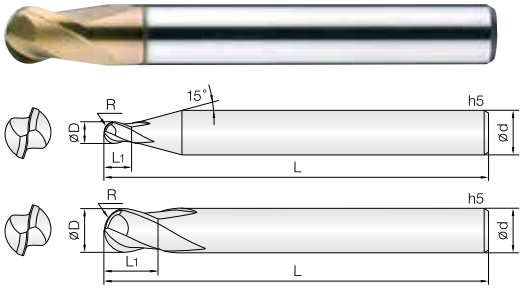
2HSB

2 Flutes High Speed Short Length Ball End Mills

2날 고속가공용 짧은 길이 볼 엔드밀



- 고경도강(HRc50~62), 프리하든강 계열의 고정밀 가공 엔드밀
- 실리콘계 코팅(Si) 처리하여 내마모성이 우수합니다.
- 고정밀 공차 적용으로 초정밀 가공에 적합합니다.
- 짧은 전장을 채택하여, 열박음척 사용이 용이합니다.
- 날부인선의 조도가 뛰어나피삭재의 면조도가 우수합니다.
- 초미립자 초경합금(0.2㎛)을채택, 고속절삭시 뛰어난 성능을 발휘합니다.

- Endmills for pre-hardened and hardened steels(HRc50~62)
- Good wear resistance by Si-based PVD coating.
- High precise edge tolerance.
- Short overall length for easy use with shrinking chuck.
- Very nice work surface finish.
- Outstanding performance at high speed machining by ultra fine (0.2㎛) WC grade.

HARD series

2 | UWC 초미립자 | TISIN Coating | R ±0.005 | R ±0.01 | 30° Helix Angle | CUTTING DATA

0.05 ~ 2.5R 3R ~ 6R 423P

Condition	D Size	D Tolerance
ØD ≠ Ød	Ø0.1 ~ 0.15	+0 ~ -0.005mm
	Ø0.2 ~ 12	+0 ~ -0.01mm

Condition	D Size	D Tolerance
ØD = Ød	Ø4 ~ 12	-0.005 ~ -0.015mm

단위 : mm

Order Number	날경 Diameter R × D	날장 Length of cut L1	전장 Overall Length L	생크 Shank Dia d	비고
2HSB 001 001 S04	0.05R X 0.1	0.1	40	4	
2HSB 001 0015 S04	0.05R X 0.1	0.15	40	4	
2HSB 0015 0015 S04	0.075R X 0.15	0.15	40	4	
2HSB 0015 002 S04	0.075R X 0.15	0.2	40	4	
2HSB 002 002 S04	0.1R X 0.2	0.2	40	4	
2HSB 002 003 S04	0.1R X 0.2	0.3	40	4	
2HSB 0025 004 S04	0.125R X 0.25	0.4	40	4	
2HSB 003 003 S04	0.15R X 0.3	0.3	40	4	
2HSB 003 0045 S04	0.15R X 0.3	0.45	40	4	
2HSB 004 004 S04	0.2R X 0.4	0.4	40	4	
2HSB 004 006 S04	0.2R X 0.4	0.6	40	4	
2HSB 005 005 S04	0.25R X 0.5	0.5	40	4	
2HSB 005 0075 S04	0.25R X 0.5	0.75	40	4	
2HSB 006 006 S04	0.3R X 0.6	0.6	40	4	
2HSB 006 009 S04	0.3R X 0.6	0.9	40	4	
2HSB 007 007 S04	0.35R X 0.7	0.7	40	4	
2HSB 007 010 S04	0.35R X 0.7	1	40	4	
2HSB 008 008 S04	0.4R X 0.8	0.8	40	4	
2HSB 008 012 S04	0.4R X 0.8	1.2	40	4	
2HSB 009 009 S04	0.45R X 0.9	0.9	40	4	
2HSB 009 013 S04	0.45R X 0.9	1.3	40	4	
2HSB 010 010 S04	0.5R X 1	1	40	4	
2HSB 010 010 S06	0.5R X 1	1	40	6	
2HSB 010 015 S04	0.5R X 1	1.5	40	4	
2HSB 010 015 S06	0.5R X 1	1.5	40	6	
2HSB 012 012 S04	0.6R X 1.2	1.2	40	4	
2HSB 015 015 S04	0.75R X 1.5	1.5	40	4	
2HSB 015 015 S06	0.75R X 1.5	1.5	40	6	
2HSB 015 023 S04	0.75R X 1.5	2.3	40	4	
2HSB 015 023 S06	0.75R X 1.5	2.3	40	6	
2HSB 020 020 S04	1R X 2	2	45	4	
2HSB 020 020 S06	1R X 2	2	45	6	
2HSB 020 030 S04	1R X 2	3	45	4	
2HSB 020 030 S06	1R X 2	3	45	6	
2HSB 025 025 S04	1.25R X 2.5	2.5	45	4	
2HSB 025 025 S06	1.25R X 2.5	2.5	45	6	
2HSB 030 030 S04	1.5R X 3	3	45	4	
2HSB 030 030 S06	1.5R X 3	3	45	6	
2HSB 030 045 S04	1.5R X 3	4.5	45	4	
2HSB 030 045 S06	1.5R X 3	4.5	45	6	
2HSB 040 040 S04	2R X 4	4	45	4	
2HSB 040 040 S06	2R X 4	4	45	6	
2HSB 040 060 S04	2R X 4	6	45	4	
2HSB 040 060 S06	2R X 4	6	45	6	
2HSB 050 050 S06	2.5R X 5	5	50	6	
2HSB 050 075 S06	2.5R X 5	7.5	50	6	
2HSB 060 060 050	3R X 6	6	50	6	
2HSB 060 060 060	3R X 6	6	60	6	
2HSB 080 080 050	4R X 8	8	50	8	
2HSB 080 080 060	4R X 8	8	60	8	

Order Number	날경 Diameter R × D	날장 Length of cut L1	전장 Overall Length L	생크 Shank Dia d	비고
2HSB 100 100 060	5R X 10	10	60	10	
2HSB 100 100 070	5R X 10	10	70	10	
2HSB 120 120 060	6R X 12	12	60	12	
2HSB 120 120 070	6R X 12	12	70	12	

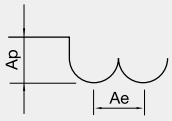
2PHCB/2HSB/2HCB Cutting Condition

• RPM : rev./min • Feed : mm/min

피삭재 Material		동 Copper C1100				합금강 / 프리하든강 Alloy Steels / Prehardened Steels NAK80/KP4M				고경도강 Hardened Steels STAVAX/SKD11				열처리 / 고경도강 Heat-treated steels / Hardened Steels SKD11 / SKD61			
경도 Hardness						40 ~ 45HRc				45 ~ 55HRc				55 ~ 62HRc			
반경 Radius	날장 Cutting Length	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth
R0.05	0.2	40,000	300	0.005	0.040	40,000	300	0.004	0.004	30,000	200	0.004	0.040	Cutting is not possible.			
R0.1	0.2	54,000	430	0.020	0.060	54,000	630	0.016	0.012	44,300	450	0.023	0.008	30,000	300	0.012	0.008
〃	0.4	54,000	430	0.020	0.051	54,000	430	0.016	0.040	44,300	345	0.010	0.023	32,800	260	0.007	0.008
R0.15	0.3	54,000	720	0.030	0.090	54,000	750	0.024	0.072	44,300	600	0.015	0.042	32,800	450	0.020	0.013
〃	0.6	54,000	720	0.030	0.075	54,000	715	0.024	0.060	44,300	575	0.015	0.035	32,800	430	0.012	0.013
R0.2	0.4	54,000	870	0.040	0.120	54,000	1,000	0.032	0.096	44,300	800	0.020	0.056	32,800	600	0.028	0.016
〃	0.8	54,000	870	0.040	0.105	54,000	880	0.032	0.084	44,300	700	0.020	0.049	32,800	525	0.016	0.016
R0.25	0.5	56,000	1,250	0.050	0.150	53,000	1,250	0.040	0.120	43,500	1,000	0.025	0.070	32,200	750	0.035	0.022
〃	1	56,000	1,380	0.050	0.125	50,000	1,000	0.040	0.100	41,350	800	0.025	0.058	30,600	600	0.021	0.022
R0.3	0.6	58,000	1,510	0.060	0.180	52,000	1,380	0.048	0.144	42,650	1,100	0.030	0.084	31,500	825	0.042	0.026
〃	1.2	58,000	1,710	0.060	0.155	48,500	1,020	0.048	0.124	40,500	810	0.030	0.072	30,000	610	0.025	0.026
R0.4	0.8	52,000	1,870	0.080	0.240	48,000	1,500	0.064	0.192	39,500	1,200	0.040	0.112	29,250	900	0.056	0.036
〃	2	52,000	1,970	0.080	0.200	45,000	1,085	0.064	0.160	37,500	870	0.040	0.093	27,800	650	0.033	0.036
R0.5	1	41,000	1,660	0.100	0.300	38,540	1,560	0.080	0.240	36,900	1,250	0.050	0.140	27,300	940	0.063	0.040
〃	2.5	41,000	1,880	0.100	0.200	38,540	1,000	0.080	0.160	31,500	800	0.050	0.090	23,000	600	0.022	0.040
R0.6	3	34,000	2,120	0.120	0.360	31,960	1,550	0.096	0.288	32,800	1,250	0.060	0.168	24,400	940	0.072	0.051
R0.75	1.5	27,000	2,280	0.150	0.450	25,380	1,600	0.120	0.360	28,700	1,280	0.075	0.210	21,500	960	0.087	0.068
〃	4	27,000	1,830	0.150	0.325	25,380	1,000	0.120	0.260	26,000	800	0.075	0.152	19,250	600	0.052	0.068
R1	2	32,700	3,560	0.200	0.600	30,738	1,850	0.160	0.480	24,600	1,480	0.100	0.280	18,250	1,110	0.112	0.089
〃	5	32,700	2,980	0.200	0.435	30,738	1,350	0.160	0.348	22,000	1,080	0.100	0.203	16,250	810	0.067	0.089
R1.25	6	30,600	3,680	0.250	0.542	28,764	1,600	0.200	0.430	27,901	1,280	0.125	0.251	15,500	960	0.067	0.115
R1.5	3	26,100	4,400	0.300	0.957	24,534	2,520	0.240	0.766	23,798	2,050	0.150	0.447	15,500	1,530	0.197	0.171
〃	8	26,100	4,110	0.300	0.765	24,534	2,350	0.240	0.612	23,798	1,880	0.150	0.357	15,500	1,410	0.100	0.171
R2	4	18,800	4,160	0.400	1.380	17,672	2,450	0.320	1.100	17,142	1,960	0.200	0.644	12,800	1,470	0.266	0.208
〃	8	18,800	3,920	0.400	1.020	17,672	2,350	0.320	0.816	17,142	1,880	0.200	0.476	12,800	1,410	0.134	0.208
R2.5	5	17,300	3,980	0.500	1.660	16,262	2,560	0.400	1.330	15,774	2,050	0.250	0.770	11,000	1,530	0.215	0.240
〃	10	17,300	3,660	0.500	1.275	16,262	2,300	0.400	1.020	15,774	1,840	0.250	0.595	11,000	1,380	0.180	0.240
R3	6	16,500	3,880	0.600	2.340	15,510	2,700	0.480	1.870	15,045	2,160	0.300	1.090	9,600	1,620	0.290	0.281
〃	12	16,500	3,500	0.600	1.530	15,510	2,400	0.480	1.225	15,045	1,920	0.300	0.715	9,600	1,440	0.230	0.281
R4	8	11,660	4,000	0.800	3.100	10,960	2,300	0.640	2.480	10,632	1,840	0.400	1.446	7,600	1,380	0.400	0.175
〃	14	11,660	3,850	0.800	2.050	10,960	2,000	0.640	1.640	10,632	1,600	0.400	0.957	7,600	1,200	0.400	0.175
R5	10	9,560	4,100	1.000	3.750	8,986	2,200	0.800	3.000	8,717	1,780	0.500	1.750	6,400	1,340	0.500	0.154
〃	18	9,560	3,720	1.000	2.550	8,986	1,700	0.800	2.040	8,717	1,360	0.500	1.190	6,400	1,020	0.500	0.154
R6	12	7,100	4,000	1.200	4.420	6,674	1,850	0.960	3.540	6,474	1,480	0.600	2.060	5,450	1,110	0.600	0.159
〃	22	7,100	3,250	1.200	3.050	6,674	1,600	0.960	2,440	6,474	1,280	0.600	1.423	5,450	960	0.600	0.159
R8	30	4,650	2,000	1.120	3.870	4,371	1,630	0.790	2,350	4,240	1,100	0.500	1.742	4,000	810	0.450	1.150
R10	38	3,200	2,200	1.100	4.120	3,008	1,450	0.840	2,530	2,918	1,100	0.520	1.866	3,100	800	0.400	1.000

절입량 Depth of Cut

- Ap : Axial Depth
- Ae : Radial Depth
- D : Outside Diameter
- n : Speed
- Vf : Feed



- 유효장 길이가 긴 경우, RPM과 FEED를 동일 비율로 낮춰 주세요.
- 상기 절삭조건은 참고 수치이므로 실 가공시 가공 형상, 가공 목적, 적용 기계에 따라 조건 변경 요망합니다.
- 적용 기계의 회전 속도가 부족한 경우에는 회전 속도와 이송 속도를 같은 비율로 줄여서 적용 합니다.
- 진동이 적고 강성이 좋은 공작기계 사용 요망 합니다(Ø1이하 사용시 진동 허용 관리 5㎛이내 일것.)
- 원활한 칩배출을 위하여 에어브로 혹은 미스트 쿨런트 사용을 추천하며, 동 가공시 습식 쿨런트를 추천 합니다.

- If the effective length is long, reduce the RPM and feed in the same proportion.
- Use this table for your reference. Adjust the parameters depending on your machining geometry, machining purpose and CNC.
- If the table over the maximum RPM and feed of your machine, adjust RPM and feed in the same proportion.
- Use a machine with low vibration and good rigidity (Ø1 or less, the vibration tolerance management should be within 5㎛).
- Air blow or oil mist is recommended for smooth chip emission, and wet coolant milling is recommended for copper material.