너 보호처리		4-flute end mills 4날 엔드밀			
	Corner flattened Corner flattened		5-flute end mills 5날 엔드밀			
Length and diameter ratio 전경비(D)	3 times diameter 직경대비 3배		6-flute end mills 6날 엔드밀			
	5 times diameter 직경대비 5배		7-flute end mills 7날 엔드밀			
Type 종류	External cooling twist drills 외부급유		Workpiece material 파삭재	Steel 강용		
	Internal cooling twist drills 내부급유 (콜러트)			Stainless Steel 스테인레스용		
			Cast iron 주철용			
		Aluminum alloy 알루미늄합금				
		High temperature alloy / Titanium alloy 고온합금 및 티타늄합금				
		High-hardened steel 난삭재 (HSRA)				





**MISSION**

Developing market with perfect solution based on customer's satisfaction



**VISION**

Aggressive Pioneer in the market



**OBJECTIVE**

300 Million USD in 2030

**CONTRIBUTION TO CUSTOMER'S SATISFACTION**



KCERA is

small but reliable company and growing at every year.

Customer-oriented company,

KCERA Inc. will be a company that raise up with customers.

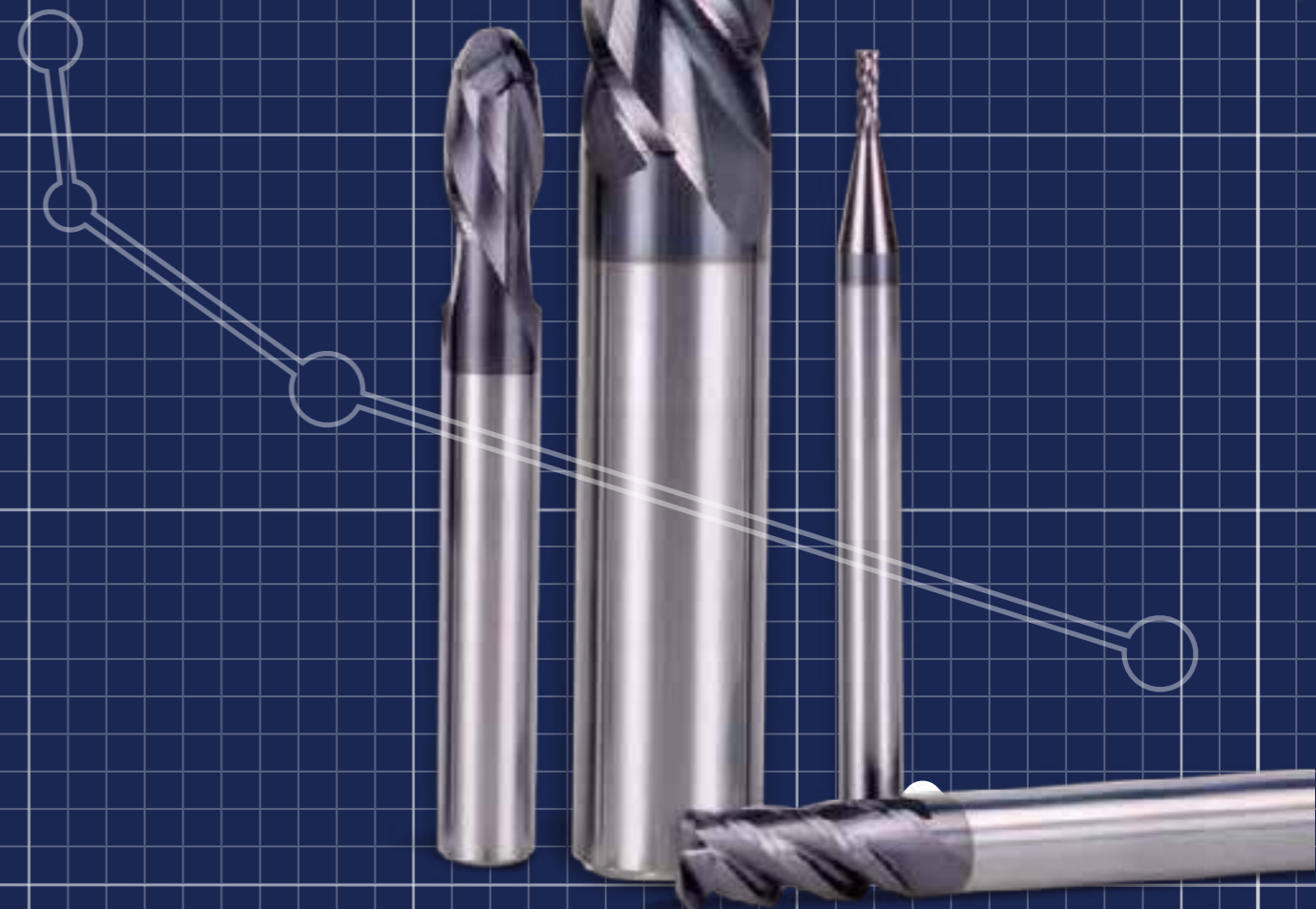
Customer's happiness first.

**SERIES FOR  
GENERAL  
MACHINING**  
범용 엔드밀 시리즈

**ZEUS**



ZEUS



Product series

# ZEUS

## Series For General Machining

### 범용 엔드밀 시리즈

Ordinary chip breaker  
일반 외주인 현상



Upgraded chip breaker  
이단 외주인 현상



The newly upgraded chip breaker not only ensures sufficient chip space, but also improves the strength and rigidity of the peripheral edge. It is suitable for finishing from finishing to roughing, and the tool performance is more comprehensive.

- ① 이단 외주인 형상으로 절삭성 향상 및 넓은 칩포켓
- ② 엔드밀 강성 증대
- ③ 황삭에서 정삭까지 안정적인 가공 실현

Curved flank structure that takes both edge strength and wear resistance into consideration

특수 인선처리로 인한 인선치핑 방지 및 절삭부하 감소



### Application Cases | 절삭평가 사례

Milling method 가공방식	Machine Tool 타 사	Cooling method 절삭유	Workpiece material 피삭재	HRC
side milling 측면가공	COMPETITOR A	water-soluble emulsion 수용성	NAK80	HRC40

#### Cutting parameters 절삭조건

회전속도 (N)	7500r/min	테이블이송 (F)	2500r/min	AP	10mm	AE	0.5mm
----------	-----------	-----------	-----------	----	------	----	-------

Machine tool processing drawing  
가공방식



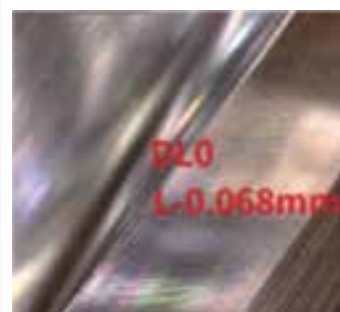
Machined parts  
가공품



#### Tool life comparison 테스트 결과

ZE-SGP4080 has less wear and tear, and its lifespan is 38% higher than company A's products.  
ZE-SGP4080 절삭부하 감소 및 절삭성 개선으로 38% 공구 수명 증가

ZE-SGP4080

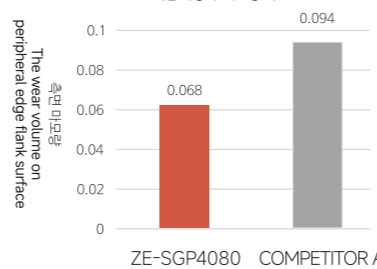


COMPETITOR A



Comparative analysis of wear volume  
마모량 비교 테이블

Wear of peripheral edge after 7 hours machining  
7시간 가공 후 마모량 비교



# ZE-SGP2

## 2-Flute Straight Shank

### Flat End Mills

### 2날 스퀘어 엔드밀

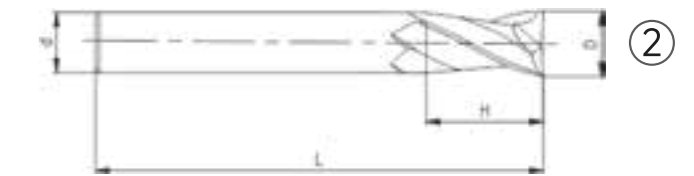
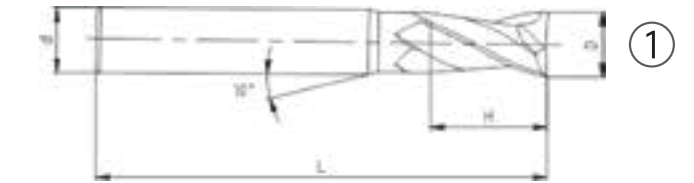
- ✓ Able to achieve various processing of slot milling, side milling, drilling and milling  
홈가공 / 측면가공 / 드릴링가공
- ✓ Wide application  
다양한 영역에 적용 가능

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



Corner protection flattened  
코너 보호기능 (Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP2010-S	1.0	4	3	50	2	①	●
ZE-SGP2015-S	1.5	4	4	50	2	①	●
ZE-SGP2020-S	2.0	4	8	50	2	①	●
ZE-SGP2025-S	2.5	4	3	50	2	①	●
ZE-SGP2030-S	3.0	4	8	50	2	①	●
ZE-SGP2040-S	4.0	4	11	50	2	②	●
ZE-SGP2010	1.0	6	3	50	2	①	●
ZE-SGP2015	1.5	6	4	50	2	①	●
ZE-SGP2020	2.0	6	6	50	2	①	●
ZE-SGP2025	2.5	6	8	50	2	①	●
ZE-SGP2030	3.0	6	8	50	2	①	●
ZE-SGP2035	3.5	6	10	50	2	①	●
ZE-SGP2040	4.0	6	11	50	2	①	●
ZE-SGP2045	4.5	6	11	50	2	①	●
ZE-SGP2050	5.0	6	13	50	2	①	●
ZE-SGP2055	5.5	6	16	50	2	①	●
ZE-SGP2060	6.0	6	16	50	2	②	●
ZE-SGP2070	7.0	8	20	60	2	①	●

TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP2080	8.0	8	20	60	2	②	●
ZE-SGP2090	9.0	10	22	75	2	①	●
ZE-SGP2100	10.0	10	25	75	2	②	●
ZE-SGP2110	11.0	12	26	75	2	①	●
ZE-SGP2120	12.0	12	30	75	2	②	●
ZE-SGP2140	14.0	14	32	75	2	②	●
ZE-SGP2160	16.0	16	45	100	2	②	●
ZE-SGP2180	18.0	18	45	100	2	②	●
ZE-SGP2200	20.0	20	45	100	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-SGP2-L

## 2-Flute Flattened End Mills

With Long Cutting Edge

2날 스퀘어 롱 플루트 엔드밀

✓ Able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 가공

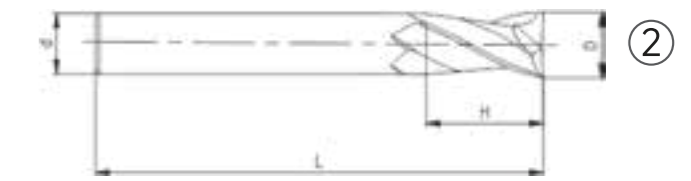
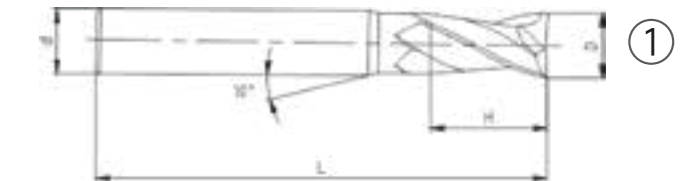
✓ Wide application  
다양한 영역에 적용 가능

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^{0}$  / D6~D14  $_{-0.025}^{0}$  / D15~D20  $_{-0.03}^{0}$



Corner protection flattened 코너 보호기능 (Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP2030-L	3.0	6	12	75	2	①	●
ZE-SGP2040-L	4.0	6	15	75	2	①	●
ZE-SGP2050-L	5.0	6	20	75	2	①	●
ZE-SGP2060-L	6.0	6	20	75	2	②	●
ZE-SGP2080-L	8.0	8	25	100	2	②	●
ZE-SGP2100-L	10.0	10	30	100	2	②	●
ZE-SGP2120-L	12.0	12	35	100	2	②	●
ZE-SGP2140-L	14.0	14	40	100	2	②	●
ZE-SGP2160-L	16.0	16	50	150	2	②	●
ZE-SGP2200-L	20.0	20	55	150	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천



ZE-SGP2/-L Cutting Parameters 추천절삭조건

Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
1	40000	800	40000	800	38000	700	32000	320	22300	200	25000	275
2	24000	900	24000	900	19000	760	16000	400	11150	230	13000	275
3	15500	950	15500	950	12750	760	10600	450	7400	290	8500	280
4	11500	950	11500	950	9550	760	8000	550	5550	370	6500	370
5	9500	1050	9500	1050	7650	800	6400	550	4450	370	5000	375
6	8000	1050	8000	1050	6400	800	5300	580	3700	390	4200	390
8	6000	1300	6000	1300	4800	950	4000	700	2750	455	3200	440
10	4800	1200	4800	1200	3800	900	3200	650	2200	430	2500	440
12	4000	1100	4000	1100	3200	840	2650	610	1850	430	2100	420
16	3000	1050	3000	1050	2400	800	2000	600	1350	380	1600	375
20	2400	950	2400	950	1900	680	1600	560	1100	370	1250	330

- ✓ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ Please use air blow or cutting liquid with high mist retardant property.  
고능을 절삭유나 공랭기 사용을 추천합니다.
- ✓ Down milling is recommended in the case of side milling  
측면가공의 경우에는 플런지 가공을 추천합니다.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정미 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# ZE-SGP3

## 3-Flute Straight Shank

### Flat End Mills

### 3날 스퀘어 엔드밀

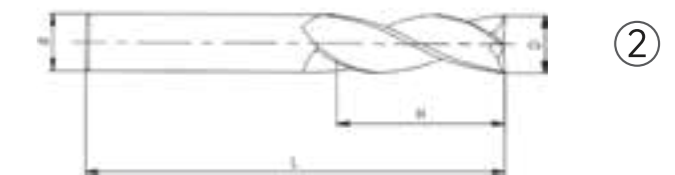
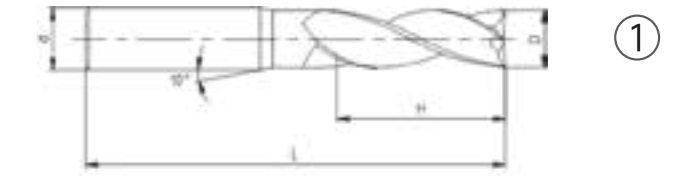
- ✓ Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 가공

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP3010-S	1.0	4	3	50	3	①	●
ZE-SGP3015-S	1.5	4	4	50	3	①	●
ZE-SGP3020-S	2.0	4	6	50	3	①	●
ZE-SGP3025-S	2.5	4	8	50	3	①	●
ZE-SGP3030-S	3.0	4	8	50	3	①	●
ZE-SGP3040-S	4.0	4	11	50	3	②	●
ZE-SGP3010	1.0	6	3	50	3	①	●
ZE-SGP3015	1.5	6	4	50	3	①	●
ZE-SGP3020	2.0	6	6	50	3	①	●
ZE-SGP3025	2.5	6	8	50	3	①	●
ZE-SGP3030	3.0	6	8	50	3	①	●
ZE-SGP3035	3.5	6	10	50	3	①	●
ZE-SGP3040	4.0	6	11	50	3	①	●
ZE-SGP3045	4.5	6	11	50	3	①	●
ZE-SGP3050	5.0	6	13	50	3	①	●
ZE-SGP3055	5.5	6	16	50	3	①	●

TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP3060	6.0	6	16	50	3	②	●
ZE-SGP3070	7.0	8	20	60	3	①	●
ZE-SGP3080	8.0	8	20	60	3	②	●
ZE-SGP3090	9.0	10	22	75	3	①	●
ZE-SGP3100	10.0	10	25	75	3	②	●
ZE-SGP3110	11.0	12	26	75	3	①	●
ZE-SGP3120	12.0	12	30	75	3	②	●
ZE-SGP3140	14.0	14	32	75	3	②	●
ZE-SGP3160	16.0	16	45	100	3	②	●
ZE-SGP3180	18.0	18	45	100	3	②	●
ZE-SGP3200	20.0	20	45	100	3	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

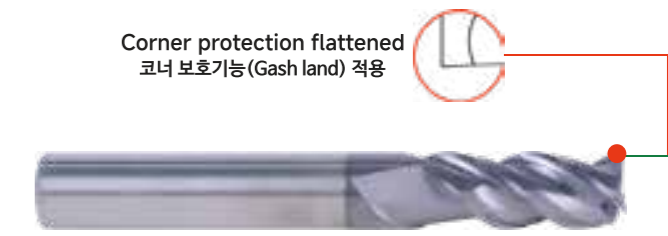
Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-SGP3-L

## 3-Flute Flattened End Mills

### With Long Cutting Edge

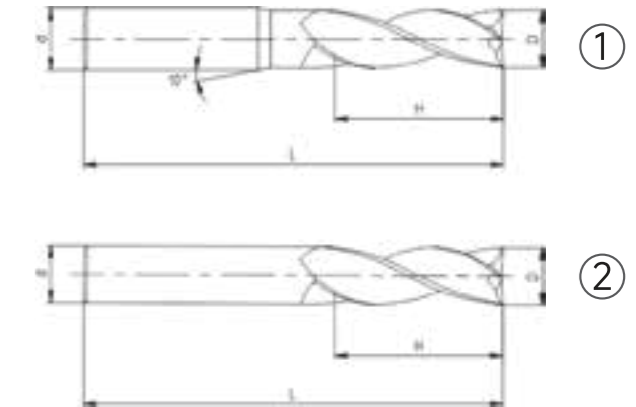
### 3날 스퀘어 롱 플루트 엔드밀



✓ Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 가공

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP3030-L	3.0	6	12	75	3	①	●
ZE-SGP3040-L	4.0	6	15	75	3	①	●
ZE-SGP3050-L	5.0	6	20	75	3	①	●
ZE-SGP3060-L	6.0	6	20	75	3	②	●
ZE-SGP3080-L	8.0	8	25	100	3	②	●
ZE-SGP3100-L	10.0	10	30	100	3	②	●
ZE-SGP3120-L	12.0	12	35	100	3	②	●
ZE-SGP3140-L	14.0	14	40	100	3	②	●
ZE-SGP3160-L	16.0	16	50	150	3	②	●
ZE-SGP3200-L	20.0	20	55	150	3	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

ZE-SGP3/-L Cutting Parameters 추천절삭조건

Workpiece Material 파삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
1	40000	800	40000	800	38000	700	32000	320	22300	200	25000	275
2	24000	900	24000	900	19000	760	16000	400	11150	230	13000	275
3	15500	950	15500	950	12750	760	10600	450	7400	290	8500	280
4	11500	950	11500	950	9550	760	8000	550	5550	370	6500	370
5	9500	1050	9500	1050	7650	800	6400	550	4450	370	5000	375
6	8000	1050	8000	1050	6400	800	5300	580	3700	390	4200	390
8	6000	1300	6000	1300	4800	950	4000	700	2750	455	3200	440
10	4800	1200	4800	1200	3800	900	3200	650	2200	430	2500	440
12	4000	1100	4000	1100	3200	840	2650	610	1850	430	2100	420
16	3000	1050	3000	1050	2400	800	2000	600	1350	380	1600	375
20	2400	950	2400	950	1900	680	1600	560	1100	370	1250	330

- ① The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ② Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- Please use air blow or cutting liquid with high mist retardant property.  
고능율 절삭유나 공랭기 사용을 추천합니다.
- Down milling is recommended in the case of side milling  
측면가공의 경우에는 플런지 가공을 추천합니다.
- When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 파삭재 고정기 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# ZE-SGP4

## 4-Flute Straight Shank

### Flat End Mills

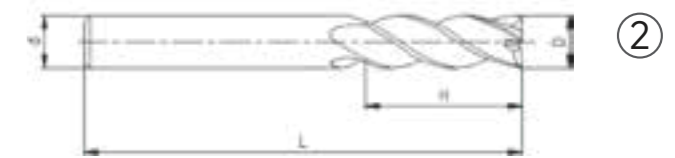
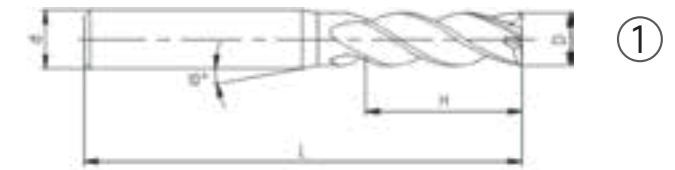
### 4날 스퀘어 엔드밀

- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Wide application  
다양한 영역에 적용 가능

Diameter Tolerance 직경 공차 :  
D1~D6\_ 0.02 / D6~D14\_ 0.025 / D15~D20\_ 0.03



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP4010-F	1.0	3	3	50	4	①	▲
ZE-SGP4010-S	1.0	4	3	50	4	①	●
ZE-SGP4010	1.0	6	3	50	4	①	●
ZE-SGP4015-F	1.5	3	4	50	4	①	▲
ZE-SGP4015-S	1.5	4	4	50	4	①	●
ZE-SGP4015	1.5	6	4	50	4	①	●
ZE-SGP4020-F	2.0	3	6	50	4	①	▲
ZE-SGP4020-S	2.0	4	6	50	4	①	●
ZE-SGP4020	2.0	6	6	50	4	①	●
ZE-SGP4025-F	2.5	3	8	50	4	①	▲
ZE-SGP4025-S	2.5	4	8	50	4	①	●
ZE-SGP4025	2.5	6	8	50	4	①	●
ZE-SGP4030-F	3.0	3	8	50	4	②	▲
ZE-SGP4030-S	3.0	4	8	50	4	①	●
ZE-SGP4030	3.0	6	8	50	4	①	●
ZE-SGP4035-S	3.5	4	10	50	4	①	●
ZE-SGP4035	3.5	6	10	50	4	①	●
ZE-SGP4040-S	4.0	4	11	50	4	①	●



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP4040	4.0	6	11	50	4	①	●
ZE-SGP4045	4.5	6	11	50	4	①	●
ZE-SGP4050	5.0	6	13	50	4	①	●
ZE-SGP4055	5.5	6	16	50	4	①	●
ZE-SGP4060	6.0	6	16	50	4	②	●
ZE-SGP4070	7.0	8	20	60	4	①	●
ZE-SGP4080	8.0	8	20	60	4	②	●
ZE-SGP4090	9.0	10	22	75	4	①	●
ZE-SGP4100	10.0	10	25	75	4	②	●
ZE-SGP4110	11.0	12	26	75	4	①	●
ZE-SGP4120	12.0	12	30	75	4	②	●
ZE-SGP4140	14.0	14	32	75	4	②	●
ZE-SGP4160	16.0	16	45	100	4	②	●
ZE-SGP4180	18.0	18	45	100	4	②	●
ZE-SGP4200	20.0	20	45	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-SGP4-L

## 4-Flute Flattened End Mills

With Long Cutting Edge

4날 스퀘어 롱 플루트 엔드밀

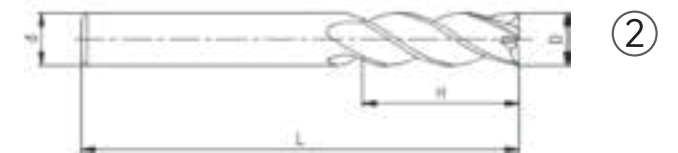
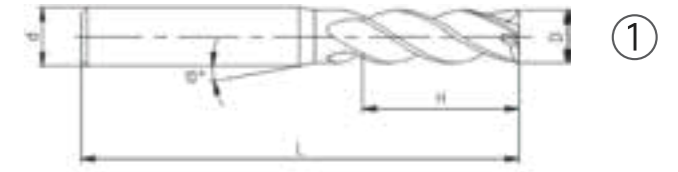
Corner protection flattened  
코너 보호기능 (Gash land) 적용



✓ ZE-SGP4 long cutting edge series  
ZE-SGP4 롱 커팅 엣지 시리즈

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^{0}$  / D6~D14  $_{-0.025}^{0}$  / D15~D20  $_{-0.03}^{0}$



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP4030-L	3.0	6	12	75	4	①	●
ZE-SGP4040-L	4.0	6	15	75	4	①	●
ZE-SGP4050-L	5.0	6	20	75	4	①	●
ZE-SGP4060-L	6.0	6	20	75	4	②	●
ZE-SGP4080-L	8.0	8	25	100	4	②	●
ZE-SGP4100-L	10.0	10	30	100	4	②	●
ZE-SGP4120-L	12.0	12	35	100	4	②	●
ZE-SGP4140-L	14.0	14	40	100	4	②	●
ZE-SGP4160-L	16.0	16	50	150	4	②	●
ZE-SGP4200-L	20.0	20	55	150	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-SGP4-X

## 4-Flute Flattened End Mills

With Straight Shank And Extra Long Cutting Edge

4날 스퀘어 엑스트라 롱 플루트 엔드밀

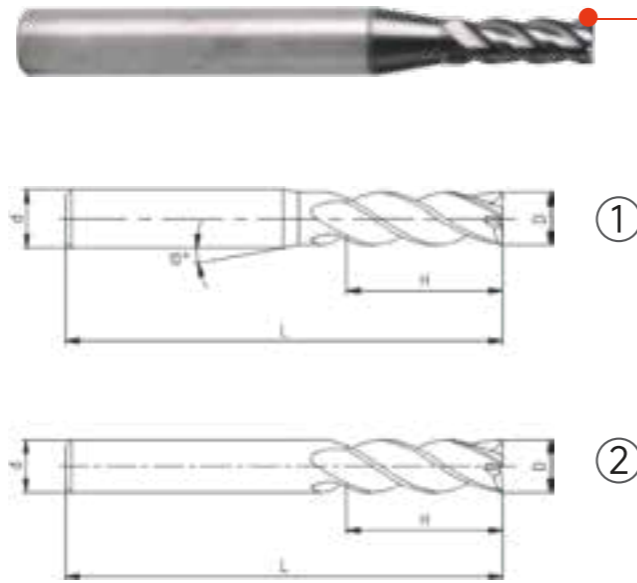
- ZE-SGP4 extra long cutting edge series, for deep side wall machining
- ZE-SPG4 엑스트라 롱 커팅 엣지 시리즈

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



Corner protection flattened 코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP4030-X	3.0	6	20	75	4	①	▲
ZE-SGP4040-X	4.0	6	25	75	4	①	▲
ZE-SGP4050-X	5.0	6	30	75	4	①	▲
ZE-SGP4060-X	6.0	6	30	75	4	②	▲
ZE-SGP4080-X	8.0	8	40	100	4	②	▲
ZE-SGP4100-X	10.0	10	50	110	4	②	▲
ZE-SGP4120-X	12.0	12	50	110	4	②	▲
ZE-SGP4160-X	16.0	16	70	150	4	②	▲
ZE-SGP4200-X	20.0	20	75	150	4	②	▲

- Stock Available 재고관리 ▲ Make to order 주문제작

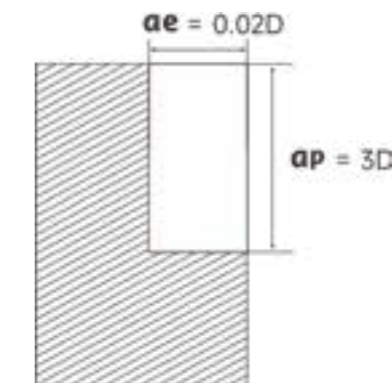
### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)
1	20000	160	20000	160	20000	125	20000	125	20000	55	20000	95
2	15000	250	15000	250	15000	230	16000	230	11150	65	13000	140
3	14000	430	14000	430	13000	400	10600	400	7500	80	8500	260
4	10800	440	10800	440	10000	400	8000	400	5500	80	6500	265
5	8200	460	8200	460	7600	420	6400	420	4500	80	5000	280
6	5800	475	5800	475	5300	430	4250	340	2650	70	3600	290
8	4400	475	4400	475	4000	430	3180	340	2000	70	2700	290
10	3500	460	3500	460	3200	420	2550	330	1600	70	2150	280
12	2900	460	2900	460	2650	420	2120	330	1350	70	1800	280
16	2200	440	2200	440	2000	390	1590	315	1000	65	1350	260
20	1750	430	1750	430	1600	386	1270	310	800	60	1050	255

최대 가공 깊이



- ✓ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard. 상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✓ Please select high-precision machine and tool holder. 고정도 장비 및 홀더를 사용하세요.
- ✓ Please use air blow or cutting liquid with high mist retardant property. 고능율 절삭유나 공랭기 사용을 추천합니다.
- ✓ Down milling is recommended in the case of side milling. 측면가공의 경우에는 플런지 가공을 추천합니다.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly. 장비강성이 약하거나 피삭재 고정이 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference. 가능한 짧은 오버행 공구를 사용하세요.

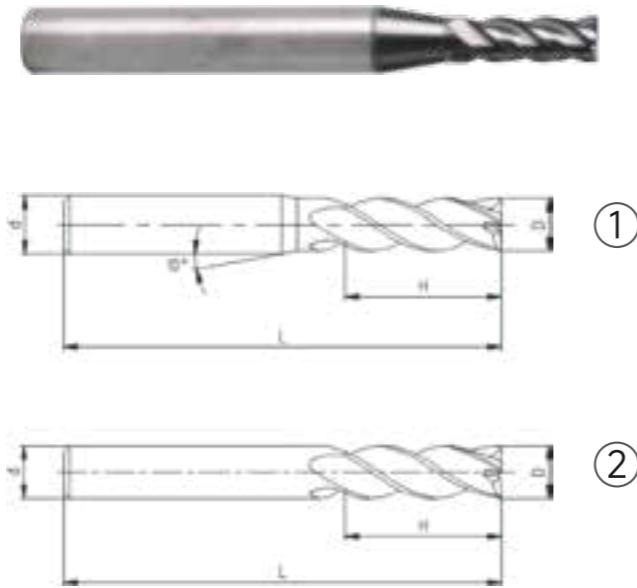
# ZE-SFP4

## Sharp Flattened 4-Flute Straight Shank Flat End Mills 4날 스퀘어 샤프 엔드밀

✔ Suitable for side milling and shallow slot machining  
측면 가공 및 좁은 홈 가공용

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SFP4010-S	1.0	4	3	50	4	①	▲
ZE-SFP4010	1.0	6	3	50	4	①	▲
ZE-SFP4015-S	1.5	4	4	50	4	①	▲
ZE-SFP4015	1.5	6	4	50	4	①	▲
ZE-SFP4020-S	2.0	4	6	50	4	①	▲
ZE-SFP4020	2.0	6	6	50	4	①	▲
ZE-SFP4025-S	2.5	4	8	50	4	①	▲
ZE-SFP4025	2.5	6	8	50	4	①	▲
ZE-SFP4030-S	3.0	4	8	50	4	①	▲
ZE-SFP4030	3.0	6	8	50	4	①	▲
ZE-SFP4035	3.5	6	10	50	4	①	▲
ZE-SFP4040-S	4.0	4	11	50	4	②	●
ZE-SFP4040	4.0	6	11	50	4	①	▲
ZE-SFP4045	4.5	6	11	50	4	①	▲
ZE-SFP4050	5.0	6	13	50	4	①	▲
ZE-SFP4055	5.5	6	16	50	4	①	▲
ZE-SFP4060	6.6	6	16	50	4	②	●
ZE-SFP4070	7.0	8	20	60	4	①	▲
ZE-SFP4080	8.0	8	20	60	4	②	●
ZE-SFP4090	9.0	10	22	75	4	①	▲

TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SFP4100	10.0	10	25	75	4	②	●
ZE-SFP4110	11.0	12	26	75	4	①	▲
ZE-SFP4120	12.0	12	30	75	4	②	●
ZE-SFP4140	14.0	14	32	75	4	②	▲
ZE-SFP4160	16.0	16	45	100	4	②	●
ZE-SFP4180	18.0	18	45	100	4	②	▲
ZE-SFP4200	20.0	20	45	100	4	②	▲

● Stock Available 재고관리    ▲ Make to order 주문제작

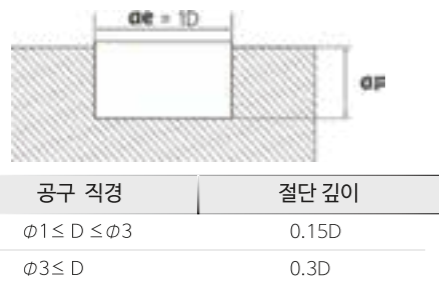
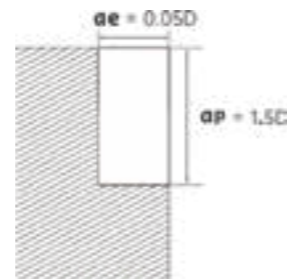
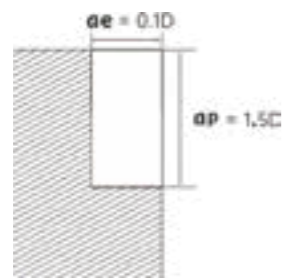
WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
◎	◎	◎	○		○	◎					
Hardness unit 경도 : HRC    ◎ Very Suitable 1차 추천    ○ Suitable 2차 추천											



ZE-SFP4 Cutting Parameters 추천절삭조건

Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)
1	20000	160	20000	160	20000	125	20000	125	20000	55	20000	95
2	15000	250	15000	250	15000	230	15000	230	11150	65	13000	140
3	14000	430	14000	430	13000	400	10600	400	7500	80	8500	260
4	10800	440	10800	440	10000	400	8000	400	5500	80	6500	265
5	8200	460	8200	460	7600	420	6400	420	4500	80	5000	280
6	7000	470	7000	470	6400	435	5300	435	3700	85	4200	285
8	5200	465	5200	465	4800	430	4000	430	2800	85	3200	290
10	4200	460	4200	460	3800	420	3200	420	2200	85	2500	275
12	3500	460	3500	460	3200	420	2650	420	1850	80	2100	275
14	3000	430	3000	430	2700	400	2300	400	1600	80	1800	260
16	2600	430	2600	430	2400	400	2000	400	1400	80	1600	260
18	2300	420	2300	420	2100	390	1800	390	1250	70	1400	255
20	24050	420	24050	420	1900	390	1600	390	1100	70	1250	255

최대 가공 깊이



공구 직경	절단 깊이
$\phi 1 \leq D \leq \phi 3$	0.15D
$\phi 3 \leq D$	0.3D

- ✓ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✓ Please select high-precision machine and tool holder.      ✓ Down milling is recommended in the case of side milling  
고정도 장비 및 홀더를 사용하세요.      측면가공의 경우에는 플런지 가공을 추천합니다.
- ✓ Please use air blow or cutting liquid with high mist retardant property.  
고능을 절삭유나 공랭기 사용을 추천합니다.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated.  
Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# ZE-SGP4-H

## 4-Flute Long Shank Flat

### End Mills

### 4날 스퀘어 롱 샹크 엔드밀

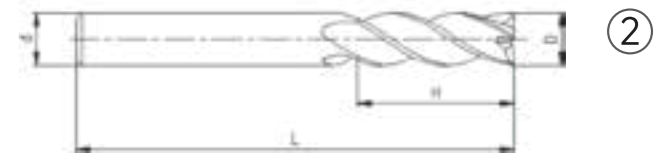
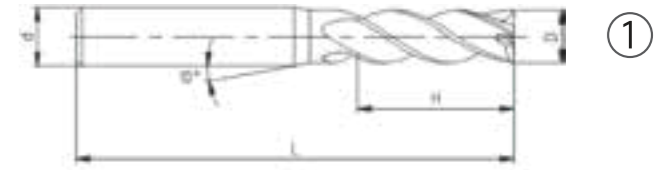
Corner protection flattened  
코너 보호기능(Gash land) 적용



- ✓ ZE-SGP4 long shank series for deep cavity milling  
ZE-SGP4 깊은 홈 밀링용

Diameter Tolerance 직경 공차 :

D1~D6  $\pm 0.02$  / D6~D14  $\pm 0.025$  / D15~D20  $\pm 0.03$



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP4030-SH	3.0	4	8	75	4	①	▲
ZE-SGP4030-H	3.0	6	8	75	4	①	▲
ZE-SGP4040-SH	4.0	4	11	75	4	②	▲
ZE-SGP4040-H	4.0	6	11	75	4	①	▲
ZE-SGP4060-H	6.0	6	16	75	4	②	▲
ZE-SGP4080-H	8.0	8	20	75	4	②	▲
ZE-SGP4100-H	10.0	10	25	100	4	②	▲
ZE-SGP4120-H	12.0	12	30	100	4	②	▲

- Stock Available 재고관리      ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○	○	○	◎	◎	◎	◎	◎	

Hardness unit 경도 : HRC

◎ Very Suitable 1차 추천

○ Suitable 2차 추천

# ZE-SGP4-G

## 4-Flute Extra Long Shank

### Flat End Mills

### 4날 스퀘어 엑스트라 롱 샹크 엔드밀

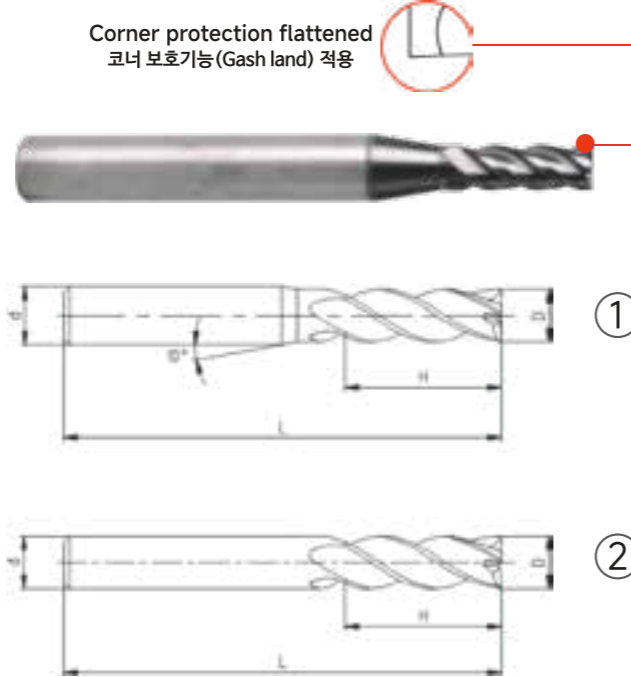
ZE-SGP4 extra long shank series for deep cavity milling  
ZE-SGP4 깊은 홈 밀링용

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZE-SGP4060-G	6.0	6	16	100	4	②	▲
ZE-SGP4080-G	8.0	8	20	100	4	②	▲
ZE-SGP4100-G	4.0	4	11	75	4	②	▲
ZE-SGP4120-G	10.0	10	25	150	4	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

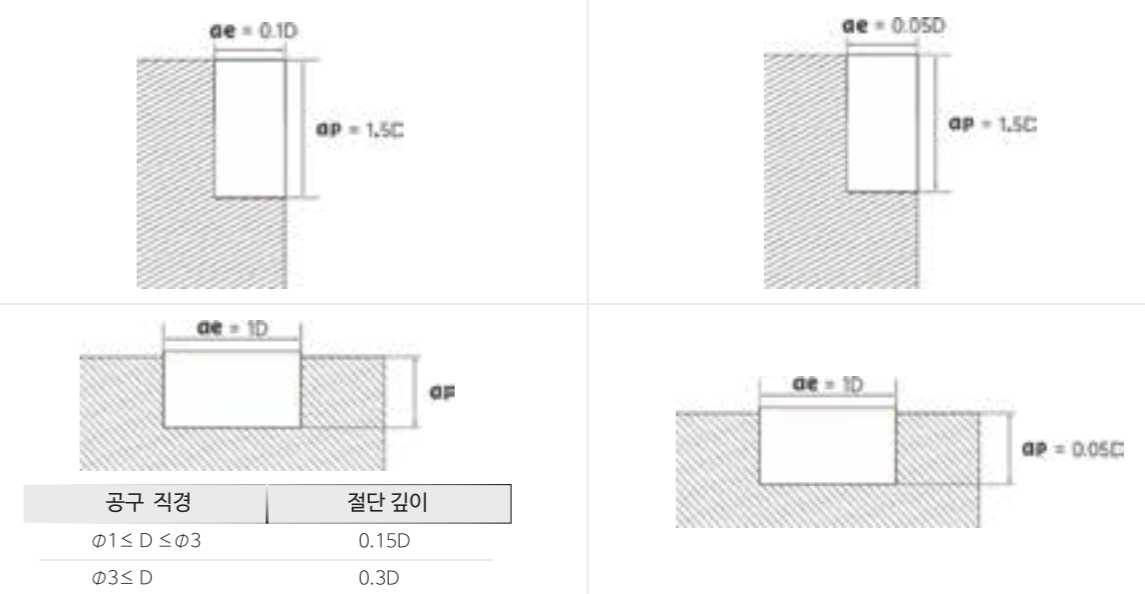
WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○	○	○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

ZE-SGP4-H/G Cutting Parameters 추천절삭조건

Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
1	20000	250	20000	250	20000	200	20000	200	20000	90	20000	150
2	15000	400	15000	400	15000	360	15000	350	11150	100	13000	225
3	14000	680	14000	680	13000	630	10600	525	7500	120	8500	410
4	10800	700	10800	700	10000	640	8000	535	5500	125	6500	420
5	8200	730	8200	730	7600	670	6400	560	4500	125	5000	440
6	7000	750	7000	750	6400	690	5300	575	3700	135	4200	450
8	5200	740	5200	740	4800	680	4000	565	2800	135	3200	460
10	4200	730	4200	730	3800	670	3200	560	2200	135	2500	435
12	3500	730	3500	730	3200	670	2650	560	1850	135	2100	435
14	3000	680	3000	680	2700	630	2300	525	1600	125	1800	410
16	2600	680	2600	680	2400	630	2000	525	1400	120	1600	410
18	2300	670	2300	670	2100	620	1800	515	1250	105	1400	405
20	2050	670	2050	670	1900	620	1600	515	1100	105	1250	405

최대 가공 깊이



- ◎ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ◎ Please select high-precision machine and tool holder. ◎ Down milling is recommended in the case of side milling 고정도 장비 및 홀더를 사용하세요. ◎ 측면가공의 경우에는 플런지 가공을 추천합니다.
- ◎ Please use air blow or cutting liquid with high mist retardant property. 고능을 절삭유나 공랭기 사용을 추천합니다.
- ◎ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly. 장비강성이 약하거나 피삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- ◎ Make overhang of tool as short as possible in conditions of non-interference. 가능한 짧은 오버행 공구를 사용하세요.

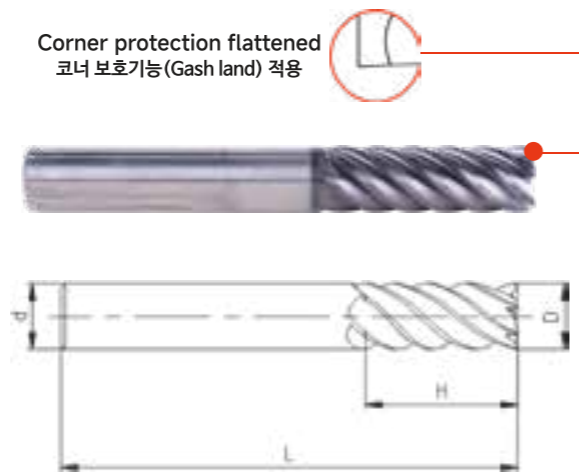
# ZE-SGP6

## 6-Flute Straight Shank

### Flat End Mills

#### 6날 스퀘어 엔드밀

- Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공



Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	STOCK 재고
	D	d	H	L		
ZE-SGP6060	6.0	6	18	60	6	●
ZE-SGP6080	8.0	8	20	60	6	●
ZE-SGP6100	10.0	10	30	75	6	●
ZE-SGP6120	12.0	12	32	75	6	●
ZE-SGP6160	16.0	16	40	100	6	●
ZE-SGP6200	20.0	20	45	100	6	●

- Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

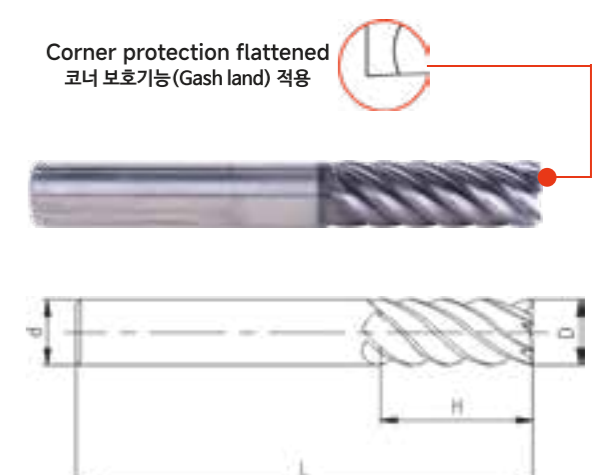
# ZE-SGP6-L

## 6-Flute Flattened End Mills

### With Straight Shank And Long Cutting Edge

#### 6날 스퀘어 롱 플루트 엔드밀

- Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공



Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	STOCK 재고
	D	d	H	L		
ZE-SGP6060-L	6.0	6	24	75	6	●
ZE-SGP6080-L	8.0	8	32	75	6	●
ZE-SGP6100-L	10.0	10	40	100	6	●
ZE-SGP6120-L	12.0	12	45	100	6	●
ZE-SGP6160-L	16.0	16	64	150	6	●
ZE-SGP6200-L	20.0	20	75	150	6	●

- Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천



ZE-SGP6/-L Cutting Parameters 추천절삭조건

Workpiece Material 파삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)
6	7000	750	7000	750	6400	690	5300	575	3700	135	4200	450
8	5200	740	5200	740	4800	680	4000	565	2800	135	3200	460
10	4200	730	4200	730	3800	670	3200	560	2200	135	2500	435
12	3500	730	3500	730	3200	670	2650	560	1850	135	2100	435
16	2600	680	2600	680	2400	630	2000	525	1400	120	1600	410
20	2050	670	2050	670	1900	620	1600	515	1100	105	1250	405

- ✓ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ Please use air blow or cutting liquid with high mist retardant property.  
고능율 절삭유나 공랭기 사용을 추천합니다.
- ✓ Down milling is recommended in the case of side milling  
측면가공의 경우에는 플런지 가공을 추천합니다.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 파삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

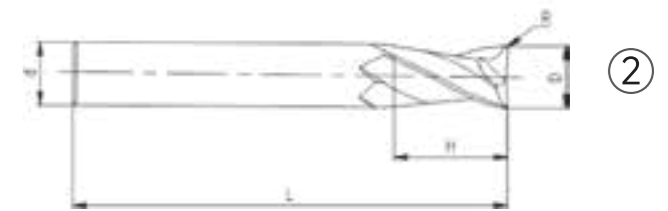
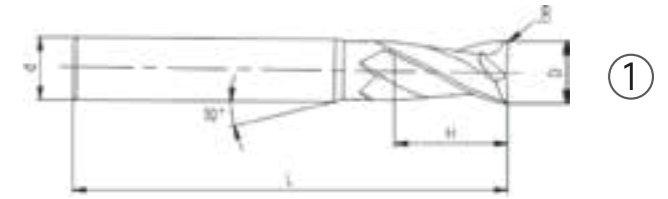
# ZE-RAP2

## 2-Flute Straight Shank Corner Radius End Mills 2날 라디우스 엔드밀

- ✓ Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공

Diameter Tolerance 직경 공차 :

D1~D6\_0.02 / D6~D14\_0.025 / D15~D20\_0.03



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP2010-R0.2S	1.0	0.2	4	3	50	2	①	●
ZE-RAP2015-R0.2S	1.5	0.2	4	4	50	2	①	●
ZE-RAP2020-R0.2S	2.0	0.2	4	6	50	2	①	●
ZE-RAP2020-R0.5S	2.0	0.5	4	6	50	2	①	●
ZE-RAP2025-R0.2S	2.5	0.2	4	8	50	2	①	●
ZE-RAP2025-R0.5S	2.5	0.5	4	8	50	2	①	●
ZE-RAP2030-R0.2S	3.0	0.2	4	8	50	2	①	●
ZE-RAP2030-R0.3S	3.0	0.3	4	8	50	2	①	●
ZE-RAP2030-R0.5S	3.0	0.5	4	8	50	2	①	●
ZE-RAP2040-R0.2S	4.0	0.2	4	11	50	2	②	●
ZE-RAP2040-R0.3S	4.0	0.3	4	11	50	2	②	●
ZE-RAP2040-R0.5S	4.0	0.5	4	11	50	2	②	●
ZE-RAP2040-R1.0S	4.0	1.0	4	11	50	2	②	●
ZE-RAP2050-R0.3	5.0	0.3	6	13	50	2	①	●
ZE-RAP2050-R0.5	5.0	0.5	6	13	50	2	①	●
ZE-RAP2050-R1.0	5.0	1.0	6	13	50	2	①	●
ZE-RAP2060-R0.3	6.0	0.3	6	16	50	2	②	●
ZE-RAP2060-R0.5	6.0	0.5	6	16	50	2	②	●
ZE-RAP2060-R1.0	6.0	1.0	6	16	50	2	②	●

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP2080-R0.3	8.0	0.3	8	20	60	2	②	●
ZE-RAP2080-R0.5	8.0	0.5	8	20	60	2	②	●
ZE-RAP2080-R1.0	8.0	1.0	8	20	60	2	②	●
ZE-RAP2100-R0.5	10.0	0.5	10	25	75	2	②	●
ZE-RAP2100-R1.0	10.0	1.0	10	25	75	2	②	●
ZE-RAP2100-R1.5	10.0	1.5	10	25	75	2	②	●
ZE-RAP2100-R2.0	10.0	2.0	10	25	75	2	②	●
ZE-RAP2120-R0.5	12.0	0.5	12	30	75	2	②	●
ZE-RAP2120-R1.0	12.0	1.0	12	30	75	2	②	●
ZE-RAP2120-R1.5	12.0	1.5	12	30	75	2	②	●
ZE-RAP2120-R2.0	12.0	2.0	12	30	75	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-RAP2-H

## 2-Flute Long Straight Shank

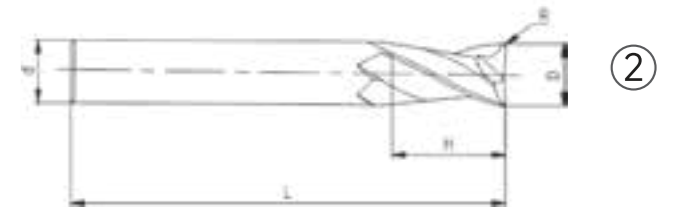
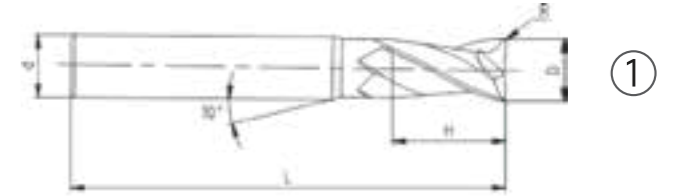
### Corner Radius End Mills

### 2날 레디우스 롱 샹크 엔드밀

✓ Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^0$  / D6~D14  $_{-0.025}^0$  / D15~D20  $_{-0.03}^0$



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP2060-R0.5H	6.0	0.5	6	16	75	2	②	●
ZE-RAP2060-R1.0H	6.0	1.0	6	16	75	2	②	●
ZE-RAP2100-R0.5H	10.0	0.5	10	25	100	2	②	●
ZE-RAP2100-R1.0H	10.0	1.0	10	25	100	2	②	●
ZE-RAP2100-R2.0H	10.0	2.0	10	25	100	2	②	●
ZE-RAP2120-R0.5H	12.0	0.5	12	30	100	2	②	●
ZE-RAP2120-R1.0H	12.0	1.0	12	30	100	2	②	●
ZE-RAP2120-R2.0H	12.0	2.0	12	30	100	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-RAP2-G

## 2-Flute Long Straight Shank

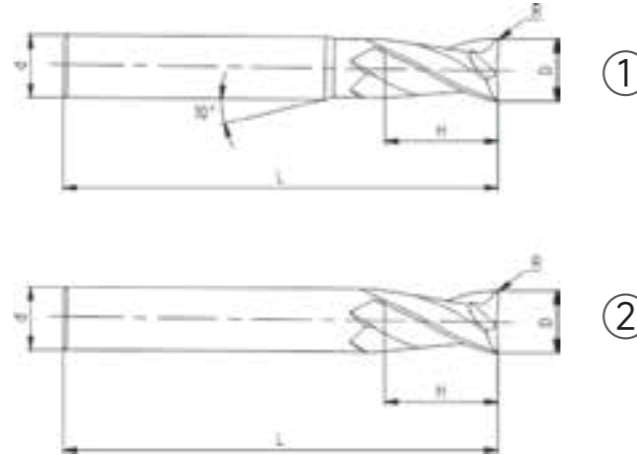
### Corner Radius End Mills

### 2날 라디우스 엑스트라 롱 샹크 엔드밀

✔ Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
 홈 가공 / 측면 가공 / 드릴링 / 밀링 가공

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP2080-R0.5G	8.0	0.5	8	20	100	2	②	●
ZE-RAP2080-R1.0G	8.0	1.0	8	20	100	2	②	●
ZE-RAP2100-R0.5G	10.0	0.5	10	25	150	2	②	●
ZE-RAP2100-R1.0G	10.0	1.0	10	25	150	2	②	●
ZE-RAP2100-R1.5G	10.0	2.0	10	25	150	2	②	●
ZE-RAP2120-R0.5G	12.0	0.5	12	30	150	2	②	●
ZE-RAP2120-R1.0G	12.0	1.0	12	30	150	2	②	●
ZE-RAP2120-R1.5G	12.0	2.0	12	30	150	2	②	●

● Stock Available 재고관리

▲ Make to order 주문제작

#### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC

◎ Very Suitable 1차 추천

○ Suitable 2차 추천

#### ZE-RAP2/-H/G Cutting Parameters 추천절삭조건

Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
1	40000	800	40000	800	38000	700	32000	320	22300	200	25000	275
2	24000	900	24000	900	19000	760	16000	400	11150	230	13000	275
3	15500	950	15500	950	12750	760	10600	450	7400	290	8500	280
4	11500	950	11500	950	9550	760	8000	550	5550	370	6500	370
5	9500	1050	9500	1050	7650	800	6400	550	4450	370	5000	375
6	8000	1050	8000	1050	6400	800	5300	580	3700	390	4200	390
8	6000	1300	6600	1300	4800	950	4000	700	2750	455	3200	440
10	4800	1200	4800	1200	3800	900	3200	650	2200	430	2500	440
12	4000	1100	4000	1100	3200	840	2650	610	1850	430	2100	420

- ✔ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
 상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✔ Please select high-precision machine and tool holder.  
 고정도 장비 및 홀더를 사용하세요.
- ✔ Please use air blow or cutting liquid with high mist retardant property.  
 고능율 절삭유나 공랭기 사용을 추천합니다.
- ✔ Down milling is recommended in the case of side milling  
 측면가공의 경우에는 플런지 가공을 추천합니다.
- ✔ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
 장비강성이 약하거나 피삭재 고정이 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- ✔ Make overhang of tool as short as possible in conditions of non-interference.  
 가능한 짧은 오버행 공구를 사용하세요.



# ZE-RAP3

## 3-Flute Straight Shank

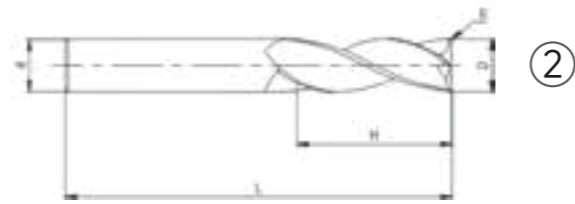
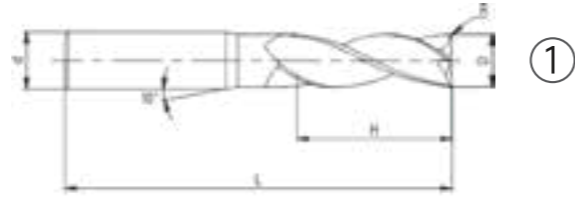
### Corner Radius End Mills

#### 3날 래디우스 엔드밀

- Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공

Diameter Tolerance 직경 공차 :

D1~D6\_0.02 / D6~D14\_0.025 / D15~D20\_0.03



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP3030-R0.2S	3.0	0.2	4	8	50	3	①	●
ZE-RAP3030-R0.3S	3.0	0.3	4	8	50	3	①	●
ZE-RAP3030-R0.5S	3.0	0.5	4	8	50	3	①	●
ZE-RAP3040-R0.2S	4.0	0.2	4	10	50	3	②	●
ZE-RAP3040-R0.3S	4.0	0.3	4	10	50	3	②	●
ZE-RAP3040-R0.5S	4.0	0.5	4	10	50	3	②	●
ZE-RAP3050-R0.3	5.0	0.3	6	13	50	3	①	●
ZE-RAP3050-R0.5	5.0	0.5	6	13	50	3	①	●
ZE-RAP3050-R1.0	5.0	1.0	6	13	50	3	①	●
ZE-RAP3060-R0.3	6.0	0.3	6	16	50	3	②	●
ZE-RAP3060-R0.5	6.0	0.5	6	16	50	3	②	●
ZE-RAP3060-R1.0	6.0	1.0	6	16	50	3	②	●
ZE-RAP3080-R0.3	8.0	0.3	8	20	60	3	②	●
ZE-RAP3080-R0.5	8.0	0.5	8	20	60	3	②	●
ZE-RAP3080-R1.0	8.0	1.0	8	20	60	3	②	●
ZE-RAP3100-R0.5	10.0	0.5	10	25	75	3	②	●
ZE-RAP3100-R1.0	10.0	1.0	10	25	75	3	②	●
ZE-RAP3100-R2.0	10.0	2.0	10	25	75	3	②	●
ZE-RAP3120-R0.5	12.0	0.5	12	30	75	3	②	●
ZE-RAP3120-R1.0	12.0	1.0	12	30	75	3	②	●

- Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

Hardness unit 경도 : HRC ○ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-RAP3-H

## 3-Flute Long Straight Shank

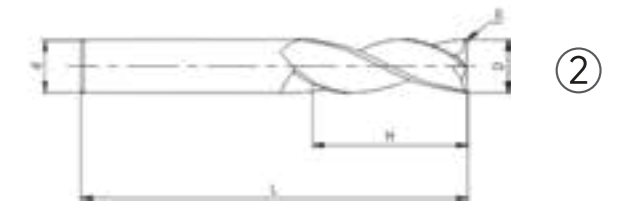
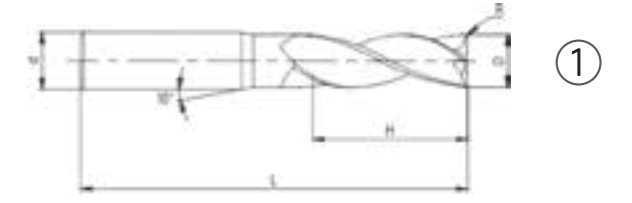
### Corner Radius End Mills

#### 3날 래디우스 롱 샹크 엔드밀

- Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공

Diameter Tolerance 직경 공차 :

D1~D6\_0.02 / D6~D14\_0.025 / D15~D20\_0.03



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP3060-R0.5H	6.0	0.5	6	16	75	3	②	●
ZE-RAP3060-R1.0H	6.0	1.0	6	16	75	3	②	●
ZE-RAP3080-R0.5H	8.0	0.5	8	20	75	3	②	●
ZE-RAP3080-R1.0H	8.0	1.0	8	20	75	3	②	●
ZE-RAP3100-R0.5H	10.0	0.5	10	25	100	3	②	●
ZE-RAP3100-R1.0H	10.0	1.0	10	25	100	3	②	●
ZE-RAP3100-R2.0H	10.0	2.0	10	25	100	3	②	●
ZE-RAP3120-R0.5H	12.0	0.5	12	30	100	3	②	●
ZE-RAP3120-R1.0H	12.0	1.0	12	30	100	3	②	●
ZE-RAP3120-R2.0H	12.0	2.0	12	30	100	3	②	●

- Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

Hardness unit 경도 : HRC ○ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-RAP3-G

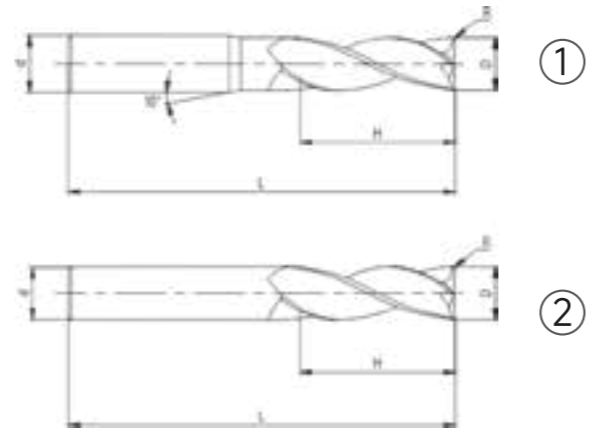
## 3-Flute Straight Extra

### Extra Long Shank Corner Radius End Mills

#### 3날 래디우스 엑스트라 롱 샹크 엔드밀

- Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공

직경 공차 :  
D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP3080-R0.5G	8.0	0.5	8	20	100	3	②	●
ZE-RAP3080-R1.0G	8.0	1.0	8	20	100	3	②	●
ZE-RAP3100-R0.5G	10.0	0.5	10	25	150	3	②	●
ZE-RAP3100-R1.0G	10.0	1.0	10	25	150	3	②	●
ZE-RAP3100-R1.5G	10.0	2.0	10	25	150	3	②	●
ZE-RAP3120-R0.5G	12.0	0.5	12	30	150	3	②	●
ZE-RAP3120-R1.0G	12.0	1.0	12	30	150	3	②	●
ZE-RAP3120-R1.5G	12.0	2.0	12	30	150	3	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)
3	15500	950	15500	950	12750	760	10600	450	7400	290	8500	280
4	11500	950	11500	950	9550	760	8000	550	5550	370	6500	370
5	9500	1050	9500	1050	7650	800	6400	550	4450	370	5000	375
6	8000	1050	8000	1050	6400	800	5300	580	3700	390	4200	390
8	6000	1300	6600	1300	4800	950	4000	700	2750	455	3200	440
10	4800	1200	4800	1200	3800	900	3200	650	2200	430	2500	440
12	4000	1100	4000	1100	3200	840	2650	610	1850	430	2100	420

- The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- Please use air blow or cutting liquid with high mist retardant property.  
고능율 절삭유나 공랭기 사용을 추천합니다.
- Down milling is recommended in the case of side milling  
측면가공의 경우에는 플런지 가공을 추천합니다.
- When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정이 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# ZE-RAP4

## 4-Flute Straight Shank

### Corner Radius End Mills

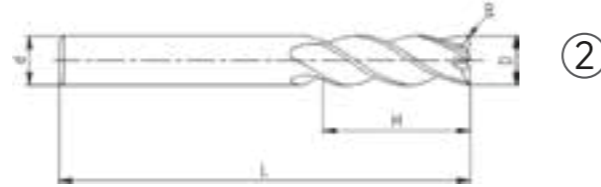
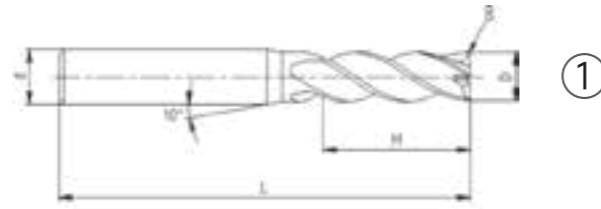
### 4날 래디우스 엔드밀

Wide range of applications, able to achieve a variety of forms of processing  
넓은 가공 영역으로 다양한 형태의 가공 가능

Diameter Tolerance 직경 공차 :

D1~D6  $\pm 0.02$  / D7~D20  $\pm 0.025$

Radius R Tolerance  $\pm 0.02$



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP4010-R0.2S	1.0	0.2	4	3	50	4	①	●
ZE-RAP4015-R0.2S	1.5	0.2	4	4	50	4	①	●
ZE-RAP4020-R0.2S	2.0	0.2	4	6	50	4	①	●
ZE-RAP4020-R0.5S	2.0	0.5	4	6	50	4	①	●
ZE-RAP4025-R0.2S	2.5	0.2	4	10	50	4	①	●
ZE-RAP4025-R0.5S	2.5	0.5	4	10	50	4	①	●
ZE-RAP4030-R0.2S	3.0	0.2	4	13	50	4	①	●
ZE-RAP4030-R0.5S	3.0	0.5	4	13	50	4	①	●
ZE-RAP4040-R0.2S	4.0	0.2	4	10	50	4	②	●
ZE-RAP4040-R0.3S	4.0	0.3	4	10	50	4	②	●
ZE-RAP4040-R0.5	4.0	0.5	6	10	50	4	②	●
ZE-RAP4040-R0.5S	4.0	0.5	4	10	50	4	②	●
ZE-RAP4050-R0.2	5.0	0.2	6	13	50	4	②	●
ZE-RAP4050-R0.5	5.0	0.5	6	13	50	4	①	●
ZE-RAP4050-R1.0	5.0	1.0	6	13	50	4	①	●
ZE-RAP4060-R0.2	6.0	0.2	6	16	50	4	①	●
ZE-RAP4060-R0.3	6.0	0.3	6	16	50	4	②	●
ZE-RAP4060-R0.5	6.0	0.5	6	16	50	4	②	●
ZE-RAP4060-R1.0	6.0	1.0	6	16	50	4	②	●

TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP4080-R0.3	8.0	0.3	8	20	60	4	②	●
ZE-RAP4080-R0.5	8.0	0.5	8	20	60	4	②	●
ZE-RAP4080-R1.0	8.0	1.0	8	20	60	4	②	●
ZE-RAP4100-R0.3	10.0	0.3	10	25	75	4	②	●
ZE-RAP4100-R0.5	10.0	0.5	10	25	75	4	②	●
ZE-RAP4100-R1.0	10.0	1.0	10	25	75	4	②	●
ZE-RAP4100-R2.0	10.0	2.0	10	25	75	4	②	●
ZE-RAP4100-R3.0	10.0	3.0	10	25	75	4	②	●
ZE-RAP4120-R0.3	12.0	0.3	12	30	75	4	②	●
ZE-RAP4120-R0.5	12.0	0.5	12	30	75	4	②	●
ZE-RAP4120-R1.0	12.0	1.0	12	30	75	4	②	●
ZE-RAP4120-R2.0	12.0	2.0	12	30	75	4	②	●
ZE-RAP4120-R3.0	12.0	3.0	12	30	75	4	②	●

● Stock Available 재고관리

▲ Make to order 주문제작

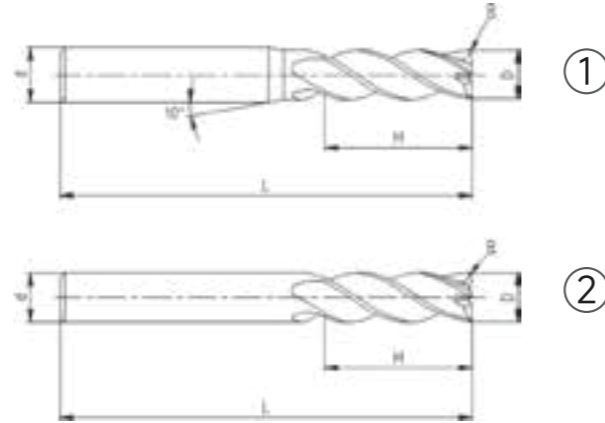


# ZE-RAP4-H

## 4-Flute Long Shank

### Corner Radius End Mills

### 4날 라디우스 롱 샹크 엔드밀



ZE-RAP4 long shank / extra long shank series  
ZE-RAP4 롱 샹크 / 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :

D1~D6  $0_{-0.02}$  / D7~D20  $0_{-0.025}$

Radius R Tolerance  $\pm 0.02$



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP4040-R0.2SH	4.0	0.2	4	10	75	4	②	●
ZE-RAP4040-R0.2H	4.0	0.2	6	10	75	4	①	●
ZE-RAP4040-R0.5SH	4.0	0.5	4	10	75	4	②	●
ZE-RAP4040-R0.5H	4.0	0.5	6	10	75	4	①	●
ZE-RAP4060-R0.2H	6.0	0.2	6	16	75	4	②	●
ZE-RAP4060-R0.5H	6.0	0.5	6	16	75	4	②	●
ZE-RAP4060-R1.0H	6.0	1.0	6	16	75	4	②	●
ZE-RAP4080-R0.2H	8.0	0.2	8	20	75	4	②	●
ZE-RAP4080-R0.5H	8.0	0.5	8	20	75	4	②	●
ZE-RAP4080-R1.0H	8.0	1.0	8	20	75	4	②	●
ZE-RAP4100-R0.2H	10.0	0.2	10	25	100	4	②	●
ZE-RAP4100-R0.5H	10.0	0.5	10	25	100	4	②	●
ZE-RAP4100-R1.0H	10.0	1.0	10	25	100	4	②	●
ZE-RAP4100-R2.0H	10.0	2.0	10	25	100	4	②	●

TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP4120-R0.2H	12.0	0.2	12	30	100	4	②	●
ZE-RAP4120-R0.5H	12.0	0.5	12	30	100	4	②	●
ZE-RAP4120-R1.0H	12.0	1.0	12	30	100	4	②	●
ZE-RAP4120-R2.0H	12.0	2.0	12	30	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○		○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZE-RAP4-G

## 4-Flute Straight Extra

### Extra Long Shank Corner Radius End Mills

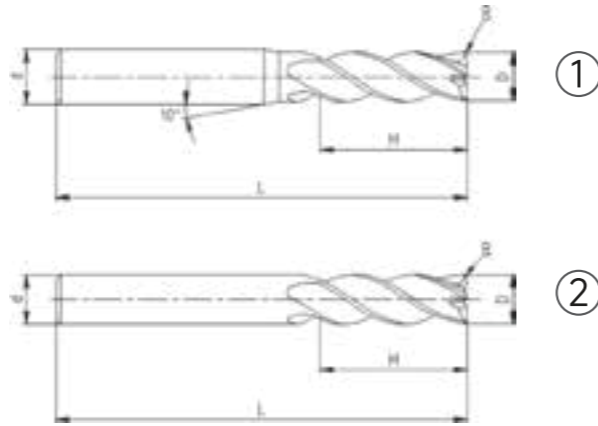
#### 4날 래디우스 엑스트라 롱 샹크 엔드밀

- ZE-RAP4 long shank / extra long shank series  
ZE-RAP4 롱 샹크 / 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>

Radius R Tolerance ± 0.02



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-RAP4060-R0.2G	6.0	0.2	6	16	100	4	②	●
ZE-RAP4060-R0.5G	6.0	0.5	6	16	100	4	②	●
ZE-RAP4060-R1.0G	6.0	1.0	6	16	100	4	②	●
ZE-RAP4080-R0.2G	8.0	0.2	8	20	100	4	②	●
ZE-RAP4080-R0.5G	8.0	0.5	8	20	100	4	②	●
ZE-RAP4080-R1.0G	8.0	1.0	8	20	100	4	②	●
ZE-RAP4100-R0.2G	10.0	0.2	10	25	150	4	②	●
ZE-RAP4100-R0.5G	10.0	0.5	10	25	150	4	②	●
ZE-RAP4100-R1.0G	10.0	1.0	10	25	150	4	②	●
ZE-RAP4100-R2.0G	10.0	2.0	10	25	150	4	②	●
ZE-RAP4120-R0.2G	12.0	0.2	12	30	150	4	②	●
ZE-RAP4120-R0.5G	12.0	0.5	12	30	150	4	②	●
ZE-RAP4120-R1.0G	12.0	1.0	12	30	150	4	②	●
ZE-RAP4120-R2.0G	12.0	2.0	12	30	150	4	②	●

- Stock Available 재고관리 ▲ Make to order 주문제작

#### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○	○	○	◎					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

#### ZE-RAP4/-H/G Cutting Parameters 추천절삭조건

Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)
4	10800	840	10800	840	10000	770	8000	640	5550	145	6500	500
5	8200	880	8200	880	7600	810	6400	670	4500	145	5000	530
6	7000	900	7000	900	6400	830	5300	690	3700	160	4200	540
8	5200	890	5200	890	4800	815	4000	680	2800	160	3200	550
10	4200	880	4200	880	3800	810	3200	670	2200	160	2500	520
12	3500	880	3500	880	3200	810	2650	670	1850	160	2100	520

- The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- Please use air blow or cutting liquid with high mist retardant property.  
고능율 절삭유나 공랭기 사용을 추천합니다.
- Down milling is recommended in the case of side milling  
측면가공의 경우에는 플런지 가공을 추천합니다.
- When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정이 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# ZE-BAP2

## 2-Flute Straight Shank

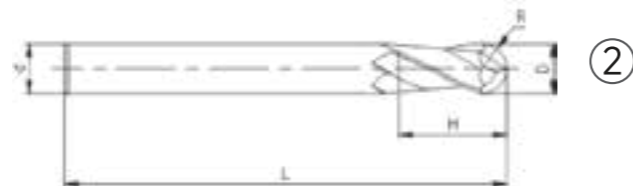
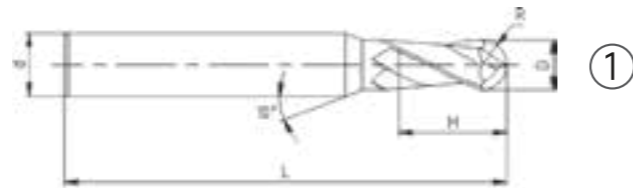
### Ball Nose End Mills

### 2날 볼 엔드밀

✔ Suitable for profile milling, and high speed machining, with wide range of applications  
형상가공 고속도 가공용

Diameter Tolerance 직경 공차 :  $D_{-0.02}$

Radius R Tolerance  $\pm 0.05$



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-BAP2010-R0.5S	1	0.5	4	2	50	2	①	▲
ZE-BAP2010-R0.5	1	0.5	6	2	50	2	①	▲
ZE-BAP2015-R0.75S	1.5	0.75	4	3	50	2	①	▲
ZE-BAP2015-R0.75	1.5	0.75	6	3	50	2	①	▲
ZE-BAP2020-R1.0F	2	1	3	4	50	2	①	▲
ZE-BAP2020-R1.0S	2	1	4	4	50	2	①	▲
ZE-BAP2020-R1.0	2	1	6	4	50	2	①	▲
ZE-BAP2025-R1.25F	2.5	1.25	3	5	50	2	①	▲
ZE-BAP2025-R1.25S	2.5	1.25	4	5	50	2	①	▲
ZE-BAP2025-R1.25	2.5	1.25	6	5	50	2	①	▲
ZE-BAP2030-R1.5F	3	1.5	3	6	50	2	②	▲
ZE-BAP2030-R1.5S	3	1.5	4	6	50	2	①	●
ZE-BAP2030-R1.5	3	1.5	6	6	50	2	①	●
ZE-BAP2035-R1.75S	3.5	1.75	4	8	50	2	①	●
ZE-BAP2035-R1.75	3.5	1.75	6	8	50	2	①	●

TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-BAP2040-R2.0S	4	2	4	8	50	2	②	●
ZE-BAP2040-R2.0	4	2	6	8	50	2	①	●
ZE-BAP2050-R2.5	5	2.5	6	10	50	2	①	●
ZE-BAP2055-R2.75	5.5	2.75	6	12	50	2	①	●
ZE-BAP2060-R3.0	6	3	6	12	50	2	②	●
ZE-BAP2070-R3.5	7	3.5	8	14	60	2	①	●
ZE-BAP2080-R4.0	8	4	8	16	60	2	②	●
ZE-BAP2090-R4.5	9	4.5	10	18	75	2	①	●
ZE-BAP2100-R5.0	10	5	10	20	75	2	②	●
ZE-BAP2120-R6.0	12	6	12	24	75	2	②	●
ZE-BAP2140-R7.0	14	7	14	28	75	2	②	●
ZE-BAP2160-R8.0	16	8	16	32	100	2	②	●
ZE-BAP2200-R10.0	20	10	20	40	100	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○			○				◎	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천



# ZE-BAP2-H/G

## 2-Flute Long Shank / Extra

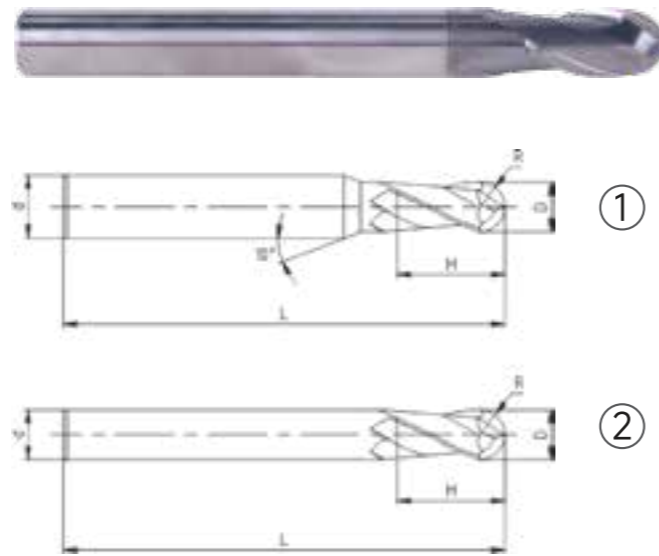
### Long Shank Ball Nose End Mills

2날 볼 롱 / 엑스트라 롱 샹크 엔드밀

- ZE-BAP2 long shank / extra long shank series
- ZE-BAP2 롱 샹크 / 엑스트라 롱 샹크 시리즈

Helix angle 헬릭스 각도 :  $\angle 30^\circ$

Diameter Tolerance 직경 공차 :  $D_{-0.02}$   $R \pm 0.005$



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-BAP2020-R1.0SH	2	1	4	4	75	2	①	●
ZE-BAP2020-R1.0H	2	1	6	4	75	2	①	●
ZE-BAP2025-R1.25S	2.5	1.25	4	5	75	2	①	●
ZE-BAP2025-R1.25H	2.5	1.25	6	5	75	2	①	●
ZE-BAP2030-R1.5SH	3	1.5	4	6	75	2	①	●
ZE-BAP2030-R1.5H	3	1.5	6	6	75	2	①	●
ZE-BAP2035-R1.75S	3.5	1.75	4	8	75	2	①	●
ZE-BAP2035-R1.75H	3.5	1.75	6	8	75	2	①	●
ZE-BAP2040-R2.0SH	4	2	4	8	75	2	②	●
ZE-BAP2040-R2.0H	4	2	6	8	75	2	①	●
ZE-BAP2050-R2.5H	5	2.5	6	10	75	2	①	●
ZE-BAP2055-R2.75H	5.5	2.75	6	12	75	2	①	●

TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-BAP2060-R3.0H	6	3	6	12	75	2	②	●
ZE-BAP2060-R3.0G	6	3	6	12	100	2	②	●
ZE-BAP2070-R3.5H	7	3.5	8	14	75	2	①	●
ZE-BAP2080-R4.0H	8	4	8	16	75	2	②	●
ZE-BAP2080-R4.0G	8	4	8	16	100	2	②	●
ZE-BAP2090-R4.5H	9	4.5	10	18	100	2	①	●
ZE-BAP2100-R5.0H	10	5	10	20	100	2	②	●
ZE-BAP2100-R5.0G	10	5	10	20	150	2	②	●
ZE-BAP2120-R6.0H	12	6	12	24	100	2	②	●
ZE-BAP2120-R6.0G	12	6	12	24	150	2	②	●
ZE-BAP2140-R7.0H	14	7	14	28	100	2	②	●
ZE-BAP2160-R8.0H	16	8	16	32	150	2	②	●
ZE-BAP2200-R10.0H	20	10	20	40	150	2	②	●

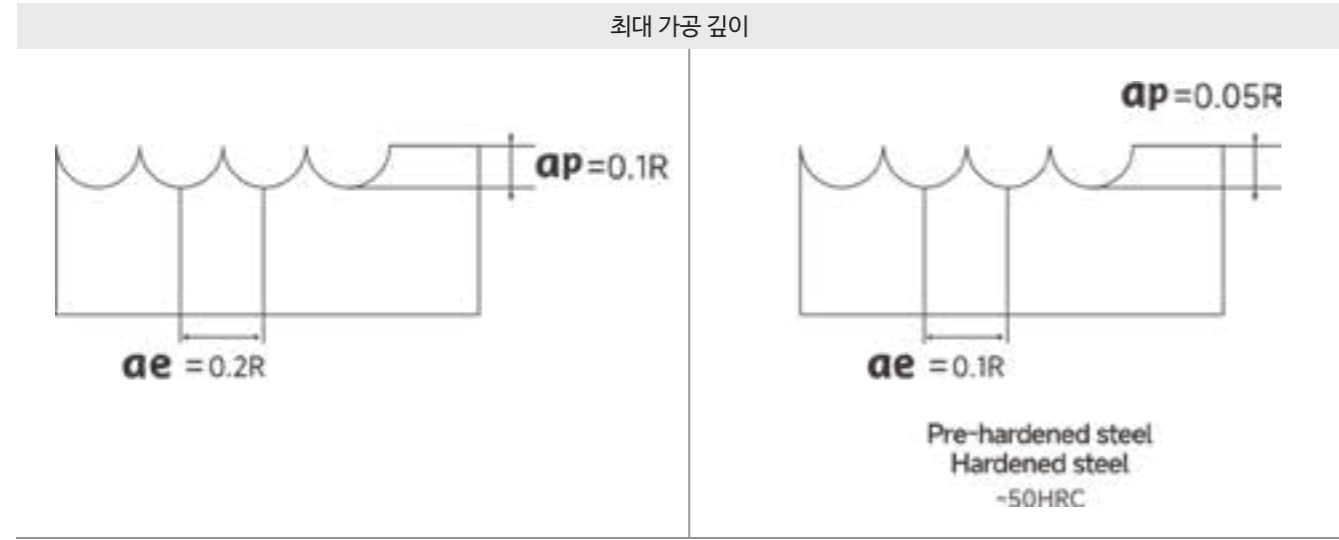
● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○			○				◎	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

ZE-BAP2/-H/G Cutting Parameters 추천절삭조건												
Workpiece Material 피삭재	Cast Iron Nodular Cast Iron 회주철 구상흑연주철		Carbon steel Alloy steel 탄소강 / 합금강 ~750N/mm <sup>2</sup>		Carbon steel Alloy steel 탄소강 / 합금강 ~30HRC		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~40HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel 프리하든강 고경도강 ~50HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
R0.5	40000	800	40000	800	38000	700	32000	320	22300	200	25000	275
R1.0	24000	900	24000	900	19000	760	16000	400	11150	230	13000	275
R1.5	15500	950	15500	950	12750	760	10600	450	7400	290	8500	280
R2.0	11500	950	11500	950	9550	760	8000	550	5550	370	6500	370
R2.5	9500	1050	9500	1050	7650	800	6400	550	4450	370	5000	375
R3.0	8000	1050	8000	1050	6400	800	5300	580	3700	390	4200	390
R4.0	6000	1300	6000	1300	4800	950	4000	700	2750	455	3200	440
R5.0	4800	1200	4800	1200	3800	900	3200	650	2200	430	2500	440
R6.0	4000	1100	4000	1100	3200	840	2650	610	1850	430	2100	420
R8.0	3000	1050	3000	1050	2400	800	2000	600	1350	380	1600	375
R10.0	2400	950	2400	950	1900	680	1600	560	1100	370	1250	330



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ Please use air cooling or liquid cooling.  
공랭기나 수냉기를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# ZE-BAP4

## 4-Flute Straight Shank Ball

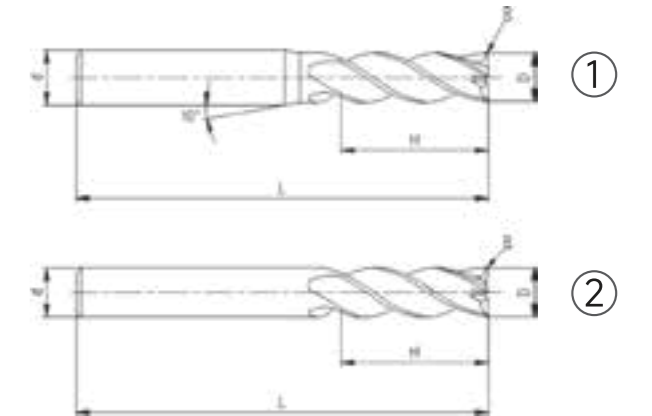
### Nose End Mills

### 4날 볼 엔드밀



- ✓ Excellent vibration resistance, able to achieve various processing of slot milling, side milling, drilling and milling  
홈 가공 / 측면 가공 / 드릴링 / 밀링 가공

Diameter Tolerance 직경 공차 : D1~D20<sub>-0.02</sub> R±0.005



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
ZE-BAP4030-R1.5S	3.0	1.5	4	6	50	4	①	●
ZE-BAP4030-R1.5	3.0	1.5	6	6	50	4	①	●
ZE-BAP4030-R2.0S	4.0	2.0	4	8	50	4	②	●
ZE-BAP4040-R2.0	4.0	2.0	6	8	50	4	①	●
ZE-BAP4050-R2.5	5.0	2.5	6	10	50	4	①	●
ZE-BAP4060-R3.0	6.0	3.0	6	12	50	4	②	●
ZE-BAP4080-R4.0	8.0	4.0	8	16	60	4	②	●
ZE-BAP4100-R5.0	10.0	5.0	10	20	75	4	②	●
ZE-BAP4120-R6.0	12.0	6.0	12	24	75	4	②	●
ZE-BAP4140-R7.0	14.0	7.0	14	28	75	4	②	●
ZE-BAP4160-R8.0	16.0	8.0	16	32	100	4	②	●
ZE-BAP4180-R9.0	18.0	9.0	18	36	100	4	②	●
ZE-BAP4200-R10.0	20.0	10.0	20	40	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

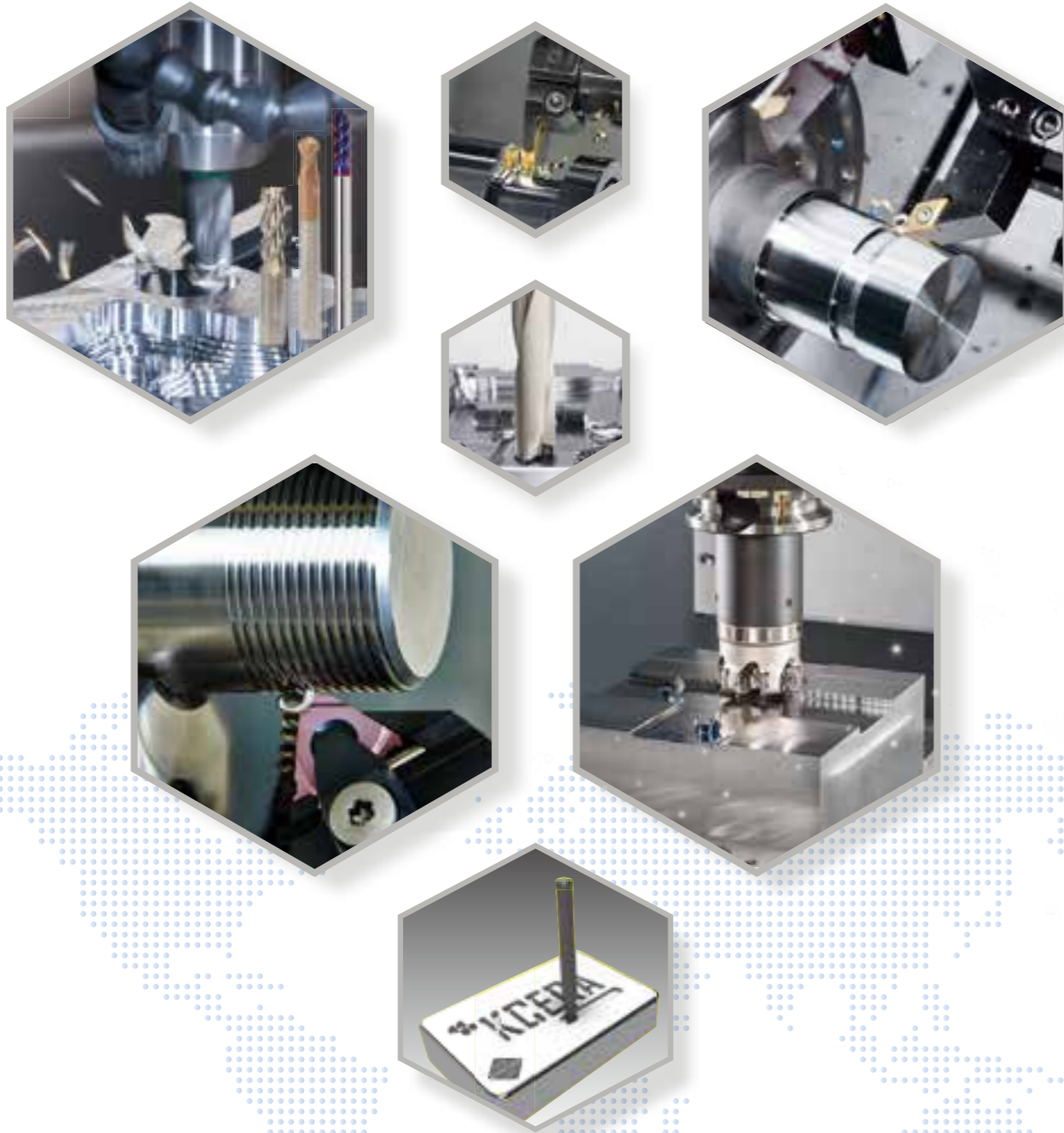
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	○			○	◎				

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천





# EFFICIENT METAL CUT



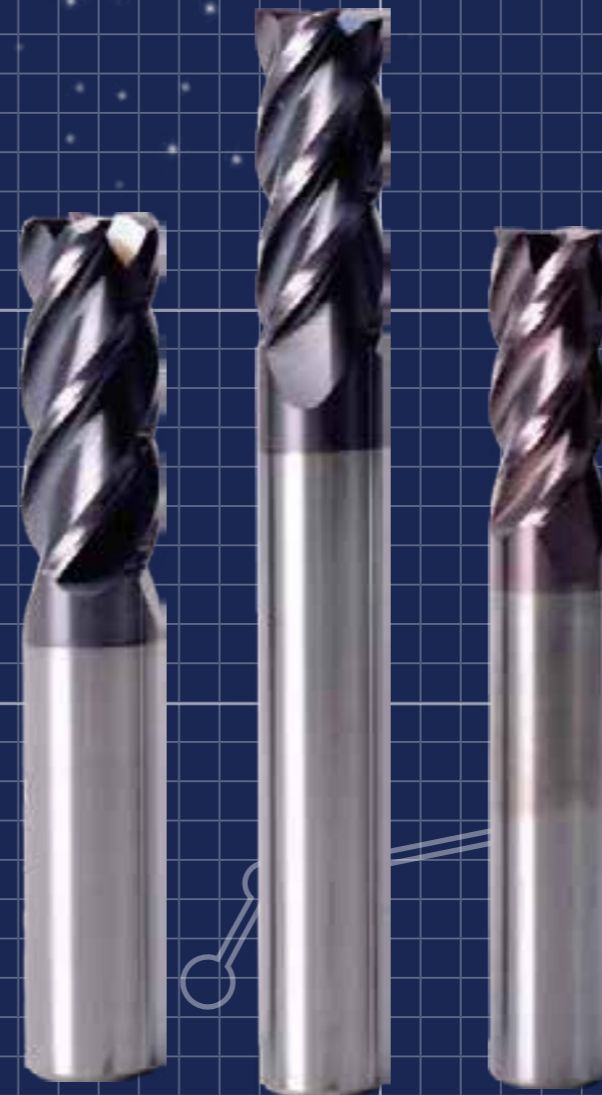
# SERIES FOR HIGH-PERFORMANCE MACHINING

고성능 범용 엔드밀 시리즈



ZEUS PRO

# ZEUS PRO





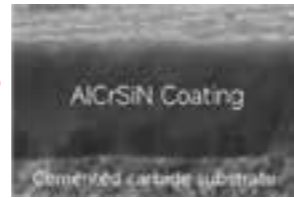
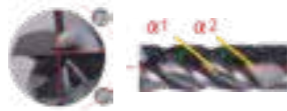
Product series  
**ZEUS PRO**

Series For High-performance Machining  
고성능 범용 엔드밀 시리즈

HIGH-PERFORMANCE MACHINING



Ultra-fine grains 초미립소재  
Excellent wear resistance and extremely high bending strength  
우수한 내마모성과 높은 강성



More wear-resistant and high-temperature resistant nanocomposite coating  
내마모성 및 내열성 증가한 나노 코팅

Differential helical angle and pitch design offer high vibration resistance  
더블 헬리컬 앵글 및 부등분할 적용으로 떨림 방지

MACHINING PARTS 가공방식



CUTTING CONDITIONS 절삭조건

WORK PIECE NAME	가공물	Woodworking Tools
DESIGNATION	형번	ZP-SGP4100 COMPETITOR A
WORK PIECE MATERIAL	피삭재	40Cd (HRC20+)
RPM	회전수	2500
F	테이블 이송	400
ap	축 방향 - 절삭 깊이	5
ae	반경 방향 - 절삭 폭	10
COOLING METHOD	절삭유	External cooling Cutting fluid

CUTTING RESULTS 테스트 결과



Customer's processing time is reduced from 21 hours to 10.5 hours with a 100% efficiency increase.

사이클 타임 21시간에서 10.5시간으로 줄임으로서 100% 생산성 증대

**ZP-SGP4**

4-Flute Straight Shank

Flat End Mills

4날 스퀘어 엔드밀

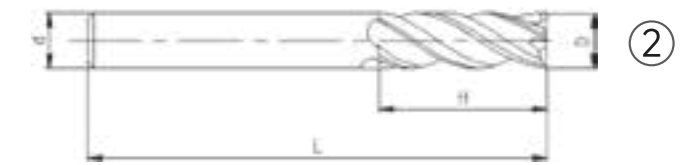
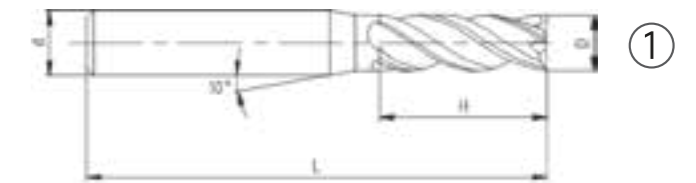
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Wide application  
다양한 영역에 적용 가능

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^0$  / D7~D20  $_{-0.025}^0$



Corner protection flattened  
코너 보호기능 (Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZP-SGP4010-S	1.0	4	3	50	4	①	●
ZP-SGP4015-S	1.5	4	4	50	4	①	●
ZP-SGP4020-S	2.0	4	6	50	4	①	●
ZP-SGP4025-S	2.5	4	8	50	4	①	●
ZP-SGP4030-S	3.0	4	8	50	4	①	●
ZP-SGP4025	2.5	6	8	50	4	①	●
ZP-SGP4030	3.0	6	8	50	4	①	●
ZP-SGP4035-S	3.5	4	10	50	4	①	●
ZP-SGP4040-S	4.0	4	11	50	4	②	●
ZP-SGP4035	3.5	6	10	50	4	①	●
ZP-SGP4040	4.0	6	11	50	4	①	●
ZP-SGP4045	4.5	6	11	50	4	①	●
ZP-SGP4050	5.0	6	13	50	4	①	●
ZP-SGP4055	5.5	6	16	50	4	①	●
ZP-SGP4060	6.0	6	16	50	4	②	●
ZP-SGP4070	7.0	8	20	60	4	①	●
ZP-SGP4080	8.0	8	20	60	4	②	●

ZEUS PRO

TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZP-SGP4090	9.0	10	22	75	4	①	●
ZP-SGP4100	10.0	10	25	75	4	②	●
ZP-SGP4110	11.0	12	26	75	4	①	●
ZP-SGP4120	12.0	12	30	75	4	②	●
ZP-SGP4140	14.0	14	32	75	4	②	●
ZP-SGP4160	16.0	16	45	100	4	②	●
ZP-SGP4180	18.0	18	45	100	4	②	●
ZP-SGP4200	20.0	20	45	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		◎	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-SGP4-L

## 4-Flute Flattened End Mills

With Straight Shank And Long Cutting Edge

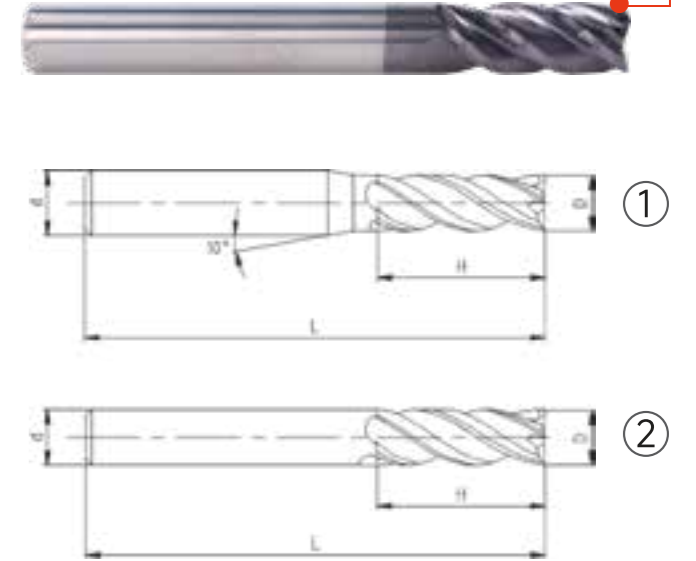
4날 스퀘어 롱 플루트 엔드밀

- ✔ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✔ Wide application 다양한 영역에 적용 가능
- ✔ ZP-SGP4 long cutting edge series  
ZP-SGP4 롱 커팅 엣지 시리즈

Diameter Tolerance 직경 공차 :  
D1~D6\_0.02 / D7~D20\_0.025



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZP-SGP4030-L	3.0	6	12	75	4	①	●
ZP-SGP4040-L	4.0	6	15	75	4	①	●
ZP-SGP4050-L	5.0	6	20	75	4	①	●
ZP-SGP4060-L	6.0	6	20	75	4	②	●
ZP-SGP4080-L	8.0	8	25	100	4	②	●
ZP-SGP4100-L	10.0	10	30	100	4	②	●
ZP-SGP4120-L	12.0	12	35	100	4	②	●
ZP-SGP4140-L	14.0	14	40	100	4	②	●
ZP-SGP4160-L	16.0	16	50	150	4	②	●
ZP-SGP4200-L	20.0	20	55	150	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		◎	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-PERFORMANCE MACHINING

ZEUS PRO

# ZP-SGP4-H

## 4-Flute Long Shank Flat

### End Mills

#### 4날 스퀘어 롱 샹크 엔드밀

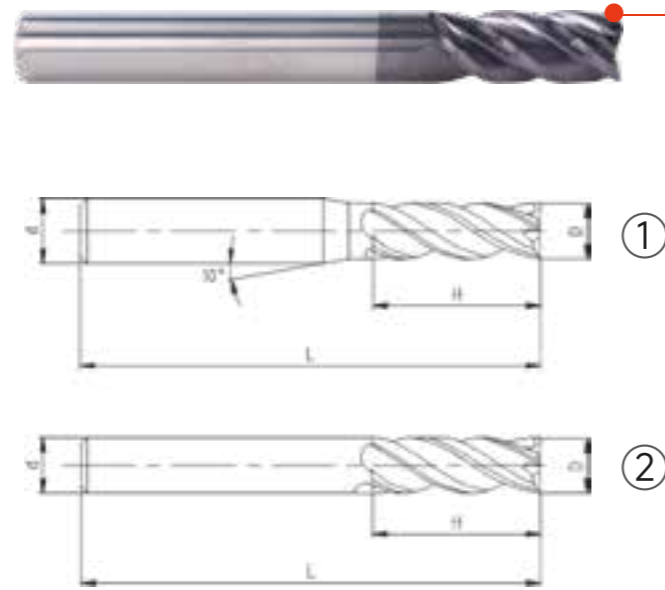
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Wide application
- ✓ ZP-SGP4 long shank / extra long shank series  
ZP-SGP4 롱 샹크 / 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



Corner protection flattened  
코너 보호기능 (Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZP-SGP4030-SH	3.0	4	8	75	4	①	●
ZP-SGP4030-H	3.0	6	8	75	4	①	●
ZP-SGP4040-SH	4.0	4	11	75	4	②	●
ZP-SGP4040-H	4.0	6	11	75	4	①	●
ZP-SGP4050-H	5.0	6	13	75	4	①	●
ZP-SGP4060-H	6.0	6	16	75	4	②	●
ZP-SGP4080-H	8.0	8	20	75	4	②	●
ZP-SGP4100-H	10.0	10	25	100	4	②	●
ZP-SGP4120-H	12.0	12	30	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		◎	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-SGP4-G

## 4-Flute Extra Long Shank

### Flat End Mills

#### 4날 스퀘어 엑스트라 롱 샹크 엔드밀

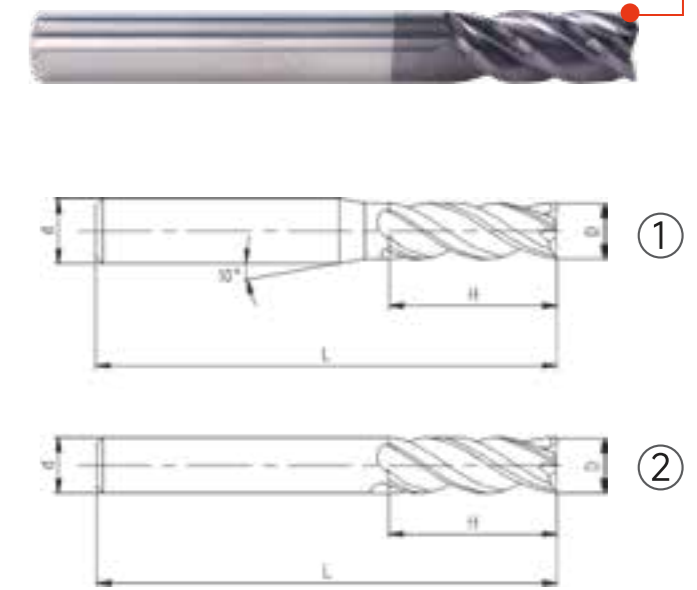
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Wide application
- ✓ ZP-SGP4 long shank / extra long shank series  
ZP-SGP4 롱 샹크 / 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



Corner protection flattened  
코너 보호기능 (Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
ZP-SGP4060-G	6.0	6	16	100	4	②	●
ZP-SGP4080-G	8.0	8	20	100	4	②	●
ZP-SGP4100-G	10.0	10	25	150	4	②	●
ZP-SGP4120-G	12.0	12	30	150	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		◎	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-PERFORMANCE MACHINING

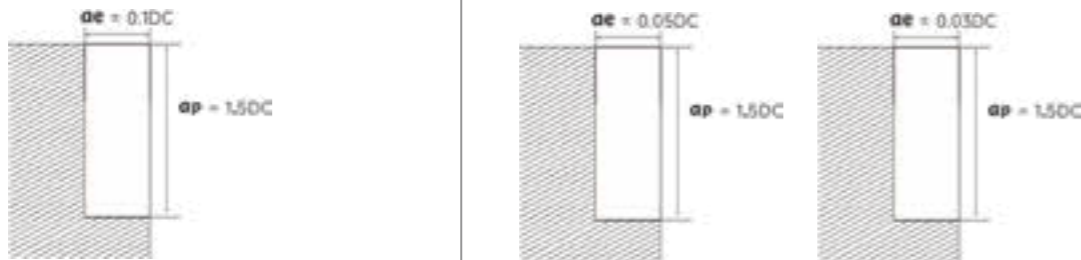
ZEUS PRO



ZP-SGP4/-L/H/G Cutting Parameters (General cutting) 추천절삭조건 (범용절삭)

Workpiece Material 피삭재	Cast Iron Carbon steel Alloy steel 회주철 / 탄소강 / 합금강 ~30HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel and tempered steel 프리하드강 / 고경도강 / 합금강 ~40HRC		Pre-hardened steel Hardened steel and tempered steel 프리하드강 / 고경도강 / 합금강 ~50HRC		Quenched steel 조질강 ~55HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
1	20000	300	20000	108	20000	240	20000	180	20000	135
2	15000	480	11500	120	15000	420	13000	270	11140	195
3	14000	815	7500	145	10600	630	8500	495	7430	360
4	10800	840	5500	150	8000	645	6500	505	5570	370
5	8200	875	4500	150	6400	675	5000	530	4460	390
6	7000	900	3700	165	5300	690	4200	540	3710	390
8	5200	890	2800	165	4000	680	3200	555	2785	405
10	4200	875	2200	165	3200	675	2500	525	2230	375
12	3500	875	1850	165	2650	675	2100	525	1855	375
14	3000	815	1600	150	2300	630	1800	495	1590	360
16	2600	815	1400	145	2000	630	1600	495	1390	360
18	2300	805	1250	125	1800	620	1400	485	1240	350
20	2050	805	1100	125	1600	620	1250	485	1115	350

최대 가공 깊이



공구 직경	절단 깊이(ap)
$\phi 1 \leq DC \leq \phi 3$	0.15DC
$\phi 3 \leq DC \leq \phi 6$	0.3DC
$\phi 6 \leq DC \leq \phi 20$	0.5DC

공구 직경	절단 깊이(ap)
$\phi 1 \leq D \leq \phi 3$	0.1DC
$\phi 3 \leq DC$	0.2DC

- ✓ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard. 상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✓ Please select high-precision machine and tool holder. 고경도 장비 및 홀더를 사용하세요.
- ✓ Down milling is recommended in the case of side milling 측면가공의 경우에는 플런지 가공을 추천합니다.
- ✓ Please use air blow or cutting liquid with high mist retardant property. 고능율 절삭유나 공랭기 사용을 추천합니다.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly. 장비강성이 약하거나 피삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference. 가능한 짧은 오버행 공구를 사용하세요.

# ZP-SGP4-DIN

## 4-Flute Straight Shank

### Flat End Mills

### 4날 스퀘어 엔드밀

✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합

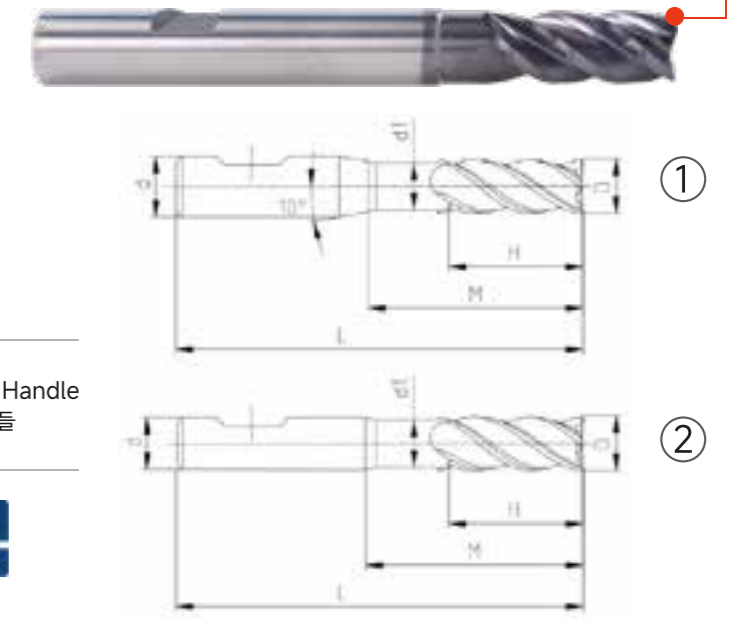
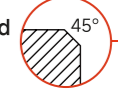
✓ Wide application  
다양한 영역에 적용 가능

Diameter Tolerance 직경 공차 :  
D1~D6  $0_{-0.015}$  / D7~D20  $0_{-0.02}$

✓ DIN 6535-HB Handle  
DIN6535-HB 핸들



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)						NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	M	d1	L			
ZP-SGP4010-S-DIN	1.0	4	3	7	0.9	50	4	①	●
ZP-SGP4015-S-DIN	1.5	4	4	8	1.4	50	4	①	●
ZP-SGP4020-S-DIN	2.0	4	6	10	1.85	50	4	①	●
ZP-SGP4025-S-DIN	2.5	4	8	12	2.3	50	4	①	●
ZP-SGP4030-S-DIN	3.0	4	8	13	2.7	50	4	①	●
ZP-SGP4025-DIN	2.5	6	8	12	2.3	50	4	①	●
ZP-SGP4030-DIN	3.0	6	8	13	2.7	50	4	①	●
ZP-SGP4035-S-DIN	3.5	4	10	15	3.2	50	4	①	●
ZP-SGP4040-S-DIN	4.0	4	11	16	3.7	50	4	②	●
ZP-SGP4035-DIN	3.5	6	10	15	3.2	50	4	①	●
ZP-SGP4040-DIN	4.0	6	11	16	3.7	50	4	①	●
ZP-SGP4045-DIN	4.5	6	11	16	4.2	50	4	①	●
ZP-SGP4050-DIN	5.0	6	13	19	4.7	50	4	①	●
ZP-SGP4055-DIN	5.5	6	16	22	5	50	4	①	●
ZP-SGP4060-DIN	6.0	6	16	22	5.5	50	4	②	●
ZP-SGP4070-DIN	7.0	8	20	28	6.5	60	4	①	●
ZP-SGP4080-DIN	8.0	8	20	28	7.5	60	4	②	●



TYPE 형번	BASIC DIMENSION 치수(mm)						NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	M	d1	L			
ZP-SGP4090-DIN	9.0	10	22	31	8.5	75	4	①	●
ZP-SGP4100-DIN	10.0	10	25	35	9.2	75	4	②	●
ZP-SGP4110-DIN	11.0	12	26	38	10.2	75	4	①	●
ZP-SGP4120-DIN	12.0	12	30	42	11	75	4	②	●
ZP-SGP4140-DIN	14.0	14	32	44	13	75	4	②	●
ZP-SGP4160-DIN	16.0	16	45	57	15	100	4	②	●
ZP-SGP4180-DIN	18.0	18	45	58	17	100	4	②	●
ZP-SGP4200-DIN	20.0	20	45	58	19	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		○	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-SGP4-L-DIN

## 4-Flute Flattened End Mills

With Straight Shank And Long Cutting Edge

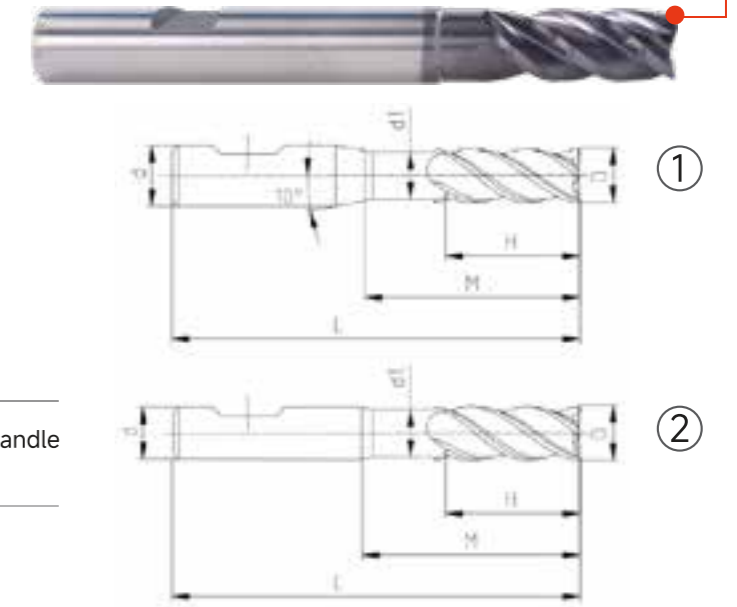
4날 스퀘어 롱 플루트 엔드밀

- ✓ Suitable for side milling and shallow slot machining 측면가공 및 홈가공에 적합
- ✓ Wide application 다양한 영역에 적용 가능
- ✓ ZP-SGP4 long cutting edge series ZP-SGP4 롱 커팅 엣지 시리즈

Diameter Tolerance 직경 공차 :  DIN 6535-HB Handle DIN6535-HB 핸들  
D1~D6  $_{-0.015}$  / D7~D20  $_{-0.02}$



Corner protection flattened 코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)						NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	M	d1	L			
ZP-SGP4030-L-DIN	3.0	6	12	17	2.7	75	4	①	●
ZP-SGP4040-L-DIN	4.0	6	15	20	3.7	75	4	①	●
ZP-SGP4050-L-DIN	5.0	6	20	26	4.7	75	4	①	●
ZP-SGP4060-L-DIN	6.0	6	20	26	5.5	75	4	②	●
ZP-SGP4080-L-DIN	8.0	8	25	33	7.5	100	4	②	●
ZP-SGP4100-L-DIN	10.0	10	30	40	9.2	100	4	②	●
ZP-SGP4120-L-DIN	12.0	12	35	47	11	100	4	②	●
ZP-SGP4140-L-DIN	14.0	14	40	52	13	100	4	②	●
ZP-SGP4160-L-DIN	16.0	16	50	62	15	150	4	②	●
ZP-SGP4200-L-DIN	20.0	20	55	68	19	150	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		○	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-SGP4-H-DIN

## 4-Flute Long Shank Flat

### End Mills

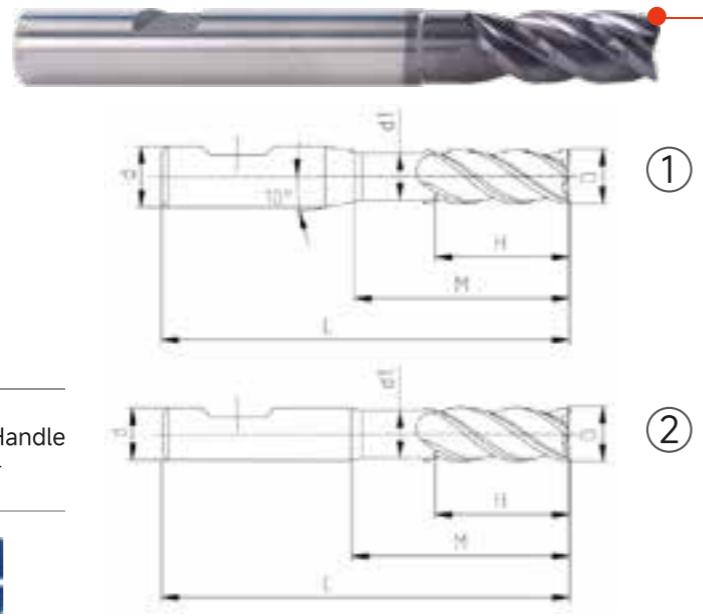
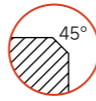
#### 4날 스퀘어 롱 샹크 엔드밀

- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Wide application
- ✓ ZP-SGP4 long shank / extra long shank series  
ZP-SGP4 롱 샹크 / 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :  
D1~D6  $_{-0.015}^0$  / D7~D20  $_{-0.02}^0$  ✓ DIN 6535-HB Handle  
DIN6535-HB 핸들



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)						NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	M	d1	L			
ZP-SGP4030-SH-DIN	3.0	4	8	13	2.7	75	4	①	●
ZP-SGP4030-H-DIN	3.0	6	8	13	2.7	75	4	①	●
ZP-SGP4040-SH-DIN	4.0	4	11	16	3.7	75	4	②	●
ZP-SGP4040-H-DIN	4.0	6	11	16	3.7	75	4	①	●
ZP-SGP4050-H-DIN	5.0	6	13	19	4.7	75	4	①	●
ZP-SGP4060-H-DIN	6.0	6	16	22	5.5	75	4	②	●
ZP-SGP4080-H-DIN	8.0	8	20	28	7.5	75	4	②	●
ZP-SGP4100-H-DIN	10.0	10	25	35	9.2	100	4	②	●
ZP-SGP4120-H-DIN	12.0	12	30	42	11	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎	◎	○	◎	○	○	○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-SGP4-G-DIN

## 4-Flute Extra Long Shank

### Flat End Mills

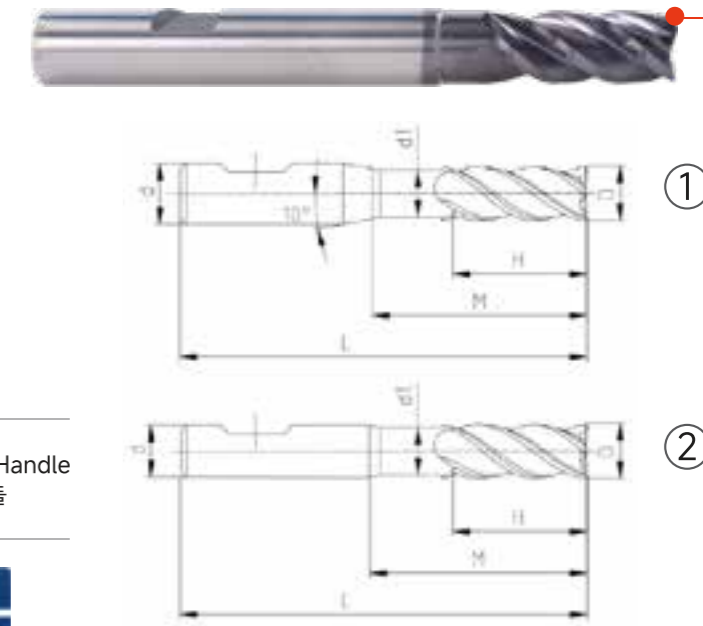
#### 4날 스퀘어 엑스트라 롱 샹크 엔드밀

- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Wide application
- ✓ ZP-SGP4 long shank / extra long shank series  
ZP-SGP4 롱 샹크 / 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :  
D1~D6  $_{-0.015}^0$  / D7~D20  $_{-0.02}^0$  ✓ DIN 6535-HB Handle  
DIN6535-HB 핸들



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)						NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	M	d1	L			
ZP-SGP4060-G-DIN	6.0	6	16	22	5.5	100	4	②	●
ZP-SGP4080-G-DIN	8.0	8	20	28	7.5	100	4	②	●
ZP-SGP4100-G-DIN	10.0	10	25	35	9.2	150	4	②	●
ZP-SGP4120-G-DIN	12.0	12	30	42	11	150	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎	◎	○	◎	○	○	○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

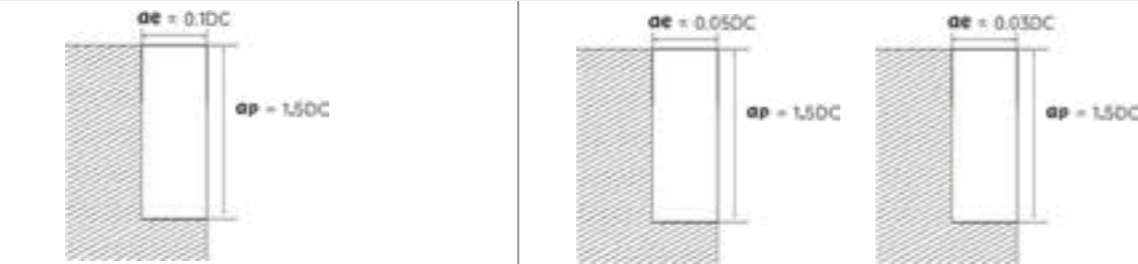
HIGH-PERFORMANCE MACHINING

ZEUS PRO

ZP-SGP4/-L/H/G-DIN Cutting Parameters (General cutting) 추천절삭조건 (범용절삭)

Workpiece Material 피삭재	Cast Iron Carbon steel Alloy steel 회주철 / 탄소강 / 합금강 ~30HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~40HRC		Pre-hardened steel Hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~50HRC		Quenched steel 조질강 ~55HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
1	20000	300	20000	108	20000	240	20000	180	20000	135
2	15000	480	11500	120	15000	420	13000	270	11140	195
3	14000	815	7500	145	10600	630	8500	495	7430	360
4	10800	840	5500	150	8000	645	6500	505	5570	370
5	8200	875	4500	150	6400	675	5000	530	4460	390
6	7000	900	3700	165	5300	690	4200	540	3710	390
8	5200	890	2800	165	4000	680	3200	555	2785	405
10	4200	875	2200	165	3200	675	2500	525	2230	375
12	3500	875	1850	165	2650	675	2100	525	1855	375
14	3000	815	1600	150	2300	630	1800	495	1590	360
16	2600	815	1400	145	2000	630	1600	495	1390	360
18	2300	805	1250	125	1800	620	1400	485	1240	350
20	2050	805	1100	125	1600	620	1250	485	1115	350

최대 가공 깊이



공구 직경	절단 깊이(ap)
$\phi 1 \leq DC \leq \phi 3$	0.15DC
$\phi 3 \leq DC \leq \phi 6$	0.3DC
$\phi 6 \leq DC \leq \phi 20$	0.5DC

공구 직경	절단 깊이(ap)
$\phi 1 \leq D \leq \phi 3$	0.1DC
$\phi 3 \leq DC$	0.2DC

- ✓ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard. 상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✓ Please select high-precision machine and tool holder. 고정도 장비 및 홀더를 사용하세요.
- ✓ Please use air blow or cutting liquid with high mist retardant property. 고능율 절삭유나 공랭기 사용을 추천합니다.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly. 장비강성이 약하거나 피삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference. 가능한 짧은 오버행 공구를 사용하세요.

# ZP-RAP4

## 4-Flute Straight Shank

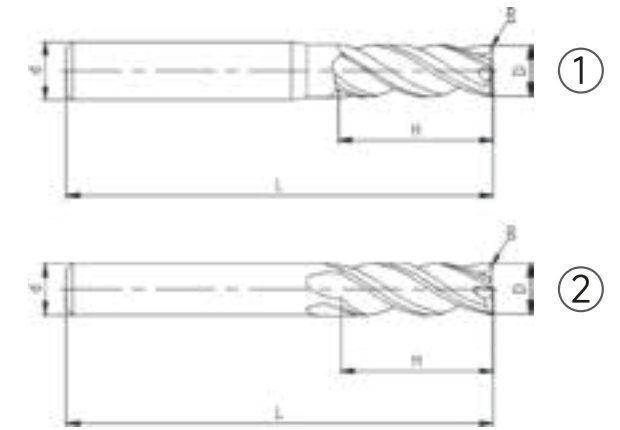
### Corner Radius End Mills

#### 4날 라디우스 엔드밀

- ✓ Suitable for side milling and shallow slot machining. 측면가공 및 홈가공에 적합
- ✓ Wide application. 다양한 영역에 적용 가능

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^0$  / D7~D20  $_{-0.025}^0$  R±0.01



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-RAP4010-R0.2S	1.0	0.2	3	50	4	4	①	▲
ZP-RAP4015-R0.2S	1.5	0.2	4	50	4	4	①	▲
ZP-RAP4020-R0.2S	2.0	0.2	6	50	4	4	①	▲
ZP-RAP4020-R0.2	2.0	0.2	6	50	6	4	①	▲
ZP-RAP4020-R0.5S	2.0	0.5	6	50	4	4	①	▲
ZP-RAP4020-R0.5	2.0	0.5	6	50	6	4	①	▲
ZP-RAP4025-R0.2S	2.5	0.2	8	50	4	4	①	▲
ZP-RAP4025-R0.2	2.5	0.2	8	50	6	4	①	▲
ZP-RAP4025-R0.5S	2.5	0.5	8	50	4	4	①	▲
ZP-RAP4025-R0.5	2.5	0.5	8	50	6	4	①	▲
ZP-RAP4030-R0.2S	3.0	0.2	8	50	4	4	①	●
ZP-RAP4030-R0.2	3.0	0.2	8	50	6	4	①	●
ZP-RAP4030-R0.5S	3.0	0.5	8	50	4	4	①	●
ZP-RAP4030-R0.5	3.0	0.5	8	50	6	4	①	●
ZP-RAP4040-R0.2S	4.0	0.2	11	50	4	4	②	●
ZP-RAP4040-R0.2	4.0	0.2	11	50	6	4	①	●
ZP-RAP4040-R0.3S	4.0	0.3	11	50	4	4	②	●
ZP-RAP4040-R0.3	4.0	0.3	11	50	6	4	①	●
ZP-RAP4040-R0.5S	4.0	0.5	11	50	4	4	②	●



HIGH-PERFORMANCE MACHINING

TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-RAP4040-R0.5	4.0	0.5	11	50	6	4	①	●
ZP-RAP4050-R0.2	5.0	0.2	13	50	6	4	①	●
ZP-RAP4050-R0.3	5.0	0.3	13	50	6	4	①	●
ZP-RAP4050-R0.5	5.0	0.5	13	50	6	4	①	●
ZP-RAP4050-R1.0	5.0	1.0	13	50	6	4	①	●
ZP-RAP4060-R0.2	6.0	0.2	16	50	6	4	②	●
ZP-RAP4060-R0.3	6.0	0.3	16	50	6	4	②	●
ZP-RAP4060-R0.5	6.0	0.5	16	50	6	4	②	●
ZP-RAP4060-R1.0	6.0	1.0	16	50	6	4	②	●
ZP-RAP4080-R0.2	8.0	0.2	20	60	8	4	②	●
ZP-RAP4080-R0.3	8.0	0.3	20	60	8	4	②	●
ZP-RAP4080-R0.5	8.0	0.5	20	60	8	4	②	●
ZP-RAP4080-R1.0	8.0	1.0	20	60	8	4	②	●
ZP-RAP4100-R0.2	10.0	0.2	25	75	10	4	②	●
ZP-RAP4100-R0.3	10.0	0.3	25	75	10	4	②	●
ZP-RAP4100-R0.5	10.0	0.5	25	75	10	4	②	●
ZP-RAP4100-R1.0	10.0	1.0	25	75	10	4	②	●
ZP-RAP4100-R2.0	10.0	2.0	25	75	10	4	②	●
ZP-RAP4100-R3.0	10.0	3.0	25	75	10	4	②	●
ZP-RAP4120-R0.2	12.0	0.2	30	75	12	4	②	●
ZP-RAP4120-R0.3	12.0	0.3	30	75	12	4	②	●
ZP-RAP4120-R0.5	12.0	0.5	30	75	12	4	②	●
ZP-RAP4120-R1.0	12.0	1.0	30	75	12	4	②	●
ZP-RAP4120-R2.0	12.0	2.0	30	75	12	4	②	●
ZP-RAP4120-R3.0	12.0	3.0	30	75	12	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		◎	◎			○	○	

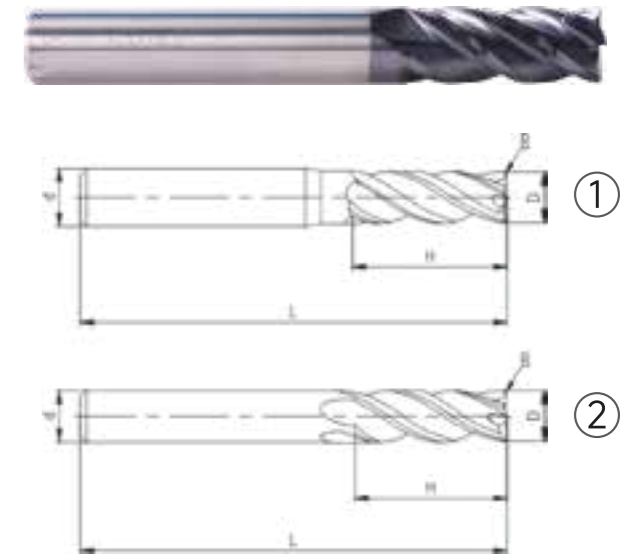
Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-RAP4-H

## 4-Flute Long Shank Corner Radius End Mills 4날 래디우스 롱 샹크 엔드밀

- ✓ Suitable for side milling and shallow slot machining 측면가공 및 홈가공에 적합
- ✓ ZP-RAP4 long shank series ZP-RAP4 롱 샹크 시리즈
- ✓ Wide application 다양한 영역에 적용 가능

Diameter Tolerance 직경 공차 : D1~D6  $_{-0.02}^0$  / D7~D20  $_{-0.025}^0$  R±0.01



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-RAP4040-R0.2SH	4.0	0.2	10	75	4	4	②	▲
ZP-RAP4040-R0.2H	4.0	0.2	10	75	6	4	①	▲
ZP-RAP4040-R0.5SH	4.0	0.5	10	75	4	4	②	▲
ZP-RAP4040-R0.5H	4.0	0.5	10	75	6	4	①	▲
ZP-RAP4060-R0.2H	6.0	0.2	16	75	6	4	②	▲
ZP-RAP4060-R0.5H	6.0	0.5	16	75	6	4	②	▲
ZP-RAP4060-R1.0H	6.0	1.0	16	75	6	4	②	▲
ZP-RAP4080-R0.2H	8.0	0.2	20	75	8	4	②	▲
ZP-RAP4080-R0.5H	8.0	0.5	20	75	8	4	②	▲
ZP-RAP4080-R1.0H	8.0	1.0	20	75	8	4	②	▲
ZP-RAP4100-R0.2H	10.0	0.2	25	100	10	4	②	▲
ZP-RAP4100-R0.5H	10.0	0.5	25	100	10	4	②	▲
ZP-RAP4100-R1.0H	10.0	1.0	25	100	10	4	②	▲
ZP-RAP4100-R2.0H	10.0	2.0	25	100	10	4	②	▲
ZP-RAP4120-R0.2H	12.0	0.2	30	100	12	4	②	▲
ZP-RAP4120-R0.5H	12.0	0.5	30	100	12	4	②	▲
ZP-RAP4120-R1.0H	12.0	1.0	30	100	12	4	②	▲
ZP-RAP4120-R2.0H	12.0	2.0	30	100	12	4	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		◎	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

ZEUS PRO



# ZP-RAP4-G

## 4-Flute Extra Long

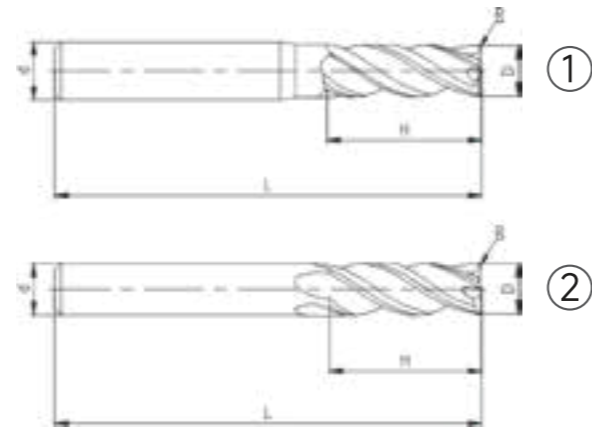
### Corner Radius End Mills

#### 4날 래디우스 엑스트라 롱 샹크 엔드밀

- ✔ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✔ Wide application  
다양한 영역에 적용 가능
- ✔ ZP-RAP4 extra long shank series  
ZP-RAP4 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :

D1~D6\_0.02 / D7~D20\_0.025 R±0.01



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-RAP4060-R0.2G	6.0	0.2	16	100	6	4	②	▲
ZP-RAP4060-R0.5G	6.0	0.5	16	100	6	4	②	▲
ZP-RAP4060-R1.0G	6.0	1.0	16	100	6	4	②	▲
ZP-RAP4080-R0.2G	8.0	0.2	20	100	8	4	②	▲
ZP-RAP4080-R0.5G	8.0	0.5	20	100	8	4	②	▲
ZP-RAP4080-R1.0G	8.0	1.0	20	100	8	4	②	▲
ZP-RAP4100-R0.2G	10.0	0.2	25	150	10	4	②	▲
ZP-RAP4100-R0.5G	10.0	0.5	25	150	10	4	②	▲
ZP-RAP4100-R1.0G	10.0	1.0	25	150	10	4	②	▲
ZP-RAP4100-R2.0G	10.0	2.0	25	150	10	4	②	▲
ZP-RAP4120-R0.2G	12.0	0.2	30	150	12	4	②	▲
ZP-RAP4120-R0.5G	12.0	0.5	30	150	12	4	②	▲
ZP-RAP4120-R1.0G	12.0	1.0	30	150	12	4	②	▲
ZP-RAP4120-R2.0G	12.0	2.0	30	150	12	4	②	▲

- Stock Available 재고관리
- ▲ Make to order 주문제작

#### WORKPIECE MATERIAL 피삭재

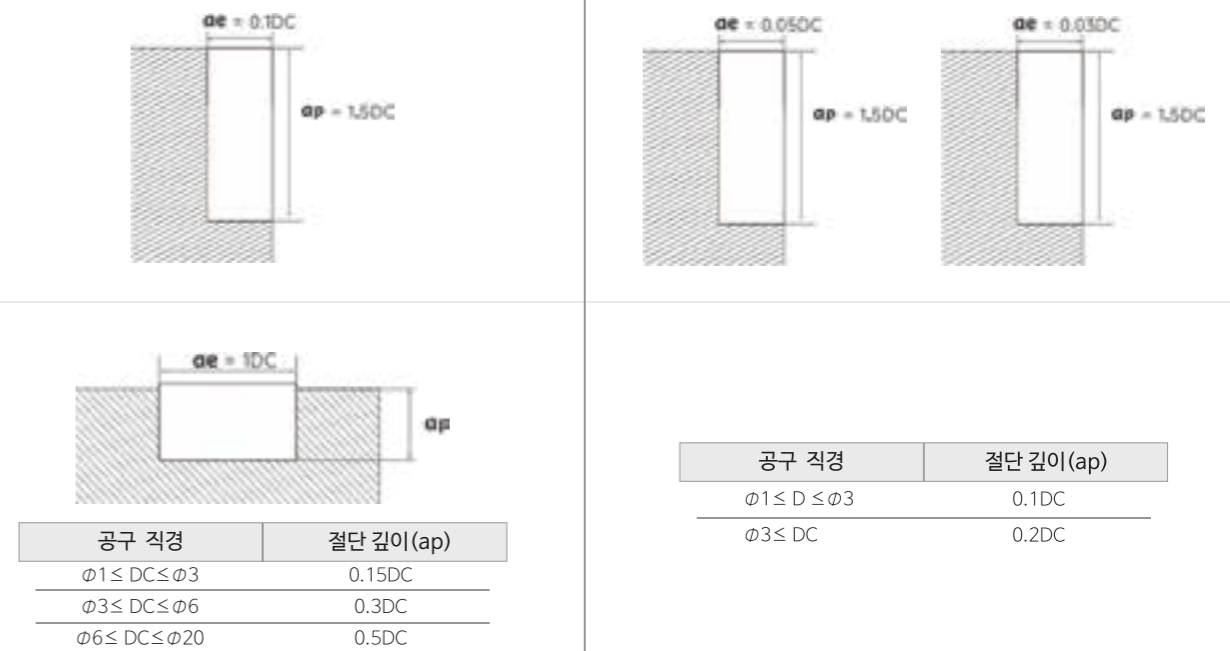
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	○	○	○	○	○	○	○	○	○	

Hardness unit 경도 : HRC ○ Very Suitable 1차 추천 ○ Suitable 2차 추천

#### ZP-RAP4/-H/G Cutting Parameters (General cutting) 추천절삭조건 (범용절삭)

Workpiece Material 피삭재	Cast Iron Carbon steel Alloy steel 회주철 / 탄소강 / 합금강 ~30HRC		Stainless steel 스테인레스강		Pre-hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~40HRC		Pre-hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~50HRC		Quenched steel 조질강 ~55HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
3	14000	985	7500	175	10600	755	8500	590	7430	435
4	10800	1010	5500	175	8000	770	6500	600	5570	445
5	8200	1055	4500	175	6400	805	5000	640	4460	470
6	7000	1080	3700	195	5300	830	4200	650	3710	470
8	5200	1070	2800	195	4000	815	3200	660	2785	485
10	4200	1055	2200	195	3200	805	2500	625	2230	450
12	3500	1055	1850	195	2650	805	2100	625	1855	450
16	2600	985	1400	175	2000	755	1600	590	1390	435

#### 최대 가공 깊이



- ✔ The above table shows the standard value of side milling. When milling slot, 50%-70% of rotating speed and 40%-60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✔ Please select high-precision machine and tool holder. 고경도 장비 및 홀더를 사용하세요.
- ✔ Down milling is recommended in the case of side milling 측면가공의 경우에는 플런지 가공을 추천합니다.
- ✔ Please use air blow or cutting liquid with high mist retardant property. 고농축 절삭유나 공랭기 사용을 추천합니다.
- ✔ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly. 장비강성이 약하거나 피삭재 고정이 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✔ Make overhang of tool as short as possible in conditions of non-interference. 가능한 짧은 오버행 공구를 사용하세요.

# ZP-RAP4-DIN

## 4-Flute Straight Shank

### Corner Radius End Mills

#### 4날 래디우스 엔드밀

✔ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합

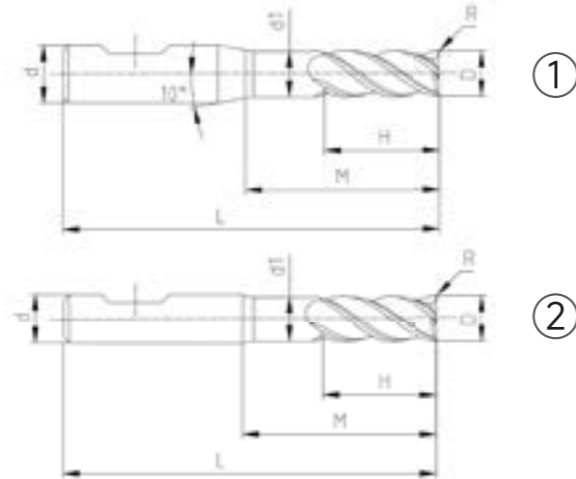
✔ Wide application  
다양한 영역에 적용 가능

✔ DIN 6535-HB Handle  
DIN6535-HB 핸들

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.015}^0$  / D7~D20  $_{-0.02}^0$

R ± 0.01



TYPE 형번	BASIC DIMENSION 치수(mm)							NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	M	d1	L			
ZP-RAP4010-R0.2S-DIN	1.0	0.2	4	3	7	0.9	50	4	①	▲
ZP-RAP4015-R0.2S-DIN	1.5	0.2	4	4	8	1.4	50	4	①	▲
ZP-RAP4020-R0.2S-DIN	2.0	0.2	4	6	10	1.85	50	4	①	▲
ZP-RAP4020-R0.2-DIN	2.0	0.2	6	6	10	1.85	50	4	①	▲
ZP-RAP4020-R0.5S-DIN	2.0	0.5	4	6	10	1.85	50	4	①	▲
ZP-RAP4020-R0.5-DIN	2.0	0.5	6	6	10	1.85	50	4	①	▲
ZP-RAP4025-R0.2S-DIN	2.5	0.2	4	8	12	2.3	50	4	①	▲
ZP-RAP4025-R0.2-DIN	2.5	0.5	6	8	12	2.3	50	4	①	▲
ZP-RAP4025-R0.5S-DIN	2.5	0.5	4	8	12	2.3	50	4	①	▲
ZP-RAP4025-R0.5-DIN	2.5	0.5	6	8	12	2.3	50	4	①	▲
ZP-RAP4030-R0.2S-DIN	3.0	0.2	4	8	13	2.7	50	4	①	●
ZP-RAP4030-R0.2-DIN	3.0	0.2	6	8	13	2.7	50	4	①	●
ZP-RAP4030-R0.5S-DIN	3.0	0.5	4	8	13	2.7	50	4	①	●
ZP-RAP4030-R0.5-DIN	3.0	0.5	6	8	13	2.7	50	4	①	●
ZP-RAP4040-R0.2S-DIN	4.0	0.2	4	11	16	3.7	50	4	②	●
ZP-RAP4040-R0.2-DIN	4.0	0.2	6	11	16	3.7	50	4	①	●
ZP-RAP4040-R0.3S-DIN	4.0	0.3	4	11	16	3.7	50	4	②	●
ZP-RAP4040-R0.3-DIN	4.0	0.3	6	11	16	3.7	50	4	①	●
ZP-RAP4040-R0.5S-DIN	4.0	0.5	4	11	16	3.7	50	4	②	●

TYPE 형번	BASIC DIMENSION 치수(mm)							NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	M	d1	L			
ZP-RAP4040-R0.5-DIN	4.0	0.5	6	11	16	3.7	50	4	①	●
ZP-RAP4050-R0.2-DIN	5.0	0.2	6	13	19	4.7	50	4	①	●
ZP-RAP4050-R0.3-DIN	5.0	0.3	6	13	19	4.7	50	4	①	●
ZP-RAP4050-R0.5-DIN	5.0	0.5	6	13	19	4.7	50	4	①	●
ZP-RAP4050-R1.0-DIN	5.0	1	6	13	19	4.7	50	4	①	●
ZP-RAP4060-R0.2-DIN	6.0	0.2	6	16	22	5.5	50	4	②	●
ZP-RAP4060-R0.3-DIN	6.0	0.3	6	16	22	5.5	50	4	②	●
ZP-RAP4060-R0.5-DIN	6.0	0.5	6	16	22	5.5	50	4	②	●
ZP-RAP4060-R1.0-DIN	6.0	1	6	16	22	5.5	50	4	②	●
ZP-RAP4080-R0.2-DIN	8.0	0.2	8	20	28	7.5	60	4	②	●
ZP-RAP4080-R0.3-DIN	8.0	0.3	8	20	28	7.5	60	4	②	●
ZP-RAP4080-R0.5-DIN	8.0	0.5	8	20	28	7.5	60	4	②	●
ZP-RAP4080-R1.0-DIN	8.0	1	8	20	28	7.5	60	4	②	●
ZP-RAP4100-R0.2-DIN	10.0	0.2	10	25	35	9.2	75	4	②	●
ZP-RAP4100-R0.3-DIN	10.0	0.3	10	25	35	9.2	75	4	②	●
ZP-RAP4100-R0.5-DIN	10.0	0.5	10	25	35	9.2	75	4	②	●
ZP-RAP4100-R1.0-DIN	10.0	1	10	25	35	9.2	75	4	②	●
ZP-RAP4100-R2.0-DIN	10.0	2	10	25	35	9.2	75	4	②	●
ZP-RAP4100-R3.0-DIN	10.0	3	10	25	35	9.2	75	4	②	●
ZP-RAP4120-R0.2-DIN	12.0	0.2	12	30	42	11	75	4	②	●
ZP-RAP4120-R0.3-DIN	12.0	0.3	12	30	42	11	75	4	②	●
ZP-RAP4120-R0.5-DIN	12.0	0.5	12	30	42	11	75	4	②	●
ZP-RAP4120-R1.0-DIN	12.0	1	12	30	42	11	75	4	②	●
ZP-RAP4120-R2.0-DIN	12.0	2	12	30	42	11	75	4	②	●
ZP-RAP4120-R3.0-DIN	12.0	3	12	30	42	11	75	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄합금	Titanium Alloy 티타늄합금	High Temperature Alloy 고온합금강
◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-PERFORMANCE MACHINING

ZEUS PRO

# ZP-RAP4-H-DIN

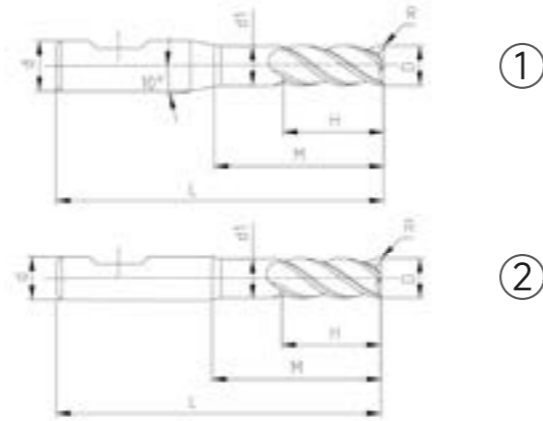
## 4-Flute Long Shank

### Corner Radius End Mills

#### 4날 래디우스 롱 샹크 엔드밀

- ✔ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✔ Wide application  
다양한 영역에 적용 가능
- ✔ ZP-RAP4 long shank series  
ZP-RAP4 롱 샹크 시리즈
- ✔ DIN 6535-HB Handle  
DIN6535-HB 핸들

Diameter Tolerance 직경 공차 :  
D1~D6<sub>-0.015</sub> / D7~D20<sub>-0.02</sub> R±0.01



TYPE 형번	BASIC DIMENSION 치수(mm)							NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	M	d1	L			
ZP-RAP4040-R0.2SH-DIN	4.0	0.2	4	10	15	3.7	75	4	②	▲
ZP-RAP4040-R0.2H-DIN	4.0	0.2	6	10	15	3.7	75	4	①	▲
ZP-RAP4040-R0.5SH-DIN	4.0	0.5	4	10	15	3.7	75	4	②	▲
ZP-RAP4040-R0.5H-DIN	4.0	0.5	6	10	15	3.7	75	4	①	▲
ZP-RAP4060-R0.2H-DIN	6.0	0.2	6	16	22	5.5	75	4	②	▲
ZP-RAP4060-R0.5H-DIN	6.0	0.5	6	16	22	5.5	75	4	②	▲
ZP-RAP4060-R1.0H-DIN	6.0	1.0	6	16	22	5.5	75	4	②	▲
ZP-RAP4080-R0.2H-DIN	8.0	0.2	8	20	28	7.5	75	4	②	▲
ZP-RAP4080-R0.5H-DIN	8.0	0.5	8	20	28	7.5	75	4	②	▲
ZP-RAP4080-R1.0H-DIN	8.0	1.0	8	20	28	7.5	75	4	②	▲
ZP-RAP4100-R0.2H-DIN	10.0	0.2	10	25	35	9.2	100	4	②	▲
ZP-RAP4100-R0.5H-DIN	10.0	0.5	10	25	35	9.2	100	4	②	▲
ZP-RAP4100-R1.0H-DIN	10.0	1.0	10	25	35	9.2	100	4	②	▲
ZP-RAP4100-R2.0H-DIN	10.0	2.0	10	25	35	9.2	100	4	②	▲
ZP-RAP4120-R0.2H-DIN	12.0	0.2	12	30	42	11	100	4	②	▲
ZP-RAP4120-R0.5H-DIN	12.0	0.5	12	30	42	11	100	4	②	▲
ZP-RAP4120-R1.0H-DIN	12.0	1.0	12	30	42	11	100	4	②	▲
ZP-RAP4120-R2.0H-DIN	12.0	2.0	12	30	42	11	100	4	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-RAP4-G-DIN

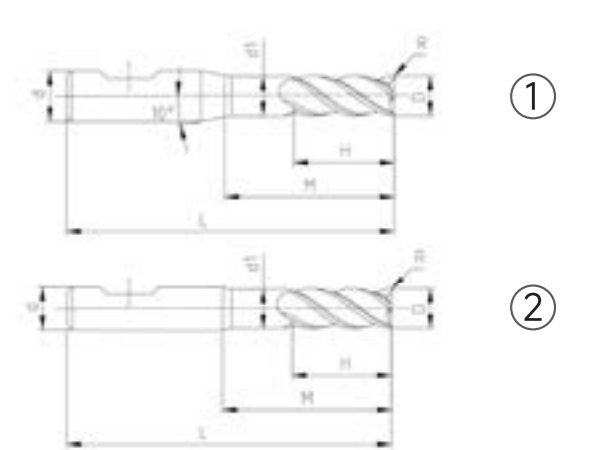
## 4-Flute Extra Long

### Corner Radius End Mills

#### 4날 래디우스 엑스트라 롱 샹크 엔드밀

- ✔ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✔ Wide application  
다양한 영역에 적용 가능
- ✔ ZP-RAP4 extra long shank series  
ZP-RAP4 엑스트라 롱 샹크 시리즈
- ✔ DIN 6535-HB Handle  
DIN6535-HB 핸들

Diameter Tolerance 직경 공차 :  
D1~D6<sub>-0.015</sub> / D7~D20<sub>-0.02</sub> R±0.01



TYPE 형번	BASIC DIMENSION 치수(mm)							NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	M	d1	L			
ZP-RAP4060-R0.2G-DIN	6.0	0.2	6	16	22	5.5	100	4	②	▲
ZP-RAP4060-R0.5G-DIN	6.0	0.5	6	16	22	5.5	100	4	②	▲
ZP-RAP4060-R1.0G-DIN	6.0	1.0	6	16	22	5.5	100	4	②	▲
ZP-RAP4080-R0.2G-DIN	8.0	0.2	8	20	28	7.5	100	4	②	▲
ZP-RAP4080-R0.5G-DIN	8.0	0.5	8	20	28	7.5	100	4	②	▲
ZP-RAP4080-R1.0G-DIN	8.0	1.0	8	20	28	7.5	100	4	②	▲
ZP-RAP4100-R0.2G-DIN	10.0	0.2	10	25	35	9.2	150	4	②	▲
ZP-RAP4100-R0.5G-DIN	10.0	0.5	10	25	35	9.2	150	4	②	▲
ZP-RAP4100-R1.0G-DIN	10.0	1.0	10	25	35	9.2	150	4	②	▲
ZP-RAP4100-R2.0G-DIN	10.0	2.0	10	25	35	9.2	150	4	②	▲
ZP-RAP4120-R0.2G-DIN	12.0	0.2	12	30	42	11	150	4	②	▲
ZP-RAP4120-R0.5G-DIN	12.0	0.5	12	30	42	11	150	4	②	▲
ZP-RAP4120-R1.0G-DIN	12.0	1.0	12	30	42	11	150	4	②	▲
ZP-RAP4120-R2.0G-DIN	12.0	2.0	12	30	42	11	150	4	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-PERFORMANCE MACHINING

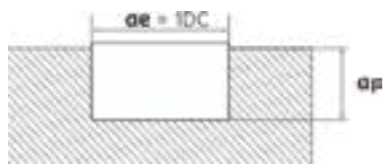
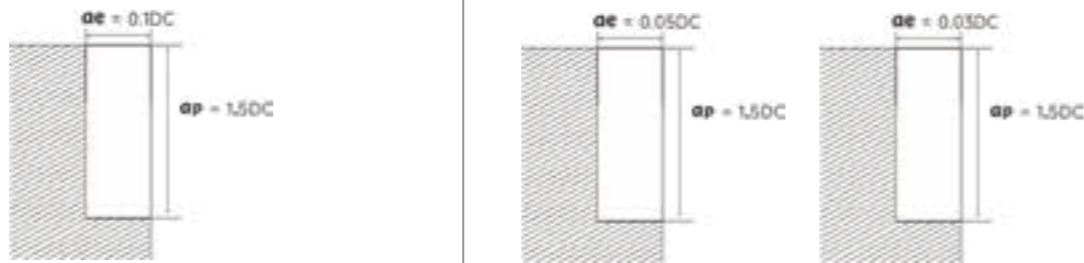
ZEUS PRO



ZP-RAP4/-H/G-DIN Cutting Parameters (General cutting) 추천절삭조건 (범용절삭)

Workpiece Material 피삭재	Cast Iron Carbon steel Alloy steel 회주철 / 탄소강 / 합금강 ~30HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel and tempered steel 프리하드강 / 고경도강 / 합금강 ~40HRC		Pre-hardened steel Hardened steel and tempered steel 프리하드강 / 고경도강 / 합금강 ~50HRC		Quenched steel 조질강 ~55HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
3	14000	985	7500	175	10600	755	8500	590	7430	435
4	10800	1010	5500	175	8000	770	6500	600	5570	445
5	8200	1055	4500	175	6400	805	5000	640	4460	470
6	7000	1080	3700	195	5300	830	4200	650	3710	470
8	5200	1070	2800	195	4000	815	3200	660	2785	485
10	4200	1055	2200	195	3200	805	2500	625	2230	450
12	3500	1055	1850	195	2650	805	2100	625	1855	450
16	2600	985	1400	175	2000	755	1600	590	1390	435

최대 가공 깊이



공구 직경	절단 깊이(ap)
$\phi 1 \leq DC \leq \phi 3$	0.15DC
$\phi 3 \leq DC \leq \phi 6$	0.3DC
$\phi 6 \leq DC \leq \phi 20$	0.5DC

공구 직경	절단 깊이(ap)
$\phi 1 \leq D \leq \phi 3$	0.1DC
$\phi 3 \leq DC$	0.2DC

- ✓ The above table shows the standard value of side milling. When milling slot, 50%~70% of rotating speed and 40%~60% of feed speed stated above are recommended as standard.  
상기 추천 절삭 조건은 측면 가공용입니다. 홈 가공시 상기 조건에서 회전속도 50~70%, 테이블 이송 40~60% 감속하여 사용하세요.
- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ Down milling is recommended in the case of side milling  
측면가공의 경우에는 플런지 가공을 추천합니다.
- ✓ Please use air blow or cutting liquid with high mist retardant property.  
고능율 절삭유나 공랭기 사용을 추천합니다.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# ZP-BAP2

## 2-Flute Straight Shank Ball

### Nose End Mills

### 2날 볼 엔드밀

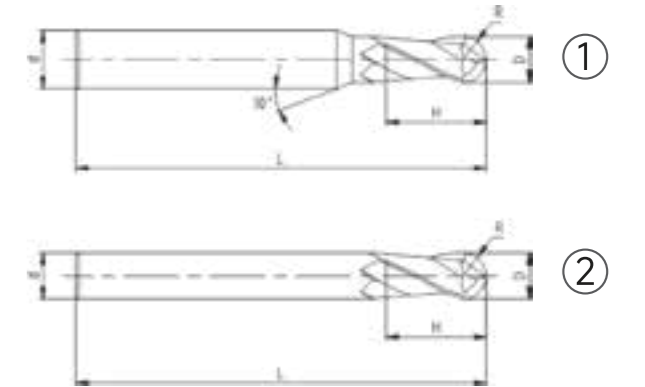


- ✓ Best suited for profiling milling and curved surface processing  
프로파일 밀링과 곡선 가공에 최적

Diameter Tolerance 직경 공차 :

D1~D20<sub>-0.02</sub>

R±0.005



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-BAP2010-R0.5S	1.0	0.5	2	50	4	2	①	▲
ZP-BAP2010-R0.5	1.0	0.5	2	50	6	2	①	▲
ZP-BAP2015-R0.75S	1.5	0.75	3	50	4	2	①	▲
ZP-BAP2015-R0.75	1.5	0.75	3	50	6	2	①	▲
ZP-BAP2020-R1.0F	2.0	1.0	4	50	3	2	①	●
ZP-BAP2020-R1.0S	2.0	1.0	4	50	4	2	①	●
ZP-BAP2020-R1.0	2.0	1.0	4	50	6	2	①	●
ZP-BAP2025-R1.25F	2.5	1.25	5	50	3	2	①	●
ZP-BAP2025-R1.25S	2.5	1.25	5	50	4	2	①	●
ZP-BAP2025-R1.25	2.5	1.25	5	50	6	2	①	●
ZP-BAP2030-R1.5F	3.0	1.5	6	50	3	2	②	●
ZP-BAP2030-R1.5S	3.0	1.5	6	50	4	2	①	●
ZP-BAP2030-R1.5	3.0	1.5	6	50	6	2	①	●
ZP-BAP2035-R1.75S	3.5	1.75	8	50	4	2	①	●
ZP-BAP2035-R1.75	3.5	1.75	8	50	2	2	①	●
ZP-BAP2040-R2.0S	4.0	2.0	8	50	4	2	②	●
ZP-BAP2040-R2.0	4.0	2.0	8	50	6	2	①	●



HIGH-PERFORMANCE MACHINING

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-BAP2050-R2.5	5.0	2.5	10	50	6	2	①	●
ZP-BAP2055-R2.75	5.5	2.75	12	50	6	2	①	●
ZP-BAP2060-R3.0	6.0	3.0	12	50	6	2	②	●
ZP-BAP2070-R3.5	7.0	3.5	14	60	8	2	①	●
ZP-BAP2080-R4.0	8.0	4.0	16	60	8	2	②	●
ZP-BAP2090-R4.5	9.0	4.5	18	75	10	2	①	●
ZP-BAP2100-R5.0	10.0	5.0	20	75	10	2	②	●
ZP-BAP2120-R6.0	12.0	6.0	24	75	10	2	②	●
ZP-BAP2140-R7.0	14.0	7.0	28	75	14	2	②	●
ZP-BAP2160-R8.0	16.0	8.0	32	100	16	2	②	●
ZP-BAP2200-R10.0	20.0	10.0	40	100	20	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎		○	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-BAP2-H

## 2-Flute Long Shank Ball

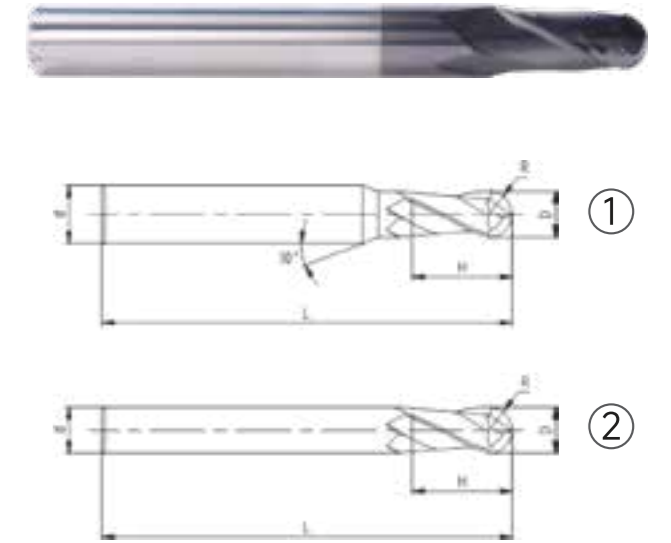
### Nose End Mills

### 2날 볼 롱샹크 엔드밀

- Best suited for profiling milling and curved surface processing  
프로파일 밀링과 곡선 가공에 최적
- ZP-BAP2 long shank series  
ZP-BAP2 롱샹크 시리즈

Diameter Tolerance 직경 공차 :

D1~D20  $_{-0.02}^0$  R ± 0.005



ZEUS PRO

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-BAP2020-R1.0SH	2.0	1.0	4	75	4	2	①	▲
ZP-BAP2020-R1.0H	2.0	1.0	4	75	6	2	①	▲
ZP-BAP2025-R1.25S	2.5	1.25	5	75	4	2	①	▲
ZP-BAP2025-R1.25H	2.5	1.25	5	75	6	2	①	▲
ZP-BAP2030-R1.5SH	3.0	1.5	6	75	4	2	①	▲
ZP-BAP2030-R1.5H	3.0	1.5	6	75	6	2	①	▲
ZP-BAP2035-R1.75S	3.5	1.75	8	75	4	2	①	▲
ZP-BAP2035-R1.75H	3.5	1.75	8	75	6	2	①	▲
ZP-BAP2040-R2.0SH	4.0	2.0	8	75	4	2	②	▲
ZP-BAP2040-R2.0H	4.0	2.0	8	75	6	2	①	▲
ZP-BAP2050-R2.5H	5.0	2.5	10	75	6	2	①	▲

HIGH-PERFORMANCE MACHINING

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-BAP2055-R2.75H	5.5	2.75	12	75	6	2	①	▲
ZP-BAP2060-R3.0H	6.0	3.0	12	75	6	2	②	▲
ZP-BAP2070-R3.5H	7.0	3.5	14	75	8	2	①	▲
ZP-BAP2080-R4.0H	8.0	4.0	16	75	8	2	②	▲
ZP-BAP2090-R4.5H	9.0	4.5	18	100	10	2	①	▲
ZP-BAP2100-R5.0H	10.0	5.0	20	100	10	2	②	▲
ZP-BAP2120-R6.0H	12.0	6.0	24	100	12	2	②	▲
ZP-BAP2140-R7.0H	14.0	7.0	28	100	14	2	②	▲
ZP-BAP2160-R8.0H	16.0	8.0	32	150	16	2	②	▲
ZP-BAP2200-R10.0H	20.0	10.0	32	150	20	2	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎	◎	○	◎			○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# ZP-BAP2-G

## 2-Flute Extra Long Shank

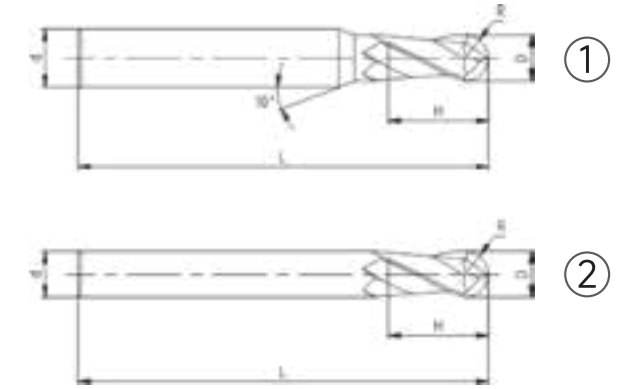
### Ball Nose End Mills

### 2날 볼 엑스트라 롱 샹크 엔드밀

- Best suited for profiling milling and curved surface processing  
프로파일 밀링과 곡선 가공에 최적
- ZP-BAP2 long shank / extra long series  
ZP-BAP2 롱 샹크 / 엑스트라 롱 샹크 시리즈

Diameter Tolerance 직경 공차 :

D1~D20  $0_{-0.02}$  R±0.005



ZEUS PRO

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	H	L	d			
ZP-BAP2060-R3.0G	6.0	3.0	12	100	6	2	②	▲
ZP-BAP2080-R4.0G	8.0	4.0	16	100	8	2	②	▲
ZP-BAP2100-R5.0G	10.0	5.0	20	150	10	2	②	▲
ZP-BAP2120-R6.0G	12.0	6.0	24	150	12	2	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
◎	◎	◎	◎	◎	○	◎			○	○	

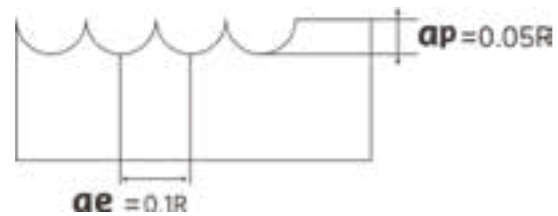
Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-PERFORMANCE MACHINING

ZP-BAP2/-H/G Cutting Parameters (General cutting) 추천절삭조건 (범용절삭)										
Workpiece Material 파삭재	Cast Iron Carbon steel Alloy steel 회주철 / 탄소강 / 합금강 ~30HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~40HRC		Pre-hardened steel Hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~50HRC		Quenched steel 조질강 ~55HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
R0.5	40000	960	22300	240	32000	385	25000	330	22280	295
R1.0	24000	1080	11150	275	16000	480	13000	330	11140	295
R1.5	15500	1150	7400	350	10600	545	8500	335	7430	295
R2.0	11500	1150	5550	445	8000	665	6500	450	5570	385
R2.5	9500	1270	4450	445	6400	665	5000	455	4455	405
R3.0	8000	1270	3700	470	5300	700	4200	470	3715	420
R4.0	6000	1575	2750	550	4000	850	3200	535	2785	465
R5.0	4800	1455	2200	520	3200	785	2500	535	2230	465
R6.0	4000	1330	1850	520	2650	740	2100	505	1855	450
R8.0	3000	1270	1350	455	2000	725	1600	455	1395	395
R10.0	2400	1150	1100	445	1600	675	1250	400	1115	360

ZP-BAP2/-H/G Cutting Parameters (High speed cutting) 추천절삭조건 (고속절삭)										
Workpiece Material 파삭재	Cast Iron Carbon steel Alloy steel 회주철 / 탄소강 / 합금강 ~30HRC		Stainless steel 스테인레스강		Pre-hardened steel Hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~40HRC		Pre-hardened steel Hardened steel and tempered steel 프리하든강 / 고경도강 / 합금강 ~50HRC		Quenched steel 조질강 ~55HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
R3.0	15000	4800	11500	2750	9500	2250	7960	1885	6370	1510
R4.0	11500	3650	8950	2100	7150	1700	5970	1420	4775	1135
R5.0	9500	3000	7150	1700	5700	1350	4775	1130	3820	905
R6.0	7950	2500	5950	1400	4750	1100	3980	920	3180	735
R8.0	5950	1900	4450	1050	3550	850	2985	760	2390	610
R10.0	4750	1500	3350	850	2850	680	2390	570	1910	455

최대 가공 깊이



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ Please use air cooling or liquid cooling.  
공랭기나 수냉기를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 파삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# SERIES FOR QUENCHED STEEL MACHINING

## 고경도용 엔드밀 시리즈

# HADES



HADES







Product series

# HADES

## Series For Quenched Steel Machining

### 고경도용 엔드밀 시리즈

QUENCHED STEEL MACHINING

HADES

#### Product features and application range | 제품 특징 및 적용 범위

- 1 The series are suitable for semi finishing and finishing of steel <HRC55 and quenched steel  
HRC55 이하 강종의 사상이나 세미 사상에 최적화된 시리즈
- 2 High rigidity tool structure design, effectively reduces the vibration in the process of tool machining  
높은 강성 구조로 절삭 가공시 떨림 최소화
- 3 High strength, high toughness substrate with new high hard special coating, effectively prolongs the tool life, also gives better workpiece surface quality.  
특화된 코팅 박막의 소재로 높은 수명과 높은 면조도 구현



# HA-SGH4

## 4-Flute Straight Shank

### Flat End Mills

### 4날 스퀘어 엔드밀

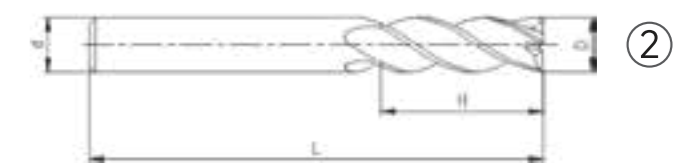
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HA-SGH4010-F	1.0	3	3	50	4	①	●
HA-SGH4010-S	1.0	4	3	50	4	①	●
HA-SGH4010	1.0	6	3	50	4	①	●
HA-SGH4015-F	1.5	3	4	50	4	①	●
HA-SGH4015-S	1.5	4	4	50	4	①	●
HA-SGH4015	1.5	6	4	50	4	①	●
HA-SGH4020-F	2.0	3	6	50	4	①	●
HA-SGH4020-S	2.0	4	6	50	4	①	●
HA-SGH4020	2.0	6	6	50	4	①	●
HA-SGH4025-F	2.5	3	8	50	4	①	●
HA-SGH4025-S	2.5	4	8	50	4	①	●
HA-SGH4025	2.5	6	8	50	4	①	●
HA-SGH4030-F	3.0	3	8	50	4	②	●
HA-SGH4030-S	3.0	4	8	50	4	①	●
HA-SGH4030	3.0	6	8	50	4	①	●
HA-SGH4035-S	3.5	4	10	50	4	①	●

TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HA-SGH4040-S	4.0	4	11	50	4	②	●
HA-SGH4035	3.5	6	10	50	4	①	●
HA-SGH4040	4.0	6	11	50	4	①	●
HA-SGH4045	4.5	6	11	50	4	①	●
HA-SGH4050	5.0	6	13	50	4	①	●
HA-SGH4055	5.5	6	16	50	4	①	●
HA-SGH4060	6.0	6	16	50	4	②	●
HA-SGH4070	7.0	8	20	60	4	①	●
HA-SGH4080	8.0	8	20	60	4	②	●
HA-SGH4090	9.0	10	20	75	4	①	●
HA-SGH4100	10.0	10	25	75	4	②	●
HA-SGH4110	11.0	12	26	75	4	①	●
HA-SGH4120	12.0	12	30	75	4	②	●
HA-SGH4140	14.0	14	32	75	4	②	●
HA-SGH4160	16.0	16	45	100	4	②	●
HA-SGH4180	18.0	18	45	100	4	②	●
HA-SGH4200	20.0	20	45	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	○	○					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HA-SGH4-L

## 4-Flute Flattened End Mills

With Straight Shank And Long Cutting Edge

4날 스퀘어 롱 플루트 엔드밀

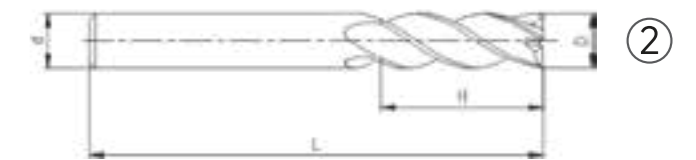
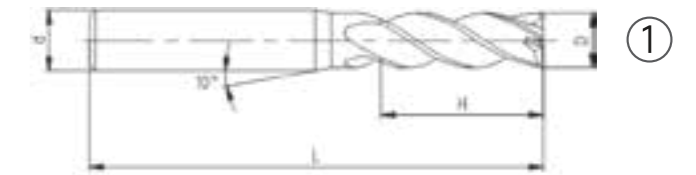
- ✔ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✔ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^0$  / D6~D14  $_{-0.025}^0$  / D15~D20  $_{-0.03}^0$



Corner protection flattened 코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HA-SGH4030-L	3.0	6	12	75	4	①	▲
HA-SGH4040-L	4.0	6	15	75	4	①	▲
HA-SGH4050-L	5.0	6	20	75	4	①	▲
HA-SGH4060-L	6.0	6	20	75	4	②	▲
HA-SGH4080-L	8.0	8	25	100	4	②	▲
HA-SGH4100-L	10.0	10	30	100	4	②	▲
HA-SGH4120-L	12.0	12	35	100	4	②	▲
HA-SGH4140-L	14.0	14	40	100	4	②	▲
HA-SGH4160-L	16.0	16	50	150	4	②	▲
HA-SGH4200-L	20.0	20	55	150	4	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	○	○					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HA-SGH4-H

## 4-Flute Long Shank Flat

### End Mills

#### 4날 스퀘어 롱 샹크 엔드밀

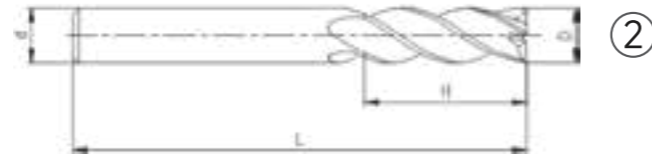
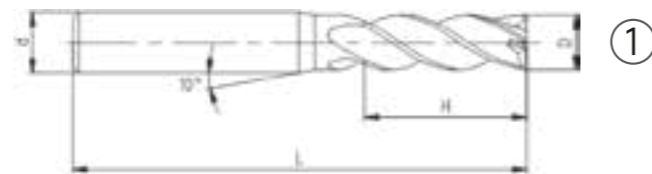
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HA-SGH4030-SH	3.0	4	8	75	4	②	●
HA-SGH4030-H	3.0	6	8	75	4	②	●
HA-SGH4040-SH	4.0	4	11	75	4	①	●
HA-SGH4040-H	4.0	6	11	75	4	②	●
HA-SGH4060-H	6.0	6	16	75	4	①	●
HA-SGH4080-H	8.0	8	20	75	4	①	●
HA-SGH4100-H	10.0	10	25	100	4	①	●
HA-SGH4120-H	12.0	12	30	100	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	○	○	○	○	○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HA-SGH4-G

## 4-Flute Extra Long Shank

### Flat End Mills

#### 4날 스퀘어 엑스트라 롱 샹크 엔드밀

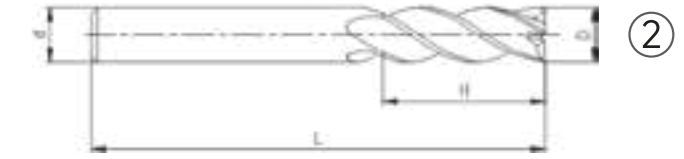
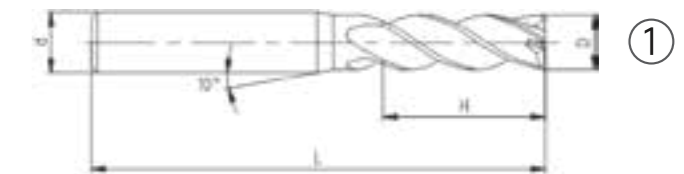
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D6~D14<sub>-0.025</sub> / D15~D20<sub>-0.03</sub>



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HA-SGH4060-G	6.0	6	16	100	4	①	●
HA-SGH4080-G	8.0	8	20	100	4	①	●
HA-SGH4100-G	10.0	10	25	150	4	①	●
HA-SGH4120-G	12.0	12	30	150	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	○	○	○	○	○	○	

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

QUENCHED STEEL MACHINING

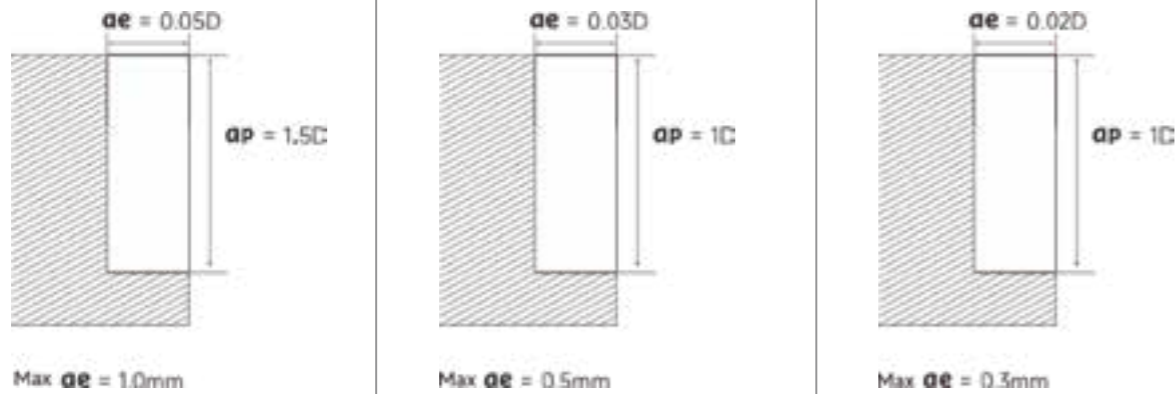
HADES



HA-SGH4/-L/H/G Cutting Parameters 추천절삭조건

Workpiece Material 파삭재	Pre-hardened steel Hardened steel 프리하든강 / 고경도강 40~50HRC		Hardened steel 고경도강 50~60HRC		Hardened steel 고경도강 60~68HRC	
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)
1	40000	320	40000	320	32000	260
2	40000	800	24000	480	16000	320
3	32000	1020	16000	510	11000	350
4	24000	1250	12000	620	8000	420
5	19000	1360	9500	680	6400	460
6	16000	1540	8000	770	5300	510
8	12000	1540	6000	770	4000	510
10	9600	1540	4800	770	3200	510
12	8000	1600	4000	800	2700	540
14	6800	1340	3400	680	2300	460
16	6000	1200	3000	600	2000	400
18	5300	1060	2700	530	1800	360
20	4800	960	2400	480	1600	320

최대 가공 깊이



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 파삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Please use air cooling or MQL.  
공랭기나 MQL 사용을 추천합니다.
- ✓ Climb milling is recommended in the case of side milling.  
측면가공시 상향밀링 가공을 추천합니다.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# HA-RAH4

## 4-Flute Straight Shank

### Corner Radius End Mills

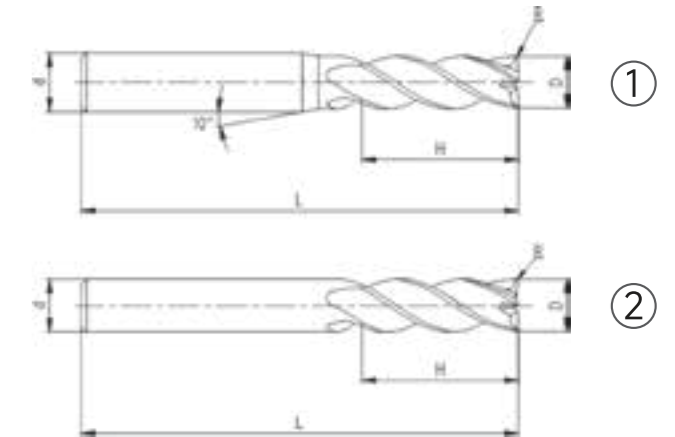
#### 4날 래디우스 엔드밀



- ✓ Wide application able to achieve various forms of processing  
넓은 가공 영역으로 다양한 형태의 가공 실현

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L	R			
HA-RAH4010-R0.2S	1.0	4	3	50	0.2	4	①	●
HA-RAH4015-R0.2S	1.5	4	4	50	0.2	4	①	●
HA-RAH4020-R0.2S	2.0	4	6	50	0.2	4	①	●
HA-RAH4020-R0.5S	2.0	4	6	50	0.5	4	①	●
HA-RAH4025-R0.2S	2.5	4	8	50	0.2	4	①	●
HA-RAH4025-R0.5S	2.5	4	8	50	0.5	4	①	●
HA-RAH4030-R0.2S	3.0	4	8	50	0.2	4	①	●
HA-RAH4030-R0.5S	3.0	4	8	50	0.5	4	①	●
HA-RAH4040-R0.2S	4.0	4	10	50	0.2	4	①	●
HA-RAH4040-R0.3S	4.0	4	10	50	0.3	4	①	●
HA-RAH4040-R0.5S	4.0	4	10	50	0.5	4	①	●
HA-RAH4050-R0.2	5.0	6	13	50	0.2	4	①	●
HA-RAH4050-R0.5	5.0	6	13	50	0.2	4	②	●
HA-RAH4050-R1.0	5.0	6	13	50	1.0	4	①	●
HA-RAH4060-R0.2	6.0	6	16	50	0.2	4	①	●
HA-RAH4060-R0.5	6.0	6	16	50	0.5	4	①	●
HA-RAH4060-R1.0	6.0	6	16	50	1.0	4	②	●
HA-RAH4080-R0.2	8.0	8	20	60	0.2	4	①	●

TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L	R			
HA-RAH4080-R0.5	8.0	8	20	60	0.5	4	①	●
HA-RAH4080-R1.0	8.0	8	20	60	1.0	4	①	●
HA-RAH4100-R0.2	10.0	10	25	75	0.2	4	①	●
HA-RAH4100-R0.5	10.0	10	25	75	0.5	4	①	●
HA-RAH4100-R1.0	10.0	10	25	75	1.0	4	②	●
HA-RAH4100-R2.0	10.0	10	25	75	2.0	4	①	●
HA-RAH4100-R3.0	10.0	10	25	75	3.0	4	②	●
HA-RAH4120-R0.2	12.0	12	30	75	0.2	4	①	●
HA-RAH4120-R0.5	12.0	12	30	75	0.5	4	②	●
HA-RAH4120-R1.0	12.0	12	30	75	1.0	4	①	●
HA-RAH4120-R2.0	12.0	12	30	75	2.0	4	②	●
HA-RAH4120-R3.0	12.0	12	30	75	3.0	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎		○					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

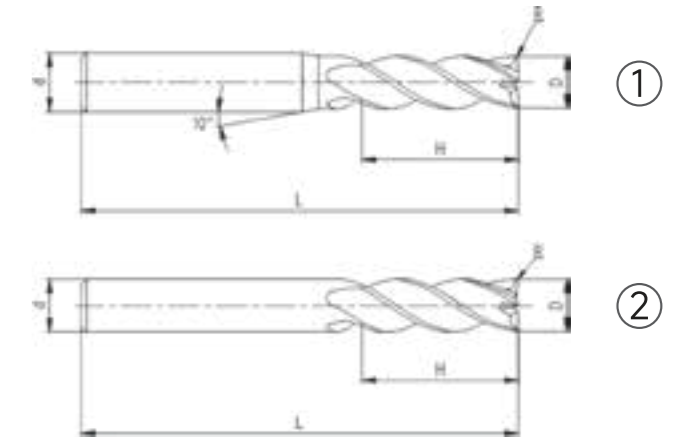
# HA-RAH4-H

## 4-Flute Long Shank Corner Radius End Mills 4날 래디우스 롱 샹크 엔드밀

Wide application able to achieve various forms of processing  
넓은 가공 영역으로 다양한 형태의 가공 실현

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HA-RAH4040-R0.2SH	4.0	0.2	4	10	75	4	①	●
HA-RAH4040-R0.2H	4.0	0.2	6	10	75	4	②	●
HA-RAH4040-R0.5SH	4.0	0.5	4	10	75	4	①	●
HA-RAH4040-R0.5H	4.0	0.5	6	10	75	4	②	●
HA-RAH4060-R0.2H	6.0	0.2	6	16	75	4	①	●
HA-RAH4060-R0.5H	6.0	0.5	6	16	75	4	①	●
HA-RAH4060-R1.0H	6.0	1.0	6	16	75	4	①	●
HA-RAH4080-R0.2H	8.0	0.2	8	20	75	4	①	●
HA-RAH4080-R0.5H	8.0	0.5	8	20	75	4	①	●
HA-RAH4080-R1.0H	8.0	1.0	8	20	75	4	①	●
HA-RAH4100-R0.2H	10.0	0.2	10	25	100	4	①	●
HA-RAH4100-R0.5H	10.0	0.5	10	25	100	4	①	●

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HA-RAH4100-R1.0H	10.0	1.0	10	25	100	4	①	●
HA-RAH4100-R2.0H	10.0	2.0	10	25	100	4	①	●
HA-RAH4120-R0.2H	12.0	0.2	12	30	100	4	①	●
HA-RAH4120-R0.5H	12.0	0.5	12	30	100	4	①	●
HA-RAH4120-R1.0H	12.0	1.0	12	30	100	4	①	●
HA-RAH4120-R2.0H	12.0	2.0	12	30	100	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

○ ○ ◎ ◎ ◎ ○ ○  
 Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HA-RAH4-G

## 4-Flute Extra Long Shank

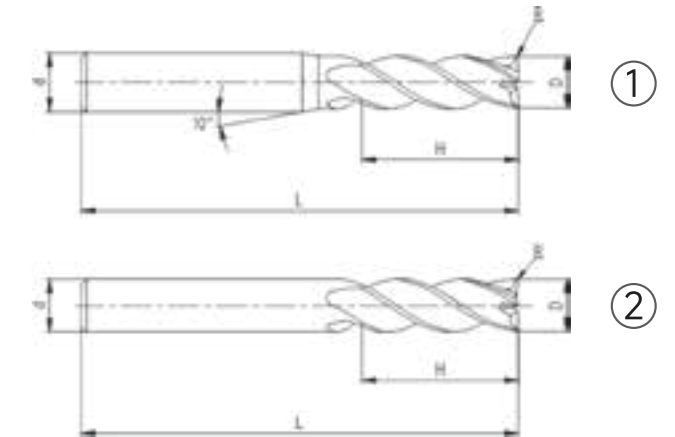
### Corner Radius End Mills

### 4날 라디우스 엑스트라 롱 샹크 엔드밀

Wide application able to achieve various forms of processing  
 넓은 가공 영역으로 다양한 형태의 가공 실현

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HA-RAH4060-R0.2G	6.0	0.2	6	16	100	4	①	●
HA-RAH4060-R0.5G	6.0	0.5	6	16	100	4	①	●
HA-RAH4060-R1.0G	6.0	1.0	6	16	100	4	①	●
HA-RAH4080-R0.2G	8.0	0.2	8	20	100	4	①	●
HA-RAH4080-R0.5G	8.0	0.5	8	20	100	4	①	●
HA-RAH4080-R1.0G	8.0	1.0	8	20	100	4	①	●
HA-RAH4100-R0.2G	10.0	0.2	10	25	150	4	①	●
HA-RAH4100-R0.5G	10.0	0.5	10	25	150	4	①	●
HA-RAH4100-R1.0G	10.0	1.0	10	25	150	4	①	●
HA-RAH4100-R2.0G	10.0	2.0	10	25	150	4	①	●
HA-RAH4120-R0.2G	12.0	0.2	12	30	150	4	①	●
HA-RAH4120-R0.5G	12.0	0.5	12	30	150	4	①	●
HA-RAH4120-R1.0G	12.0	1.0	12	30	150	4	①	●
HA-RAH4120-R2.0G	12.0	2.0	12	30	150	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

○ ○ ◎ ◎ ◎ ○ ○  
 Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

QUENCHED STEEL MACHINING

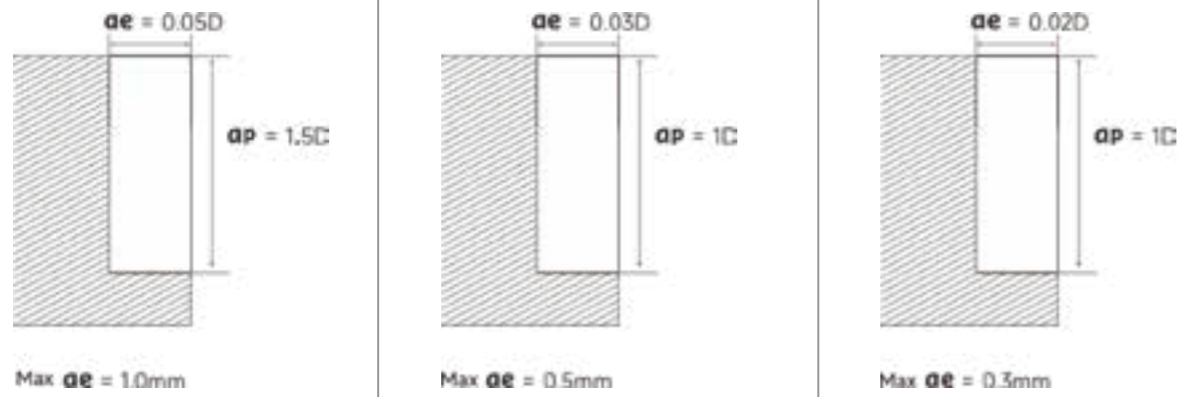
HADES



HA-RAH4/-L/H/G Cutting Parameters 추천절삭조건

Workpiece Material 피삭재	Pre-hardened steel Hardened steel 프리하드강 / 고경도강 40~50HRC		Hardened steel 고경도강 50~60HRC		Hardened steel 고경도강 60~68HRC	
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블이송 (mm/min)
3	32000	1225	16000	610	11000	420
4	24000	1500	12000	745	8000	500
5	19000	1630	9500	815	6400	550
6	16000	1850	8000	925	5300	610
8	12000	1850	6000	925	4000	610
10	9600	1850	4800	925	3200	610
12	8000	1920	4000	960	2700	648
16	6000	1440	3000	720	2000	480

최대 가공 깊이



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정이 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요
- ✓ Please use air cooling or MQL.  
공랭기나 MQL 사용을 추천합니다.
- ✓ Climb milling is recommended in the case of side milling.  
측면가공시 상향밀링 가공을 추천합니다.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# HA-BAH2

## 2-Flute Straight Shank

### Ball Nose End Mills

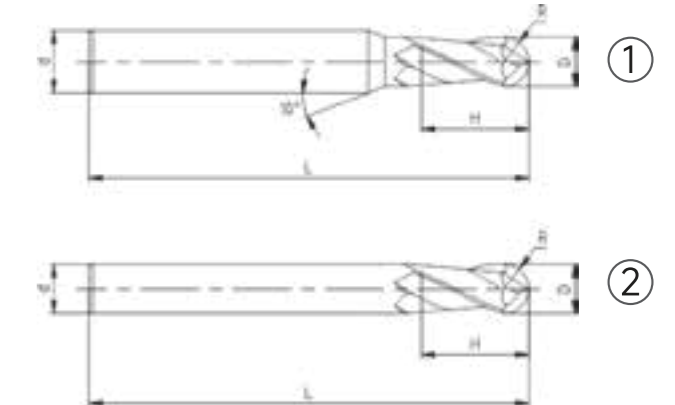
### 2날 볼 엔드밀

✓ Suitable for profile milling, and high speed machining with wide range of applications  
프로파일 밀링 / 고속가공 / 형상가공용

Diameter Tolerance 직경 공차 :

D1~D20<sub>-0.002</sub>

R±0.005



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HA-BAH2010-R0.5S	1.0	0.5	4	2	50	2	①	●
HA-BAH2010-R0.5	1.0	0.5	6	2	50	2	①	●
HA-BAH2015-R0.75S	1.5	0.75	4	3	50	2	①	●
HA-BAH2015-R0.75	1.5	0.75	6	3	50	2	①	●
HA-BAH2020-R1.0S	2.0	1.0	4	4	50	2	①	●
HA-BAH2020-R1.0	2.0	1.0	6	4	50	2	①	●
HA-BAH2025-R1.25S	2.5	1.25	4	5	50	2	①	●
HA-BAH2025-R1.25	2.5	1.25	6	5	50	2	①	●
HA-BAH2030-R1.5S	3.0	1.5	4	6	50	2	①	●
HA-BAH2030-R1.5	3.0	1.5	6	6	50	2	①	●
HA-BAH2035-R1.75	3.5	1.75	6	8	50	2	①	●
HA-BAH2040-R2.0S	4.0	2.0	4	8	50	2	②	●
HA-BAH2040-R2.0	4.0	2.0	6	8	50	2	①	●
HA-BAH2050-R2.5	5.0	2.5	8	10	50	2	①	●
HA-BAH2055-R2.75	5.5	2.75	6	12	50	2	①	●

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HA-BAH2060-R3.0	6.0	3.0	6	12	50	2	②	●
HA-BAH2070-R3.5	7.0	3.5	8	14	60	2	①	●
HA-BAH2080-R4.0	8.0	4.0	8	16	60	2	②	●
HA-BAH2090-R4.5	9.0	4.5	10	18	75	2	①	●
HA-BAH2100-R5.0	10.0	5.0	10	20	75	2	②	●
HA-BAH2120-R6.0	12.0	6.0	12	24	75	2	①	●
HA-BAH2140-R7.0	14.0	7.0	14	28	75	2	②	●
HA-BAH2160-R8.0	16.0	8.0	16	32	100	2	②	●
HA-BAH2200-R10.0	20.0	10.0	20	40	100	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

○ ○ ◎ ◎ ◎ ○ ○

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HA-BAH2-H

## 2-Flute Long Shank

### Ball Nose End Mills

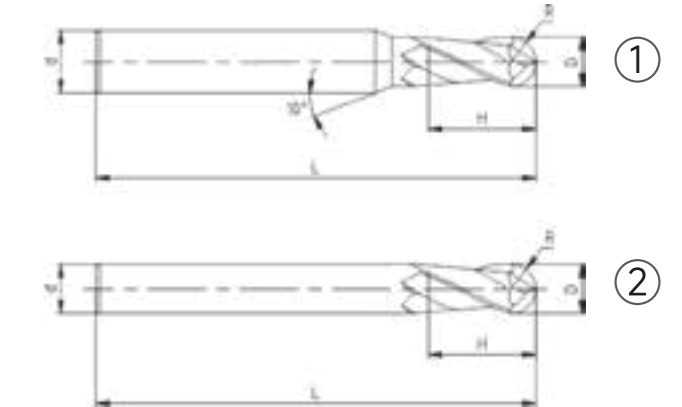
### 2날 볼 롱 샹크 엔드밀

✔ Suitable for profile milling, and high speed machining with wide range of applications  
프로파일 밀링 / 고속가공 / 형상가공용

Diameter Tolerance 직경 공차 :

D1~D20  $_{-0.002}$

R $\pm$ 0.005



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HA-BAH2020-R1.0SH	2.0	1.0	4	4	75	2	①	●
HA-BAH2020-R1.0H	2.0	1.0	6	4	75	2	①	●
HA-BAH2025-R1.25S	2.5	1.25	4	5	75	2	①	●
HA-BAH2025-R1.25H	2.5	1.25	6	5	75	2	①	●
HA-BAH2030-R1.5SH	3.0	1.5	4	6	75	2	①	●
HA-BAH2030-R1.5H	3.0	1.5	6	6	75	2	①	●
HA-BAH2035-R1.75S	3.5	1.75	4	8	75	2	①	●
HA-BAH2035-R1.75H	3.5	1.75	6	8	75	2	①	●
HA-BAH2040-R2.0SH	4.0	2.0	4	8	75	2	②	●
HA-BAH2040-R2.0H	4.0	2.0	6	8	75	2	①	●
HA-BAH2050-R2.5H	5.0	2.5	6	10	75	2	①	●
HA-BAH2055-R2.75H	5.5	2.75	6	12	75	2	①	●
HA-BAH2060-R3.0H	6.0	3.0	6	12	75	2	②	●

QUENCHED STEEL MACHINING

HADES

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HA-BAH2070-R3.5H	7.0	3.5	8	14	75	2	①	●
HA-BAH2080-R4.0H	8.0	4.0	8	14	75	2	②	●
HA-BAH2090-R4.5H	9.0	4.5	10	18	100	2	①	●
HA-BAH2100-R5.0H	10.0	5.0	10	20	100	2	②	●
HA-BAH2120-R6.0H	12.0	6.0	12	24	100	2	②	●
HA-BAH2140-R7.0H	14.0	7.0	14	28	150	2	②	●
HA-BAH2160-R8.0H	16.0	8.0	16	32	150	2	②	●
HA-BAH2200-R10.0H	20.0	10.0	20	40	150	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

**WORKPIECE MATERIAL 피삭재**

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	○	○					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HA-BAH2-G

## 2-Flute Extra Long Shank

### Ball Nose End Mills

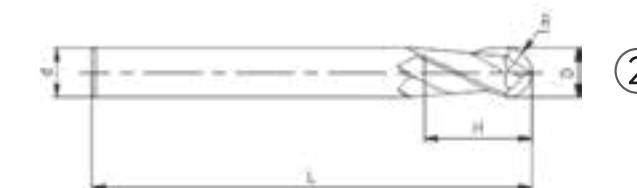
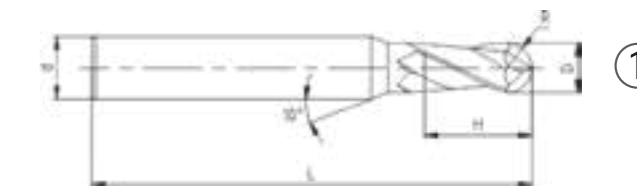
### 2날 볼 엑스트라 롱 샹크 엔드밀

✔ Suitable for profile milling, and high speed machining with wide range of applications  
프로파일 밀링 / 고속가공 / 형상가공용

Diameter Tolerance 직경 공차 :

D1~D20\_ 0.002

R ± 0.005



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			

HA-BAH2060-R3.0G	6.0	3.0	6	12	100	2	②	●
HA-BAH2080-R4.0G	8.0	4.0	8	16	100	2	②	●
HA-BAH2100-R5.0G	10.0	5.0	10	20	150	2	②	●
HA-BAH2120-R6.0G	12.0	6.0	24	24	150	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

**WORKPIECE MATERIAL 피삭재**

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	○	○					

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

QUENCHED STEEL MACHINING

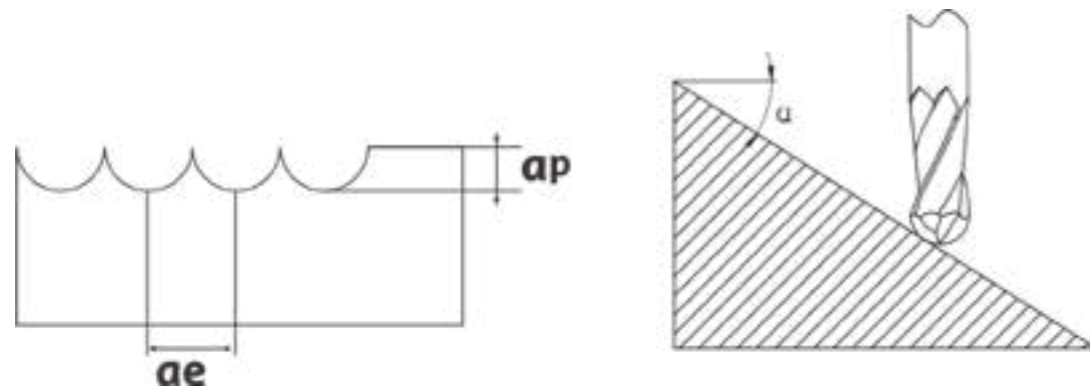
HADES



HA-BAH2/-H/G Cutting Parameters 추천절삭조건

Workpiece Material 파삭재	Pre-hardened steel Hardened steel 프리하드강 / 고경도강 40~50HRC				Hardened steel 고경도강 50~60HRC				Hardened steel 고경도강 60~68HRC			
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)
R0.5	40000	1900	0.01	0.05	36000	1500	0.01	0.05	32000	1400	0.01	0.05
R1.0	33000	3100	0.02	0.075	26000	2100	0.02	0.075	24000	2000	0.02	0.075
R1.5	29000	4100	0.03	0.1	23000	2900	0.03	0.1	21000	2600	0.03	0.1
R2.0	22000	3900	0.04	0.15	17000	2500	0.04	0.15	15000	2100	0.04	0.15
R2.5	17500	3500	0.05	0.15	13500	2200	0.05	0.15	13000	2000	0.05	0.15
R3.0	15000	3100	0.06	0.2	11500	1700	0.06	0.2	10500	1500	0.06	0.2
R4.0	11000	2500	0.08	0.25	8600	1600	0.08	0.25	8000	1400	0.08	0.25
R5.0	9000	2000	0.1	0.3	7000	1400	0.1	0.3	6000	1200	0.1	0.3
R6.0	7500	1800	0.1	0.35	5700	1300	0.1	0.35	5300	1200	0.1	0.35
R8.0	5500	1800	0.1	0.4	4300	1300	0.1	0.4	4000	1200	0.1	0.4
R10.0	4500	1800	0.1	0.5	3500	1300	0.1	0.5	3200	4500	0.1	0.5

최대 가공 깊이



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 파삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Please use air cooling or MQL.  
공랭기나 MQL 사용을 추천합니다.
- ✓ If inclination angle  $\alpha$  over 15°, please reduce the speed to 50~80% of above table.  
15도 이상의 경사각일시 상기 테이블의 50~80% 수준의 속도로 낮추세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# SERIES FOR HIGH-HARDENED STEEL MACHINING

고성능 고경도용 엔드밀 시리즈

# HADES PRO



Product series  
**HADES PRO**

Series For  
High-hardened  
Steel Machining  
고성능 고경도용  
엔드밀 시리즈

**High-rigidity and high-strength cutting edge structure design**  
높은 강도의 절삭 인석 구조 설계

- 1 Ensuring sufficient chip space, meanwhile adopt large core body to improve the tool rigidity  
넓은 칩포켓과 단단한 코어바디로 강성증대
- 2 Negative rake angle, which makes the cutting edge strength and cutting force match reasonably, and gives a wider range of applications  
네거티브 경사각으로 강한 인석 확보 및 다양한 가공 가능
- 3 Strict and scientific chip breaker geometric design, gives more stable cutting  
특수 설계 인선으로 안정적인 가공 실현



**New ultra fine cemented carbide substrate**  
초미립모재 사용

- 1 New ultra fine cemented carbide substrate, Wc grain size is 0.2um  
WC 0.2um의 입자 모재
- 2 Ultra-high hardness substrate material, micro-hardness > 2050HV  
우수한 경도 모재 (미크론 경도 > 2050HV)
- 3 Super high strength and toughness, tensile strength > 4200N/MM  
우수한 인장 강도 (인장강도 > 4200N/MM)

**Fine cutting edge surface treatment**  
인선 미립 표면 처리

- 1 Smooth rake face surface, smooth chip removal, less cutting resistance  
부드러운 칩배출 및 저절삭 부하 실현
- 2 The stress between coating and substrate is improved  
코팅과 모재의 밀착력 증대
- 3 Reduce cutting viscosity  
절삭성 증가

**CUTTING SHAPE 가공방식**



**CUTTING CONDITIONS AND RESULTS 절삭조건 및 결과**

WORK PIECE NAME	가공물	Lower laminate body piece
DESIGNATION	형번	HP-RAHI4080-R0.5 A famous domestic brand
WORK PIECE MATERIAL	피삭재	S136 mold steel (HRC52)
RPM	회전수	11000
F	테이블 이송	600
ap	축 방향 - 절삭 깊이	0.2~0.5
ae	반경 방향 - 절삭 폭	0.07
COOLING METHOD	절삭유	Cooling fluid



**HP-SGHI4**

**4-Flute Straight Shank**

**Flat End Mills**

**4날 스퀘어 엔드밀**

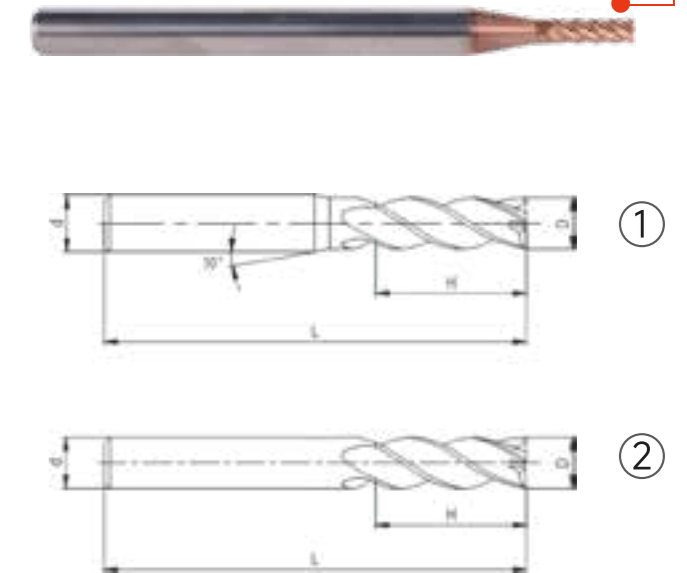
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

**Diameter Tolerance** 직경 공차 :

D1~D6\_0.02 / D6~D14\_0.025 / D15~D20\_0.03



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HP-SGHI4010-F	1.0	3	3	50	4	①	●
HP-SGHI4010-S	1.0	4	3	50	4	①	●
HP-SGHI4010	1.0	6	3	50	4	①	●
HP-SGHI4015-F	1.5	3	4	50	4	①	●
HP-SGHI4015-S	1.5	4	4	50	4	①	●
HP-SGHI4015	1.5	6	4	50	4	①	●
HP-SGHI4020-F	2.0	3	6	50	4	①	●
HP-SGHI4020-S	2.0	4	6	50	4	①	●
HP-SGHI4020	2.0	6	6	50	4	①	●
HP-SGHI4025-F	2.5	3	8	50	4	①	●
HP-SGHI4025-S	2.5	4	8	50	4	①	●
HP-SGHI4025	2.5	6	8	50	4	①	●
HP-SGHI4030-F	3.0	3	8	50	4	②	●
HP-SGHI4030-S	3.0	4	8	50	4	①	●
HP-SGHI4030	3.0	6	8	50	4	①	●
HP-SGHI4035-S	3.5	4	10	50	4	①	●
HP-SGHI4040-S	4.0	4	11	50	4	②	●

TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HP-SGHI4035	4.0	6	10	50	4	①	●
HP-SGHI4040	3.5	6	11	50	4	①	●
HP-SGHI4045	4.0	6	11	50	4	①	●
HP-SGHI4050	4.5	6	13	50	4	①	●
HP-SGHI4055	5.0	6	16	50	4	②	●
HP-SGHI4060	6.0	6	16	50	4	①	●
HP-SGHI4070	7.0	8	20	60	4	①	●
HP-SGHI4080	8.0	8	20	60	4	②	●
HP-SGHI4090	9.0	10	22	75	4	①	●
HP-SGHI4100	10.0	10	25	75	4	②	●
HP-SGHI4110	11.0	12	26	75	4	①	●
HP-SGHI4120	12.0	12	30	75	4	②	●
HP-SGHI4140	14.0	14	32	75	4	②	●
HP-SGHI4160	16.0	16	45	100	4	②	●
HP-SGHI4180	18.0	18	45	100	4	②	●
HP-SGHI4200	20.0	20	45	100	4	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	◎	○	○				

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HP-SGHI4-L

## 4-Flute Flat End Mills With

### Straight Shank And Long Cutting Edge

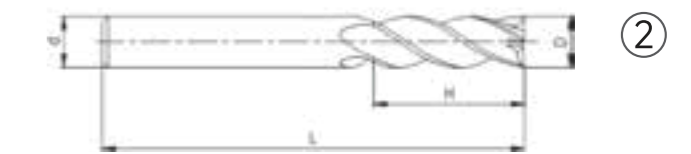
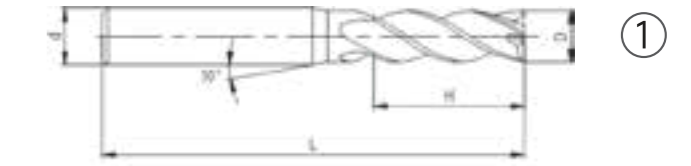
#### 4날 스퀘어 롱 플루트 엔드밀

- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

Diameter Tolerance 직경 공차 :  
D1~D6\_ 0.02 / D6~D14\_ 0.025 / D15~D20\_ 0.03



Corner protection flattened 코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수(mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			

HP-SGHI4030-L	3.0	6	12	75	4	①	▲
HP-SGHI4040-L	4.0	6	15	75	4	①	▲
HP-SGHI4050-L	5.0	6	20	75	4	①	▲
HP-SGHI4060-L	6.0	6	20	75	4	②	▲
HP-SGHI4080-L	8.0	8	25	100	4	②	▲
HP-SGHI4100-L	10.0	10	30	100	4	②	▲
HP-SGHI4120-L	12.0	12	35	100	4	②	▲
HP-SGHI4140-L	14.0	14	40	100	4	②	▲
HP-SGHI4160-L	16.0	16	50	150	4	②	▲
HP-SGHI4200-L	20.0	20	55	150	4	②	▲

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	◎	○	○				

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-HARDENED STEEL MACHINING

HADES PRO



# HP-SGHI4-H

## 4-Flute Long Shank Flat

### End Mills

#### 4날 스퀘어 롱 샹크 엔드밀

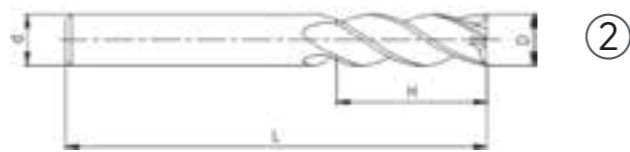
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^0$  / D6~D14  $_{-0.025}^0$  / D15~D20  $_{-0.03}^0$



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HP-SGHI4030-SH	3.0	4	8	75	4	②	●
HP-SGHI4030-H	3.0	6	8	75	4	②	●
HP-SGHI4040-SH	4.0	4	11	75	4	①	●
HP-SGHI4040-H	4.0	6	11	75	4	②	●
HP-SGHI4060-H	6.0	6	16	75	4	①	●
HP-SGHI4080-H	8.0	8	20	75	4	①	●
HP-SGHI4100-H	10.0	10	25	100	4	①	●
HP-SGHI4120-H	12.0	12	30	100	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

○ ○ ◎ ◎ ◎ ◎ ○ ○  
Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HP-SGHI4-G

## 4-Flute Extra Long Shank

### Flat End Mills

#### 4날 스퀘어 엑스트라 롱 샹크 엔드밀

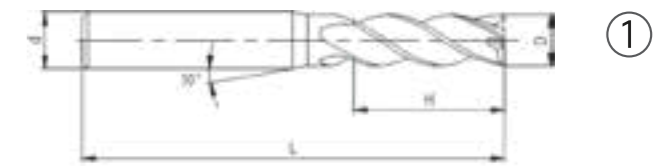
- ✓ Suitable for side milling and shallow slot machining  
측면가공 및 홈가공에 적합
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적

Diameter Tolerance 직경 공차 :

D1~D6  $_{-0.02}^0$  / D6~D14  $_{-0.025}^0$  / D15~D20  $_{-0.03}^0$



Corner protection flattened  
코너 보호기능(Gash land) 적용



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HP-SGHI4060-G	6.0	6	16	100	4	①	●
HP-SGHI4080-G	8.0	8	20	100	4	①	●
HP-SGHI4100-G	10.0	10	25	100	4	①	●
HP-SGHI4120-G	12.0	12	30	100	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

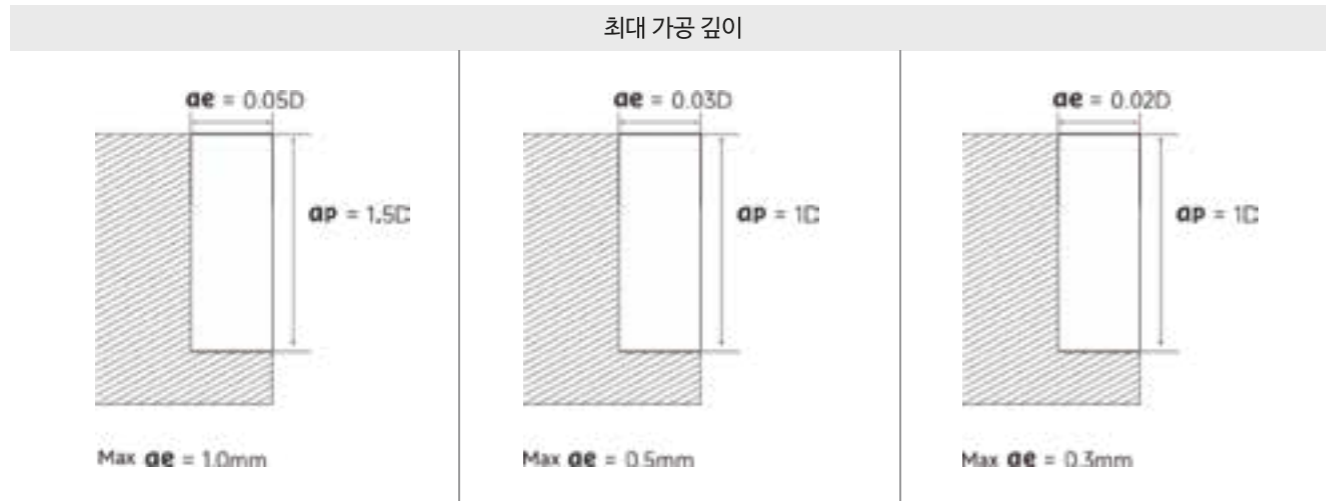
WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

○ ○ ◎ ◎ ◎ ◎ ○ ○  
Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-HARDENED STEEL MACHINING

HADES PRO

HP-SGHI4/-L/H/G Cutting Parameters 추천절삭조건						
Workpiece Material 파삭재	Pre-hardened steel Hardened steel 프리하든강 / 고경도강 40~50HRC		Hardened steel 고경도강 50~60HRC		Hardened steel 고경도강 60~68HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
1	40000	320	40000	320	32000	260
2	40000	800	24000	480	16000	320
3	32000	1020	16000	510	11000	350
4	24000	1250	12000	620	8000	420
5	19000	1360	9500	680	6400	460
6	16000	1540	8000	770	5300	510
8	12000	1540	6000	770	4000	510
10	9600	1540	4800	770	3200	510
12	8000	1600	4000	800	2700	540
14	6800	1340	3400	680	2300	460
16	6000	1200	3000	600	2000	400
18	5300	1060	2700	530	1800	360
20	4800	960	2400	480	1600	320



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 파삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Please use air cooling or MQL.  
공랭기나 MQL 사용을 추천합니다.
- ✓ Climb milling is recommended in the case of side milling.  
측면가공시 상향밀링 가공을 추천합니다.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

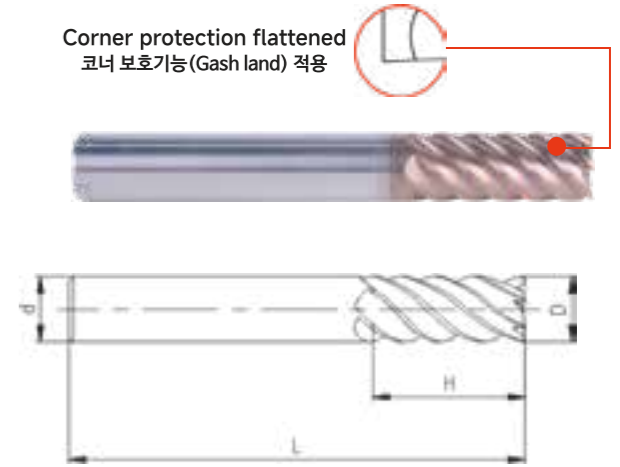
# HP-SGHI6

## 6-Flute Straight Shank

### Flat End Mills

### 6날 스퀘어 엔드밀

- ✓ The tool has good rigidity and can minimize the amount of tool clearance during side cutting  
높은 강성으로 측면 가공시 툴 clearance 최소화
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적



Diameter Tolerance 직경 공차 :

D1~D6  $0_{-0.02}$  / D6~D14  $0_{-0.025}$  / D15~D20  $0_{-0.03}$



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HP-SGHI6060	6.0	6	18	60	6	①	●
HP-SGHI6080	8.0	8	20	60	6	①	●
HP-SGHI6100	10.0	10	30	75	6	①	●
HP-SGHI6120	12.0	12	32	75	6	①	●
HP-SGHI6160	16.0	16	40	100	6	①	●
HP-SGHI6200	20.0	20	45	100	6	①	●

- Stock Available 재고관리
- ▲ Make to order 주문제작

WORKPIECE MATERIAL 파삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄합금	Titanium Alloy 티타늄합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	○	○	○	○	○	○	○	○	○	

Hardness unit 경도 : HRC    ◎ Very Suitable 1차 추천    ○ Suitable 2차 추천

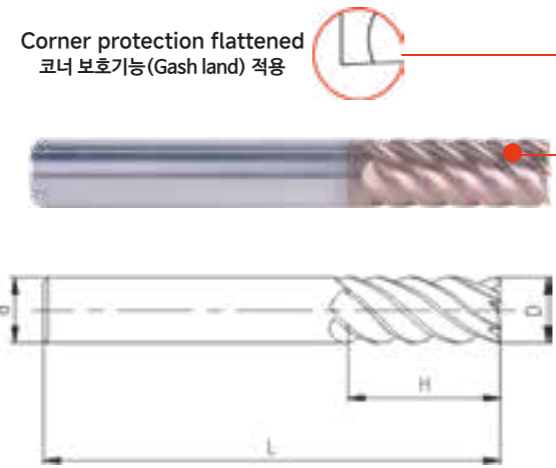
# HP-SGHI6-L

## 6-Flute Flat End Mills With

### Straight Shank And Long Cutting Edge

#### 6날 스퀘어 롱 플루트 엔드밀

- ✓ The tool has good rigidity and can minimize the amount of tool clearance during side cutting  
높은 강성으로 측면 가공시 툴 clearance 최소화
- ✓ Most suitable for high speed milling and dry milling  
고속가공 및 dry 절삭에 최적



Diameter Tolerance 직경 공차 :

D1~D6  $\frac{0}{-0.02}$  / D6~D14  $\frac{0}{-0.025}$  / D15~D20  $\frac{0}{-0.03}$



TYPE 형번	BASIC DIMENSION 치수 (mm)				NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L			
HP-SGHI6060-L	6.0	6	24	75	6	①	●
HP-SGHI6080-L	8.0	8	32	75	6	①	●
HP-SGHI6100-L	10.0	10	40	100	6	①	●
HP-SGHI6120-L	12.0	12	45	100	6	①	●
HP-SGHI6160-L	16.0	16	64	100	6	①	●
HP-SGHI6200-L	20.0	20	75	100	6	①	●

- Stock Available 재고관리
- ▲ Make to order 주문제작

### WORKPIECE MATERIAL 피삭재

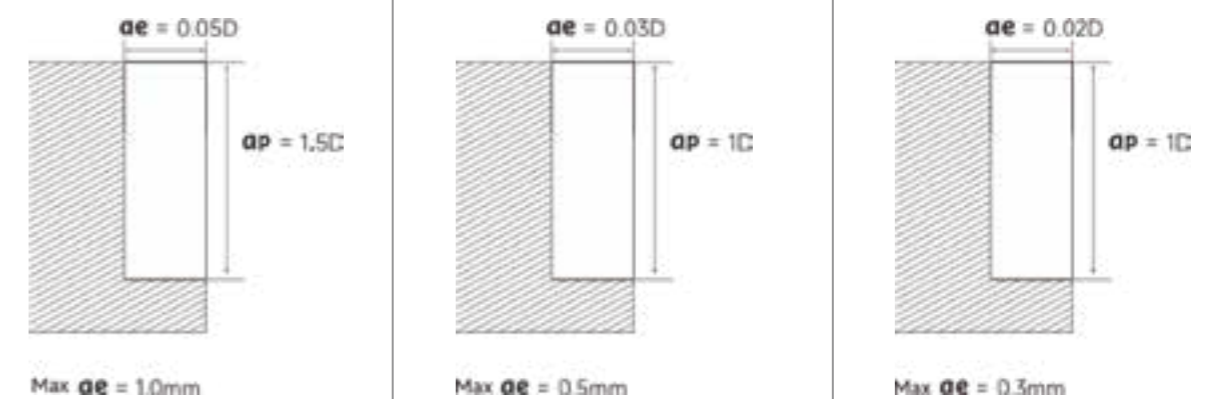
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
		○	◎	◎		○					

Hardness unit 경도 : HRC    ◎ Very Suitable 1차 추천    ○ Suitable 2차 추천

### HP-SGHI6/-L Cutting Parameters 추천절삭조건

Workpiece Material 피삭재	Pre-hardened steel Hardened steel 프리하든강 / 고경도강 40~50HRC		Hardened steel 고경도강 50~60HRC		Hardened steel 고경도강 60~68HRC	
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Rotating Speed 회전속도 (min <sup>-1</sup> )
6	16000	1850	8000	925	5300	610
8	12000	1850	6000	925	4000	610
10	9600	1850	4800	925	3200	610
12	8000	1920	4000	960	2700	650
14	6800	1600	3400	815	2300	550
16	6000	1440	3000	720	2000	480
18	5300	1270	2700	635	1800	430
20	4800	1150	2400	575	1600	385

### 최대 가공 깊이



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Please use air cooling or MQL.  
공랭기나 MQL 사용을 추천합니다.
- ✓ Climb milling is recommended in the case of side milling.  
측면가공시 상향밀링 가공을 추천합니다.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.



# HP-RAHI4

## 4-Flute Straight Shank

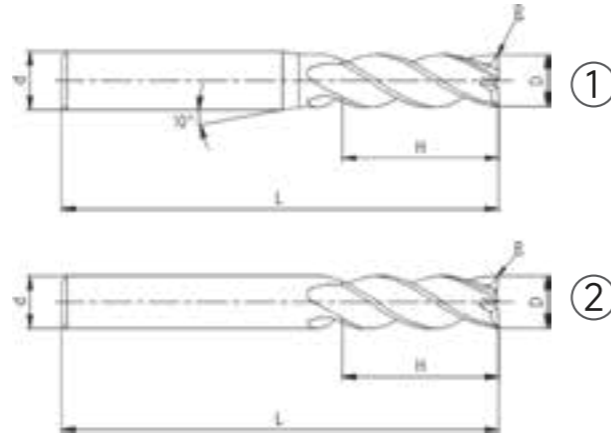
### Corner Radius End Mills

### 4날 래디우스 엔드밀

Wide range of applications, able to achieve a variety of forms of processing  
넓은 가공 영역으로 다양한 형태의 가공 실현

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L	R			
HP-RAHI4010-R0.2S	1.0	4	3	50	0.2	4	①	●
HP-RAHI4015-R0.2S	1.5	4	4	50	0.2	4	①	●
HP-RAHI4020-R0.2S	2.0	4	6	50	0.2	4	①	●
HP-RAHI4020-R0.5S	2.0	4	6	50	0.5	4	①	●
HP-RAHI4025-R0.2S	2.5	4	8	50	0.2	4	①	●
HP-RAHI4025-R0.5S	2.5	4	8	50	0.5	4	①	●
HP-RAHI4030-R0.2S	3.0	4	8	50	0.2	4	①	●
HP-RAHI4030-R0.5S	3.0	4	8	50	0.5	4	①	●
HP-RAHI4040-R0.2S	4.0	4	10	50	0.2	4	①	●
HP-RAHI4040-R0.3S	4.0	4	10	50	0.3	4	①	●
HP-RAHI4040-R0.5S	4.0	4	10	50	0.5	4	①	●
HP-RAHI4050-R0.2	5.0	6	13	50	0.2	4	①	●
HP-RAHI4050-R0.5	5.0	6	13	50	0.5	4	②	●
HP-RAHI4050-R1.0	5.0	6	13	50	1.0	4	①	●
HP-RAHI4060-R0.2	6.0	6	16	50	0.2	4	①	●
HP-RAHI4060-R0.5	6.0	6	16	50	0.5	4	②	●

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	d	H	L	R			
HP-RAHI4060-R1.0	6.0	6	16	50	1.0	4	②	●
HP-RAHI4080-R0.2	8.0	8	20	60	0.2	4	①	●
HP-RAHI4080-R0.5	8.0	8	20	60	0.5	4	①	●
HP-RAHI4080-R1.0	8.0	8	20	60	1.0	4	①	●
HP-RAHI4100-R0.2	10.0	10	25	75	0.2	4	①	●
HP-RAHI4100-R0.5	10.0	10	25	75	0.5	4	①	●
HP-RAHI4100-R1.0	10.0	10	25	75	1.0	4	②	●
HP-RAHI4100-R2.0	10.0	10	25	75	2.0	4	①	●
HP-RAHI4100-R3.0	10.0	10	25	75	3.0	4	②	●
HP-RAHI4120-R0.2	12.0	12	30	75	0.2	4	①	●
HP-RAHI4120-R0.5	12.0	12	30	75	0.5	4	②	●
HP-RAHI4120-R1.0	12.0	12	30	75	1.0	4	①	●
HP-RAHI4120-R2.0	12.0	12	30	75	2.0	4	②	●
HP-RAHI4120-R3.0	12.0	12	30	75	3.0	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎							

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-HARDENED STEEL MACHINING

HADES PRO

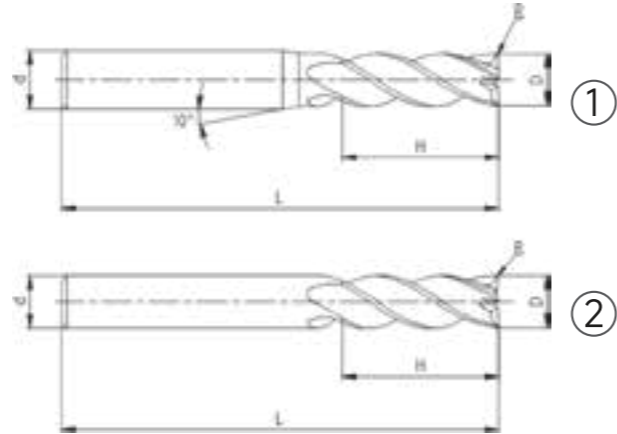
# HP-RAHI4-H

## 4-Flute Long Shank Corner Radius End Mills 4날 라디우스 롱 샹크 엔드밀

Wide range of applications, able to achieve a variety of forms of processing  
넓은 가공 영역으로 다양한 형태의 가공 실현

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-RAHI4040-R0.2SH	4.0	0.2	4	10	75	4	①	●
HP-RAHI4040-R0.2H	4.0	0.2	6	10	75	4	②	●
HP-RAHI4040-R0.5SH	4.0	0.5	4	10	75	4	①	●
HP-RAHI4040-R0.5H	4.0	0.5	6	10	75	4	②	●
HP-RAHI4060-R0.2H	6.0	0.2	6	16	75	4	①	●
HP-RAHI4060-R0.5H	6.0	0.5	6	16	75	4	①	●
HP-RAHI4060-R1.0H	6.0	1.0	6	16	75	4	①	●
HP-RAHI4080-R0.2H	8.0	0.2	8	20	75	4	①	●
HP-RAHI4080-R0.5H	8.0	0.5	8	20	75	4	①	●
HP-RAHI4080-R1.0H	8.0	1.0	8	20	75	4	①	●

TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-RAHI4100-R0.2H	10.0	0.2	10	25	100	4	①	●
HP-RAHI4100-R0.5H	10.0	0.5	10	25	100	4	①	●
HP-RAHI4100-R1.0H	10.0	1.0	10	25	100	4	①	●
HP-RAHI4100-R2.0H	10.0	2.0	10	25	100	4	①	●
HP-RAHI4120-R0.2H	12.0	0.2	12	30	100	4	①	●
HP-RAHI4120-R0.5H	12.0	0.5	12	30	100	4	①	●
HP-RAHI4120-R1.0H	12.0	1.0	12	30	100	4	①	●
HP-RAHI4120-R2.0H	12.0	2.0	12	30	100	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						



Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

HIGH-HARDENED STEEL MACHINING

HADES PRO

# HP-RAHI4-G

## 4-Flute Extra Long Shank

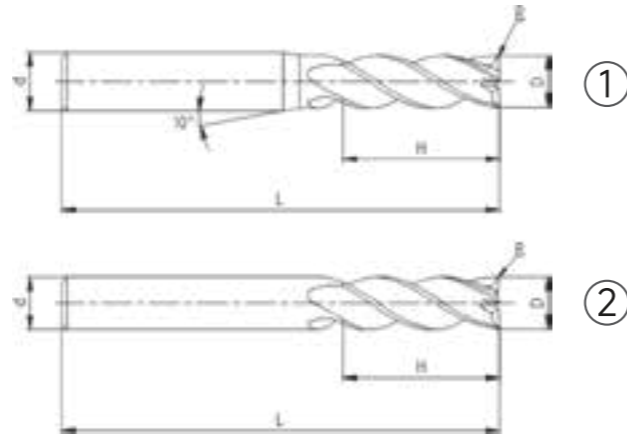
### Corner Radius End Mills

### 4날 라디우스 엑스트라 롱 샹크 엔드밀

Wide application able to achieve various forms of processing  
넓은 가공 영역으로 다양한 형태의 가공 실현

Diameter Tolerance 직경 공차 :

D1~D6<sub>-0.02</sub> / D7~D20<sub>-0.025</sub>



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-RAHI4060-R0.2G	6.0	0.2	6	16	100	4	①	●
HP-RAHI4060-R0.5G	6.0	0.5	6	16	100	4	①	●
HP-RAHI4060-R1.0G	6.0	1.0	6	16	100	4	①	●
HP-RAHI4080-R0.2G	8.0	0.2	8	20	100	4	①	●
HP-RAHI4080-R0.5G	8.0	0.5	8	20	100	4	①	●
HP-RAHI4080-R1.0G	8.0	1.0	8	20	100	4	①	●
HP-RAHI4100-R0.2G	10.0	0.2	10	25	150	4	①	●
HP-RAHI4100-R0.5G	10.0	0.5	10	25	150	4	①	●
HP-RAHI4100-R1.0G	10.0	1.0	10	25	150	4	①	●
HP-RAHI4100-R2.0G	10.0	2.0	10	25	150	4	①	●
HP-RAHI4120-R0.2G	12.0	0.2	12	30	150	4	①	●
HP-RAHI4120-R0.5G	12.0	0.5	12	30	150	4	①	●
HP-RAHI4120-R1.0G	12.0	1.0	12	30	150	4	①	●
HP-RAHI4120-R2.0G	12.0	2.0	12	30	150	4	①	●

● Stock Available 재고관리 ▲ Make to order 주문제작

#### WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						

○ ○ ◎ ◎ ◎ ○  
Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HP-BAHI2

## 2-Flute Straight Shank Ball

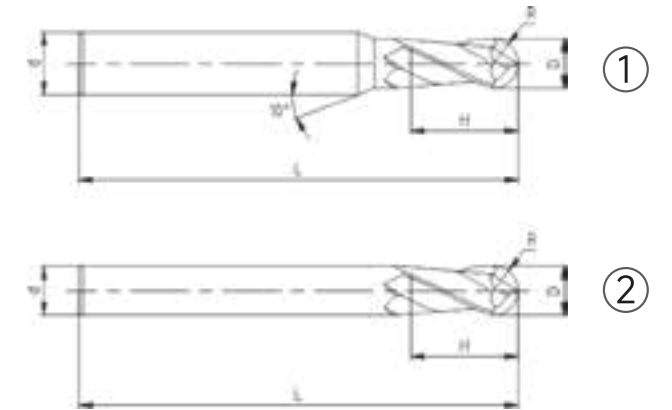
### Nose End Mills

### 2날 볼 엔드밀

Suitable for profile milling, and high speed machining, with wide range of applications  
형상가공 고속도 가공용

Diameter Tolerance 직경 공차 :

D1~D20<sub>-0.02</sub> R±0.005



TYPE 형번	BASIC DIMENSION 치수(mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-BAHI2010-R0.5S	1.0	0.5	4	2	50	2	①	●
HP-BAHI2010-R0.5	1.0	0.5	6	2	50	2	①	●
HP-BAHI2015-R0.75S	1.5	0.75	4	3	50	2	①	●
HP-BAHI2015-R0.75	1.5	0.75	6	3	50	2	②	●
HP-BAHI2020-R1.0S	2.0	1.0	4	4	50	2	①	●
HP-BAHI2020-R1.0	2.0	1.0	6	4	50	2	①	●
HP-BAHI2025-R1.25S	2.5	1.25	4	5	50	2	①	●
HP-BAHI2025-R1.25	2.5	1.25	6	5	50	2	①	●
HP-BAHI2030-R1.5S	3.0	1.5	4	6	50	2	①	●
HP-BAHI2030-R1.5	3.0	1.5	6	6	50	2	①	●
HP-BAHI2035-R1.75	3.5	1.75	6	8	50	2	①	●
HP-BAHI2040-R2.0S	4.0	2.0	4	8	50	2	②	●
HP-BAHI2040-R2.0	4.0	2.0	6	8	50	2	①	●
HP-BAHI2050-R2.5	5.0	2.5	6	10	50	2	①	●





TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-BAHI2060-R3.0H	6.0	3.0	6	12	75	2	②	●
HP-BAHI2070-R3.5H	7.0	3.5	8	14	75	2	①	●
HP-BAHI2080-R4.0H	8.0	4.0	8	16	75	2	②	●
HP-BAHI2090-R4.5H	9.0	4.5	10	18	100	2	①	●
HP-BAHI2100-R5.0H	10.0	5.0	10	20	100	2	②	●
HP-BAHI2120-R6.0H	12.0	6.0	12	24	100	2	②	●
HP-BAHI2140-R7.0H	14.0	7.0	14	28	150	2	②	●
HP-BAHI2160-R8.0H	16.0	8.0	16	32	150	2	②	●
HP-BAHI2200-R10.0H	20.0	10.0	20	40	150	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	◎	○	○				

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

# HP-BAHI2-G

## 2-Flute Extra Long Shank

### Ball Nose End Mills

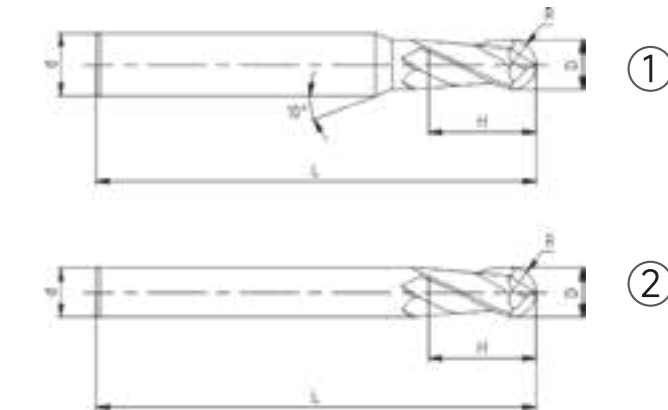
### 2날 볼 엑스트라 롱 샹크 엔드밀



✓ Suitable for profile milling, and high speed machining, with wide range of applications  
형상가공 고속도 가공용

Diameter Tolerance 직경 공차 :

D1~D20  $\pm 0.02$  R  $\pm 0.005$



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-BAHI2060-R3.0G	6.0	3.0	6	12	100	2	②	●
HP-BAHI2080-R4.0G	8.0	4.0	8	16	100	2	②	●
HP-BAHI2100-R5.0G	10.0	5.0	10	20	150	2	②	●
HP-BAHI2120-R6.0G	12.0	6.0	12	24	150	2	②	●

● Stock Available 재고관리 ▲ Make to order 주문제작

WORKPIECE MATERIAL 피삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
		~40	~50	~55	~68						
○	○	◎	◎	◎	◎	○	○				

Hardness unit 경도 : HRC ◎ Very Suitable 1차 추천 ○ Suitable 2차 추천

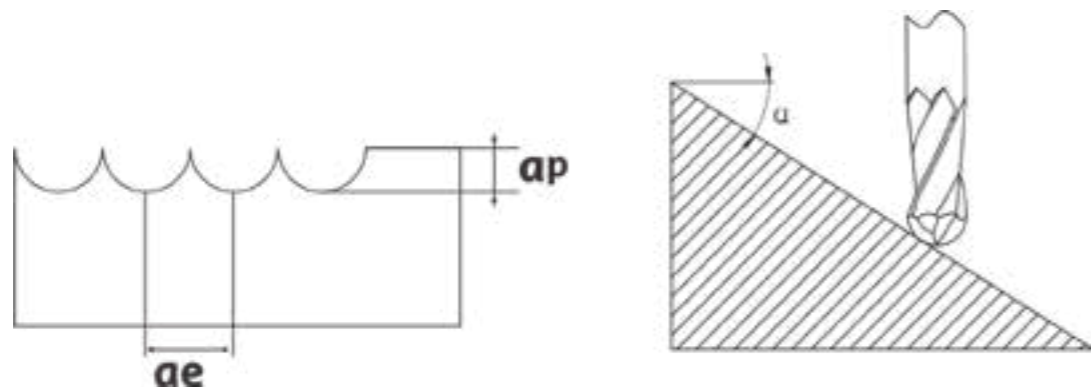
HIGH-HARDENED STEEL MACHINING

HADES PRO

HP-RAHI4/-H/G, HP-BAHI2/-H/G Cutting Parameters 추천절삭조건

Workpiece Material 파삭재	Pre-hardened steel Hardened steel 프리하든강 / 고경도강 40~50HRC				Hardened steel 고경도강 50~60HRC				Hardened steel 고경도강 60~68HRC			
	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)
R0.5	40000	1900	0.01	0.05	36000	1500	0.01	0.05	32000	1400	0.01	0.05
R1.0	33000	3100	0.02	0.075	26000	2100	0.02	0.075	24000	2000	0.02	0.075
R1.5	29000	4100	0.03	0.1	23000	2900	0.03	0.1	21000	2600	0.03	0.1
R2.0	22000	3900	0.04	0.15	17000	2500	0.04	0.15	15500	2100	0.04	0.15
R2.5	17500	3500	0.05	0.15	13500	2200	0.05	0.15	13000	2000	0.05	0.15
R3.0	15000	3100	0.06	0.2	11500	1700	0.06	0.2	10500	1500	0.06	0.2
R4.0	11000	2500	0.08	0.25	8600	1600	0.08	0.25	8000	1400	0.08	0.25
R5.0	9000	2000	0.1	0.3	7000	1400	0.1	0.3	6000	1200	0.1	0.3
R6.0	7500	1800	0.1	0.35	5700	1300	0.1	0.35	5300	1200	0.1	0.35
R8.0	5500	1800	0.1	0.4	4300	1300	0.1	0.4	4000	1200	0.1	0.4
R10.0	4500	1800	0.1	0.5	6035	1300	0.1	0.5	3200	1200	0.1	0.5

최대 가공 깊이



- ✓ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✓ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 파삭재 고정 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✓ Please use air cooling or MQL.  
공랭기나 MQL 사용을 추천합니다.
- ✓ If inclination angle  $\alpha$  over 15°, please reduce the speed to 50~80% of above table.  
15도 이상의 경사각일시 상기 테이블의 50~80% 수준의 속도로 낮추세요.
- ✓ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# HP-BAHI4

## 4-Flute Straight Shank Ball

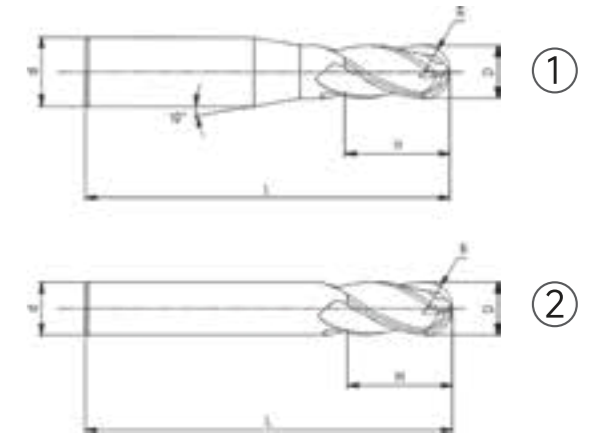
### Nose End Mills

#### 4날 볼 엔드밀

- ✓ The four-edge ball nose end mill can achieve a higher feed speed, improve processing efficiency, and achieve a longer service life in processing high-hardness materials.  
4날 볼 엔드밀은 고경도용 파삭재 가공시 높은 수명과 가공 효율 극대화

Diameter Tolerance 직경 공차 :

D1~D20  $0_{-0.02}$  R ± 0.005



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-BAHI4030-R1.5	3.0	1.5	6	6	50	4	①	●
HP-BAHI4040-R2.0	4.0	2.0	6	8	50	4	①	●
HP-BAHI4050-R2.5	5.0	2.0	6	10	50	4	①	●
HP-BAHI4060-R3.0	6.0	3.0	6	12	50	4	②	●
HP-BAHI4080-R4.0	8.0	4.0	8	16	60	4	②	●
HP-BAHI4100-R5.0	10.0	5.0	10	20	75	4	②	●
HP-BAHI4120-R6.0	12.0	6.0	12	24	75	4	②	●
HP-BAHI4140-R7.0	14.0	7.0	14	28	75	4	②	●
HP-BAHI4160-R8.0	16.0	8.0	16	32	100	4	②	●
HP-BAHI4180-R9.0	18.0	9.0	18	36	100	4	②	●
HP-BAHI4200-R10.0	20.0	10.0	20	40	100	4	②	●

- Stock Available 재고관리
- ▲ Make to order 주문제작

WORKPIECE MATERIAL 파삭재

Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
○	○	◎	◎	◎	◎	○	○	○	○	○	

Hardness unit 경도 : HRC

◎ Very Suitable 1차 추천

○ Suitable 2차 추천

HIGH-HARDENED  
STEEL MACHINING

HADES PRO



# HP-BAHI4-H

## 4-Flute Long Shank Ball

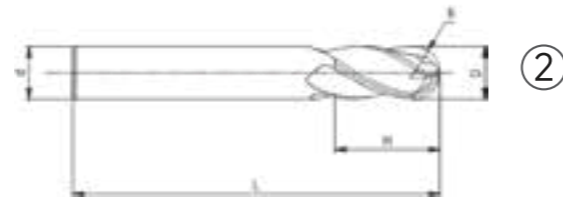
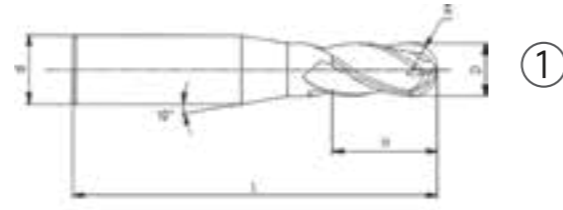
### Nose End Mills

#### 4날 볼 롱 샹크 엔드밀

✔ The four-edge ball nose end mill can achieve a higher feed speed, improve processing efficiency, and achieve a longer service life in processing high-hardness materials  
 4날 볼 엔드밀은 고경도용 피삭재 가공시 높은 수명과 가공 효율 극대화

Diameter Tolerance 직경 공차 :

D1~D20  $0_{-0.02}$  R ± 0.005



TYPE 형번	BASIC DIMENSION 치수 (mm)					NUMBER OF FLUTE / 날수 Z	GEOMETRY 그림	STOCK 재고
	D	R	d	H	L			
HP-BAHI4030-R1.5H	3.0	1.0	6	6	75	4	①	●
HP-BAHI4040-R2.0H	4.0	2.0	6	8	75	4	①	●
HP-BAHI4050-R2.5H	5.0	2.5	6	10	75	4	①	●
HP-BAHI4060-R3.0H	6.0	3.0	6	12	75	4	②	●
HP-BAHI4080-R4.0H	8.0	4.0	8	16	100	4	②	●
HP-BAHI4100-R5.0H	10.0	5.0	10	20	100	4	②	●
HP-BAHI4120-R6.0H	12.0	6.0	12	24	100	4	②	●
HP-BAHI4140-R7.0H	14.0	7.0	14	28	100	4	②	●
HP-BAHI4160-R8.0H	16.0	8.0	16	32	150	4	②	●
HP-BAHI4180-R9.0H	18.0	9.0	18	36	150	4	②	●
HP-BAHI4200-R10.0H	20.0	10.0	20	40	150	4	②	●

● Stock Available 재고관리

▲ Make to order 주문제작

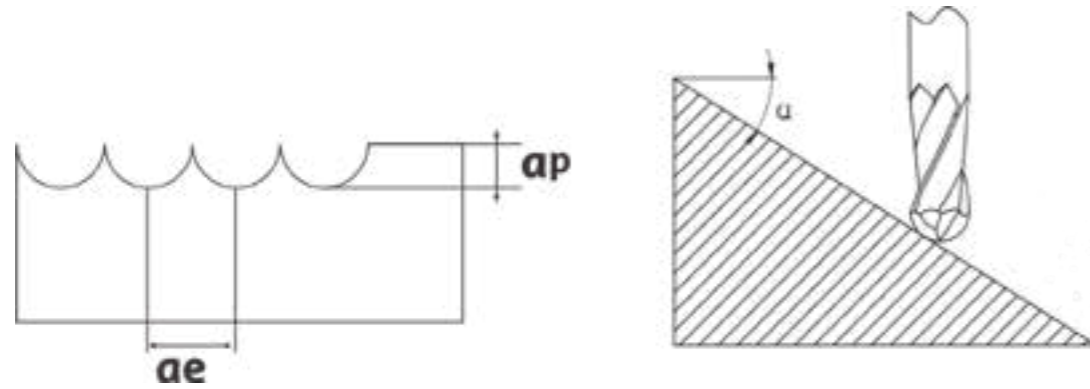
WORKPIECE MATERIAL 피삭재											
Carbon Steel 탄소강	Alloy Steel 합금강	Pre-hardened steel / Hardened steel 프리하든강 / 고경도강 ~40    ~50    ~55    ~68				Stainless Steel 스테인레스강	Cast iron Nodular cast iron 회주철 구상흑연주철	Copper Alloy 동합금	Aluminum Alloy 알루미늄 합금	Titanium Alloy 티타늄 합금	High Temperature Alloy 고온합금강
○	○	◎	◎	◎	◎	○	○				
Hardness unit 경도 : HRC    ◎ Very Suitable 1차 추천    ○ Suitable 2차 추천											

HP-BAHI4/-H Cutting Parameters 추천절삭조건												
Workpiece Material 피삭재	Pre-hardened steel Hardened steel 프리하든강 / 고경도강 40~50HRC				Hardened steel 고경도강 50~60HRC				Hardened steel 고경도강 60~68HRC			
	Diameter 직경 (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)	Ae (mm)	Rotating Speed 회전속도 (min <sup>-1</sup> )	Feed Speed 테이블 이송 (mm/min)	Ap (mm)
R1.5	29000	6560	0.03	0.1	23000	4560	0.03	0.1	21000	4240	0.03	0.1
R2.0	22000	6250	0.04	0.15	17000	4000	0.04	0.15	15500	3520	0.04	0.15
R2.5	17500	5600	0.05	0.15	13500	3520	0.05	0.15	13000	3200	0.05	0.15
R3.0	15000	4200	0.06	0.2	11500	3000	0.06	0.2	10500	2500	0.06	0.2
R4.0	11000	3500	0.08	0.25	8600	2500	0.08	0.25	8000	2250	0.08	0.25
R5.0	9000	3000	0.1	0.3	7000	2200	0.1	0.3	6000	2000	0.1	0.3
R6.0	7500	3000	0.1	0.35	5700	2000	0.1	0.35	5300	1900	0.1	0.35
R8.0	5500	3000	0.1	0.4	4300	2000	0.1	0.4	4000	1900	0.1	0.4
R10.0	4500	3000	0.1	0.5	3500	2000	0.1	0.5	3200	1900	0.1	0.5

HIGH-HARDENED STEEL MACHINING

HADES PRO

최대 가공 깊이



- ✔ Please select high-precision machine and tool holder.  
고정도 장비 및 홀더를 사용하세요.
- ✔ When the machine rigidity and workpiece fixture stability is low, vibration and abnormal noise may be generated. Please reduce the rotating speed and feed speed stated above correspondingly.  
장비강성이 약하거나 피삭재 고정이 안정하지 않아 떨림이 발생한다면 회전 속도 및 테이블 이송을 줄이세요.
- ✔ Please use air cooling or MQL.  
공랭기나 MQL 사용을 추천합니다.
- ✔ If inclination angle  $a$  over  $15^\circ$ , please reduce the speed to 50~80% of above table.  
15도 이상의 경사각일시 상기 테이블의 50~80% 수준의 속도로 낮추세요.
- ✔ Make overhang of tool as short as possible in conditions of non-interference.  
가능한 짧은 오버행 공구를 사용하세요.

# SERIES FOR HIGH- TEMPERATURE ALLOY

난삭재 (HSRA)용  
엔드밀 시리즈

# EROS

