" Carbide End Mills "

" Carbide End Mills "

■ Square Carbide End Mills Choice

Tool name	Aluminium End Mills							
Type	Square		Corner Radius	Square			Small Radius	
Pictures	NEW 		NEW 					NEW 
Page	240	241	244	247	249	252	252	253
Cod. No.	AL-SEESS2	AL-SEES2	AL-SEES2R	AL-SEEL2	AL-SEES3	AL-SEES-LS	AL-SEES-LSR	AL-SEES-XLSR
Range of size	ø1~ø10	ø1~ø30	ø6~ø20	ø3~ø25	ø3~ø25	ø6~ø22	ø6~ø22	ø6~ø22
No. of flute	2	2	2	2	3	3	3	3
Lenght of cut	Short	Regular	Regular	Long	Regular	Regular	Regular	Regular
Base Material	K10							
Coating	Uncoated							
Carbon/Alloy steel								
Hardned steel up to ~ HRc 45								
Hardned steel up to ~ HRc 50								
Stainless steel								
Cast Iron								
Aluminium alloys	☺	☺	☺	☺	☺	☺	☺	☺
Copper alloys Graphite	😐	😐	😐	😐	😐	😐	😐	😐
Titanium alloys								
Plastics	😐	😐	😐	😐	😐	😐	😐	😐
Features	Sharp corner Helix angle 45° Short cuttig edge	Sharp corner Helix angle 45° Regular cuttig length	Corner radius Helix angle 45° Regular cuttig edge	Sharp corner Helix angle 45° Long cuttig length	Sharp corner Helix angle 45° For high speed & feed	Sharp corner Helix angle 45° Long shank	With small corner radius Helix angle 45° Long shank	With small corner radius Helix angle 45° Extra-long shank

☺ = Very Good 😐 = OK ☹ = Not recommended

" Carbide End Mills "

One-Cut			Super One-Cut					
Square			Square	Corner Radius	Square			
	NEW							
								
256	257	258	260	261	262	263	264	
DZ-OCZX2	DZ-OCZX4	DZ-OCRS	DZ-SOCS	DZ-SOCS	DZ-SOCM	DZ-SOCL	DZ-SOCLS	
ø1~ø12	ø2~ø12	ø6~ø12	ø3~ø20	ø3~ø12	ø3~ø20	ø6~ø20	ø3~ø22	
2	4	3 - 4	4	4	4	4	4	
Regular	Regular	Regular	Regular	Regular	Medium	Long	Regular	
Micro Grain			Micro Grain					
DZ-Coat (TiAlN)			DZ-Coat (TiAlN)					
☺	☺	☺	☺	☺	☺	☺	☺	
☺	☺	☺	☺	☺	☺	☺	☺	
😐	😐		😐	😐	☹	☹	☹	
😐	😐		☹					
☺	☺	☺	☺	☺	☺	😐	😐	
			☺	☺	☺	☺	☺	
			☺	☺	☺	☺	☺	
Helix angle 30° Regular cutting edge For shrink-fit holder Up to 50HRC	Helix angle 30° Regular cutting edge For shrink-fit holder Up to 50HRC	Low cutting force Helix angle 20° For high feed machining	High performance Helix angle 45° Regular cutting edge	High performance Helix angle 45° With corner radius	High performance Helix angle 45° Medium cutting edge	High performance Helix angle 45° Long cutting edge	High performance Helix angle 45° Long shank	

☺ = Very Good 😐 = OK ☹ = Not recommended

" Carbide End Mills "

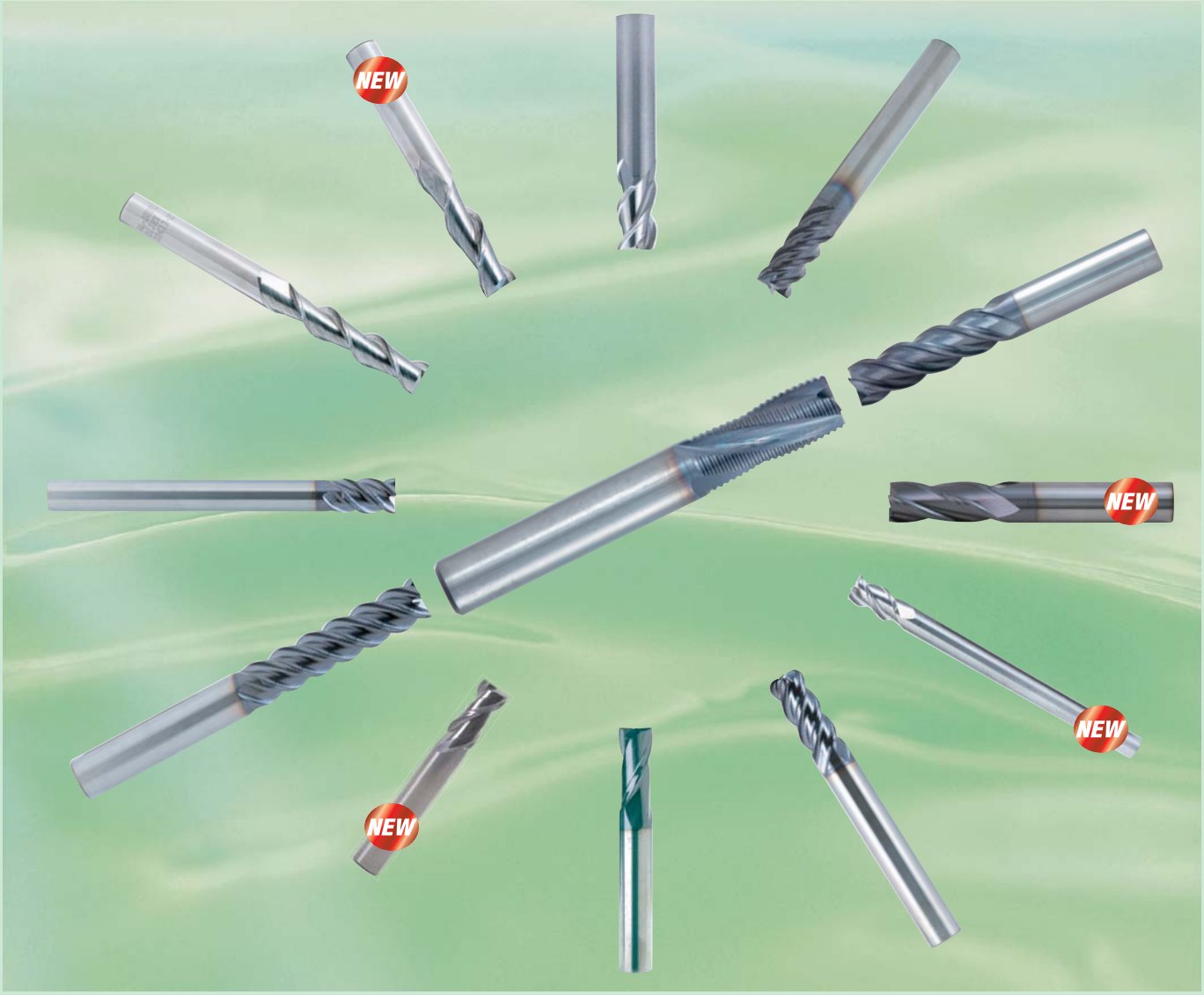
■ Ball Nose Carbide End Mills Choice

Tool name	Super Short	One-Cut		Graphite				
Type	Ball	Ball		Ball				
Pictures								
Page	268	269	271	274	275	276		
Cod. No.	DZ-SSB	DZ-OCLB-S	DZ-OCLB-T	GF-SBR	GF-SBL	GF-SBX		
Range of size	ø3~ø6	ø4~ø25	ø4~ø12	ø2~ø12	ø2~ø12	ø2~ø12		
No. of flute	2	2	2	2	3	2		
Length of cut	Regular	Regular & Long	Regular & Long	Long	Long	Long		
Base Material	Micro Grain			Micro Grain				
Coating	DZ-Coat (TiAlN)			Uncoated				
Carbon/Alloy steel	☺	☺	☺					
Hardned steel up to ~ HRc 45	☺	☺	☺					
Hardned steel up to ~ HRc 50	☺	☺	☺					
Stainless steel	😐	☹	☹					
Cast Iron	😐	☺	☺					
Aluminium alloys	☺	😐	😐	😐	😐	😐		
Copper alloys Graphite				☺	☺	☺		
Titanium alloys	😐			☹	☹	☹		
Plastics				😐	😐	😐		
Features	For shrink-fit holder Helix angle 30° Stub overall length	Extra-long Straight neck Helix angle 30° Up to 50 HRc	Extra-long Taper neck Helix angle 30° Up to 50 HRc	For graphite Helix angle 15° Standard type	For graphite Helix angle 15° Long type	For graphite Helix angle 30° Extra-long type		

☺ = Very Good 😐 = OK ☹ = Not recommended

“ Carbide End Mills ”

■ Square Carbide End Mills



" Aluminium End Mills "

Shoulder Milling | Slotting

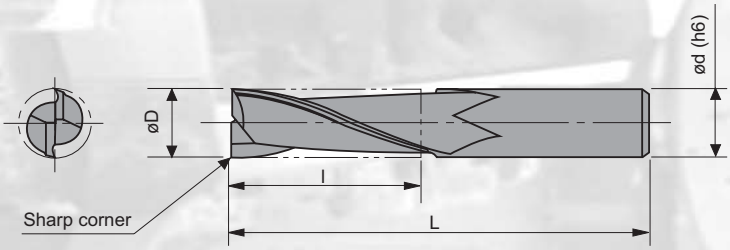
AL-SEESS-2 (Short Type)

- For aluminium alloys
- Sharp corner
- Helix angle 45°
- 2 Flutes
- Short cutting edge

NEW

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø10.0 Up to	0.000 -0.020



Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
AL-SEESS2010	●	1.0	2	40	4	2			
AL-SEESS2015	●	1.5	3	40	4	2			
AL-SEESS2020	●	2.0	4	40	4	2			
AL-SEESS2025	●	2.5	5	40	4	2			
AL-SEESS2030	●	3.0	6	50	6	2			
AL-SEESS2035	●	3.5	7	50	6	2			
AL-SEESS2040	●	4.0	8	50	6	2			
AL-SEESS2045	●	4.5	9	50	6	2			
AL-SEESS2050	●	5.0	10	55	6	2			
AL-SEESS2055	●	5.5	11	55	6	2			
AL-SEESS2060	●	6.0	12	55	6	2			
AL-SEESS2065	●	6.5	13	55	6	2			
AL-SEESS2070	●	7.0	14	65	8	2			
AL-SEESS2075	●	7.5	15	65	8	2			
AL-SEESS2080	●	8.0	16	65	8	2			
AL-SEESS2085	●	8.5	17	65	8	2			
AL-SEESS2090	●	9.0	18	70	10	2			
AL-SEESS2095	●	9.5	19	70	10	2			
AL-SEESS2100	●	10.0	20	70	10	2			

" Aluminium End Mills "

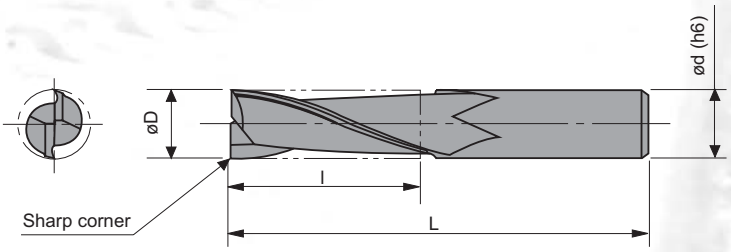
Shoulder Milling | Slotting

AL-SEES-2 (Standard Type)

- For aluminium alloys
- Sharp corner
- Helix angle 45°
- 2 Flutes
- Regular cutting edge

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø25.0 Up to	0.000 -0.020



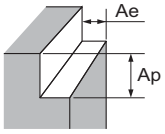
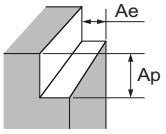
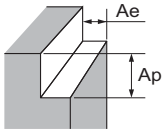
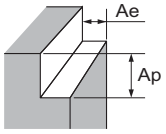
Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
AL-SEES2010	●	1.0	2.8	40	4	2			
AL-SEES2015	○	1.5	4.4	40	4	2			
AL-SEES2020	●	2.0	7	40	4	2			
AL-SEES2025	○	2.5	9	40	4	2			
AL-SEES2030	●	3.0	11	50	6	2			
AL-SEES2040	●	4.0	14	50	6	2			
AL-SEES2050	●	5.0	17	55	6	2			
AL-SEES2060	●	6.0	17	55	6	2			
AL-SEES2070	○	7.0	22	65	8	2			
AL-SEES2080	●	8.0	22	65	8	2			
AL-SEES2090	○	9.0	22	70	10	2			
AL-SEES2100	●	10.0	28	75	10	2			
AL-SEES2120	●	12.0	28	80	12	2			
AL-SEES2130	○	13.0	35	85	12	2			
AL-SEES2140	○	14.0	40	95	16	2			
AL-SEES2150	○	15.0	40	95	16	2			
AL-SEES2160	●	16.0	40	95	16	2			
AL-SEES2180	○	18.0	45	115	20	2			
AL-SEES2200	●	20.0	45	115	20	2			
AL-SEES2210	○	21.0	55	130	25	2			
AL-SEES2200	●	22.0	55	130	25	2			
AL-SEES2230	○	23.0	55	130	25	2			
AL-SEES2240	○	24.0	55	130	25	2			
AL-SEES2250	●	25.0	55	130	25	2			
AL-SEES2260	○	26.0	55	130	32	2			
AL-SEES2270	○	27.0	55	130	32	2			
AL-SEES2280	○	28.0	65	140	32	2			
AL-SEES2290	○	29.0	65	140	32	2			
AL-SEES2300	●	30.0	65	140	32	2			

○ Stock in Japan

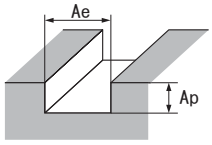
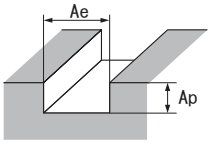
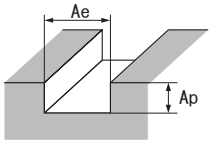
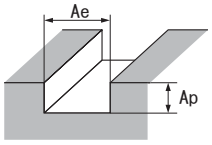
" Aluminium End Mills "

■ *Recommended cutting conditions for AL-SEESS-2 and AL-SEES-2 type*

1. Shoulder cutting (Please see note page 245)

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.5D		 Ap=1.5D Ae=0.5D		 Ap=1.5D Ae=0.5D		 Ap=1.5D Ae=0.5D	
TooløD (mm)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)
1	32,000	900	32,000	900	32,000	900	32,000	900
1.5	32,000	1,400	32,000	1,400	32,000	1,400	32,000	1,400
2	32,000	1,900	32,000	1,900	32,000	1,900	25,000	1,500
3	24,000	2,200	22,000	2,000	24,000	2,200	17,000	1,500
4	18,000	2,200	16,000	2,000	18,000	2,200	13,000	1,500
5	15,000	2,200	13,000	2,000	15,000	2,200	10,000	1,500
6	12,000	2,200	10,000	2,000	12,000	2,200	8,500	1,500
8	9,000	1,800	8,000	1,600	9,000	1,800	6,500	1,300
10	7,300	1,800	6,000	1,600	7,300	1,800	5,000	1,300
12	6,000	1,800	5,000	1,600	6,000	1,800	4,000	1,300
16	4,500	1,500	4,000	1,400	4,500	1,500	3,000	1,000
20	3,600	1,500	3,000	1,400	3,600	1,500	2,500	1,000
25	3,000	1,500	2,500	1,400	3,000	1,500	2,000	1,000
30	2,500	1,250	2,100	1,050	2,500	1,250	1,700	850

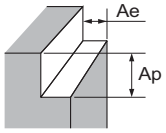
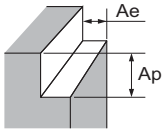
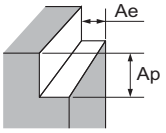
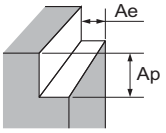
2. Slotting (Please see note page 245)

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=D Ae=D		 Ap=D Ae=D		 Ap=D Ae=D		 Ap=D Ae=D	
TooløD (mm)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)
1	32,000	570	32,000	570	32,000	570	32,000	570
1.5	32,000	860	32,000	860	32,000	860	29,000	780
2	32,000	1,100	27,000	1,000	32,000	1,100	22,000	800
3	21,000	1,100	18,000	1,000	21,000	1,100	14,000	800
4	16,000	1,100	13,000	1,000	16,000	1,100	11,000	800
5	12,000	1,100	10,000	1,000	12,000	1,100	8,900	800
6	10,000	1,100	9,000	1,000	10,000	1,100	7,400	800
8	8,000	1,100	7,000	1,000	8,000	1,100	5,500	800
10	6,000	1,100	5,500	1,000	6,000	1,100	4,500	800
12	5,000	1,100	4,500	1,000	5,000	1,100	3,700	800
16	4,000	1,000	3,300	800	4,000	1,000	2,700	700
20	3,000	900	2,700	800	3,000	900	2,200	650
25	2,500	900	2,000	700	2,500	900	1,800	650
30	2,000	800	1,800	700	2,000	800	1,500	600

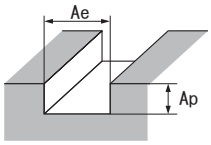
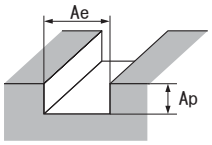
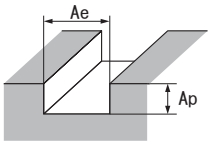
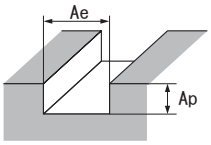
" Aluminium End Mills "

■ H.S.C. Recommended cutting conditions for AL-SEESS2 and AL-SEES2 type

1. Shoulder cutting (Please see note page 245)

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
1	50,000	1,500	50,000	1,500	50,000	1,500	50,000	1,500
1.5	50,000	2,200	50,000	2,200	50,000	2,200	50,000	2,200
2	50,000	3,000	50,000	3,000	50,000	3,000	50,000	3,000
3	50,000	4,500	45,000	4,000	50,000	4,500	37,000	3,300
4	40,000	4,500	34,000	4,000	40,000	4,500	27,000	3,300
5	32,000	4,500	27,000	4,000	32,000	4,500	22,000	3,300
6	27,000	4,500	22,000	4,000	27,000	4,500	18,000	3,300
8	20,000	4,000	17,000	3,400	20,000	4,000	14,000	2,800
10	16,000	4,000	13,000	3,200	16,000	4,000	11,000	2,800
12	13,000	3,200	11,000	2,800	13,000	3,200	9,000	2,200
16	10,000	3,000	8,500	2,500	10,000	3,000	7,000	2,100
20	8,000	2,400	7,000	2,100	8,000	2,400	5,500	1,700
25	6,500	2,200	5,500	2,000	6,500	2,200	4,500	1,600
30	5,000	1,800	4,500	1,600	5,000	1,800	3,700	1,300

2. Slotting (Please see note page 245)

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=0.5D Ae=D		 Ap=0.5D Ae=D		 Ap=0.5D Ae=D		 Ap=0.5D Ae=D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
1	50,000	900	50,000	900	50,000	900	50,000	900
1.5	50,000	1,350	50,000	1,350	50,000	1,350	50,000	1,350
2	50,000	1,800	50,000	1,800	50,000	1,800	48,000	1,700
3	48,000	2,500	40,000	2,100	48,000	2,500	32,000	1,700
4	36,000	2,500	30,000	2,100	36,000	2,500	23,000	1,700
5	28,000	2,500	24,000	2,100	28,000	2,500	19,000	1,700
6	23,000	2,500	20,000	2,100	23,000	2,500	16,000	1,700
8	18,000	2,500	15,000	2,100	18,000	2,500	12,000	1,700
10	14,000	2,500	12,000	2,100	14,000	2,500	9,500	1,700
12	12,000	2,500	10,000	2,100	12,000	2,500	8,000	1,700
16	9,000	2,500	8,000	2,100	9,000	2,500	6,000	1,700
20	7,000	2,100	6,000	1,800	7,000	2,100	4,800	1,400
25	5,700	2,000	4,800	1,700	5,700	2,000	3,800	1,300
30	4,700	1,600	4,000	1,400	4,700	1,600	3,200	1,100

" Aluminium End Mills "

Shoulder Milling | Slotting

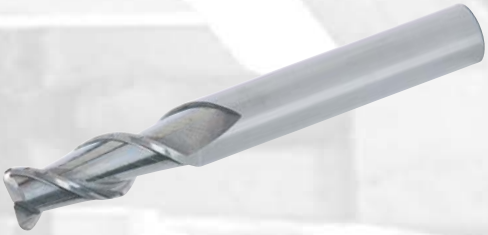
AL-SEES2-R (Standard Type - Corner Radius)

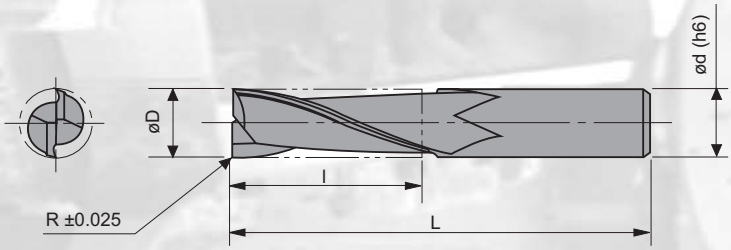
- For aluminium alloys
- Corner Radius
- Helix angle 45°
- 2 Flutes
- Standard cutting edge

NEW

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø20.0 Up to	0.000 -0.020



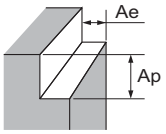
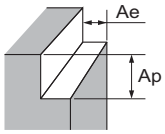
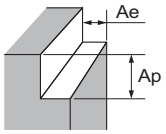
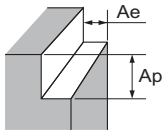


Cat. No.	Stock	Dimensions (mm)							
		R	øD	l	L	ød	Z		
AL-SEES2060-R05	●	0.5	**6.0**	17	55	6	2		
AL-SEES2060-R10	●	1.0	**6.0**	17	55	6	2		
AL-SEES2060-R15	●	1.5	**6.0**	17	55	6	2		
AL-SEES2080-R05	●	0.5	**8.0**	22	65	8	2		
AL-SEES2080-R10	●	1.0	**8.0**	22	65	8	2		
AL-SEES2080-R15	●	1.5	**8.0**	22	65	8	2		
AL-SEES2080-R20	●	2.0	**8.0**	22	65	8	2		
AL-SEES2100-R05	●	0.5	**10.0**	28	75	10	2		
AL-SEES2100-R10	●	1.0	**10.0**	28	75	10	2		
AL-SEES2100-R15	●	1.5	**10.0**	28	75	10	2		
AL-SEES2100-R20	●	2.0	**10.0**	28	75	10	2		
AL-SEES2120-R05	●	0.5	**12.0**	28	80	12	2		
AL-SEES2120-R10	●	1.0	**12.0**	28	80	12	2		
AL-SEES2120-R15	●	1.5	**12.0**	28	80	12	2		
AL-SEES2120-R20	●	2.0	**12.0**	28	80	12	2		
AL-SEES2120-R30	●	3.0	**12.0**	28	80	12	2		
AL-SEES2160-R05	●	0.5	**16.0**	40	95	16	2		
AL-SEES2160-R10	●	1.0	**16.0**	40	95	16	2		
AL-SEES2160-R15	●	1.5	**16.0**	40	95	16	2		
AL-SEES2160-R20	●	2.0	**16.0**	40	95	16	2		
AL-SEES2160-R30	●	3.0	**16.0**	40	95	16	2		
AL-SEES2200-R05	●	0.5	**20.0**	45	115	20	2		
AL-SEES2200-R10	●	1.0	**20.0**	45	115	20	2		
AL-SEES2200-R15	●	1.5	**20.0**	45	115	20	2		
AL-SEES2200-R20	●	2.0	**20.0**	45	115	20	2		
AL-SEES2200-R30	●	3.0	**20.0**	45	115	20	2		

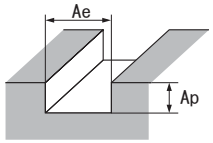
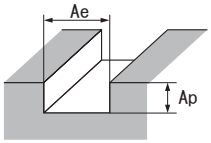
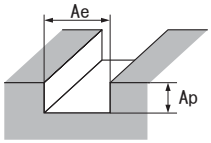
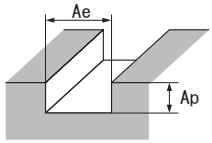
" Aluminium End Mills "

■ Recommended cutting conditions for AL-SEES2-R type

1. Shoulder cutting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.5D		 Ap=1.5D Ae=0.5D		 Ap=1.5D Ae=0.5D		 Ap=1.5D Ae=0.5D	
TooløD (mm)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)
6	12,000	2,400	10,000	2,000	12,000	2,400	8,500	1,700
8	9,000	2,300	8,000	2,000	9,000	2,300	6,500	1,600
10	7,300	2,200	6,000	1,800	7,300	2,200	5,000	1,500
12	6,000	2,100	5,000	1,800	6,000	2,100	4,000	1,400
14	5,200	2,000	4,500	1,800	5,200	2,000	3,500	1,400
16	4,500	2,000	4,000	1,800	4,500	2,000	3,000	1,400
20	3,600	1,800	3,000	1,500	3,600	1,800	2,500	1,250

2. Slotting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=D Ae=D		 Ap=D Ae=D		 Ap=D Ae=D		 Ap=D Ae=D	
TooløD (mm)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)
6	10,000	1,500	9,000	1,350	10,000	1,500	7,400	1,100
8	8,000	1,500	7,000	1,250	8,000	1,500	5,500	1,000
10	6,000	1,200	5,500	1,100	6,000	1,200	4,500	900
12	5,000	1,200	4,500	1,100	5,000	1,200	3,700	900
14	4,500	1,200	3,900	1,100	4,500	1,200	3,200	900
16	4,000	1,200	3,300	1,100	4,000	1,200	2,700	900
20	3,000	1,200	2,700	1,000	3,000	1,200	2,200	900

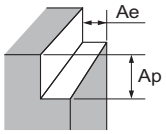
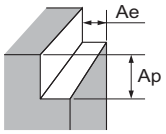
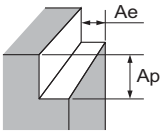
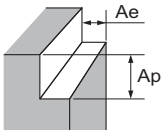
■ Note:

1. Above cutting conditions are for general guidance.
   The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
2. Ramping is not recommended. But in case of working, reduce 30-60% of above data.
3. If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
4. Full slotting is not recommended. But in case of working, reduce depth of cut up to 0.2D and reduce the feed speed 30 to 60% above data.

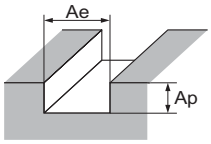
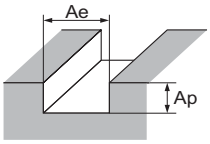
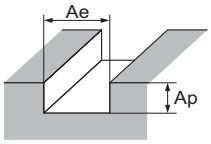
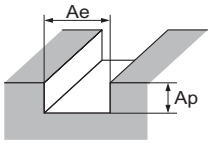
" Aluminium End Mills "

■ H.S.C. Recommended cutting conditions for AL-SEES2-R type

1. Shoulder cutting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D	
TooløD (mm)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)
6	27,000	4,000	22,000	3,300	27,000	3,500	18,000	2,700
8	20,000	4,000	17,000	3,300	20,000	3,500	14,000	2,700
10	16,000	4,000	13,000	3,300	16,000	3,500	11,000	2,700
12	13,000	4,000	11,000	3,300	13,000	3,500	9,000	2,700
14	11,000	4,000	10,000	3,300	11,000	3,500	8,000	2,700
16	10,000	4,000	8,500	3,300	10,000	3,500	7,000	2,700
20	8,000	3,600	7,000	3,100	8,000	3,500	5,500	2,500

2. Slotting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=0.5D Ae=D		 Ap=0.5D Ae=D		 Ap=0.5D Ae=D		 Ap=0.5D Ae=D	
TooløD (mm)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)	N (min⁻¹)	Vf (mm/min)
6	23,000	3,500	20,000	3,000	23,000	3,500	16,000	2,400
8	18,000	3,500	15,000	3,000	18,000	3,500	12,000	2,400
10	14,000	3,500	12,000	3,000	14,000	3,500	9,500	2,400
12	12,000	3,500	10,000	3,000	12,000	3,500	8,000	2,400
14	10,000	3,500	9,000	3,000	10,000	3,500	7,000	2,400
16	9,000	3,500	8,000	3,000	9,000	3,500	6,000	2,400
20	7,000	3,200	6,000	2,700	7,000	3,100	4,800	2,100

■ Note:

1. Above cutting conditions are for general guidance.
   The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
2. Ramping is not recommended. But in case of working, reduce 30-60% of above data.
3. If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
4. Full slotting is not recommended. But in case of working, reduce depth of cut up to 0.2D and reduce the feed speed 30 to 60% above data.

" Aluminium End Mills "

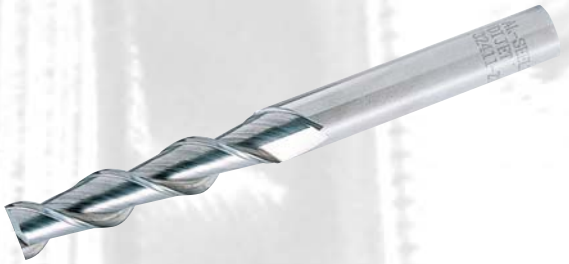
Shoulder Milling Slotting

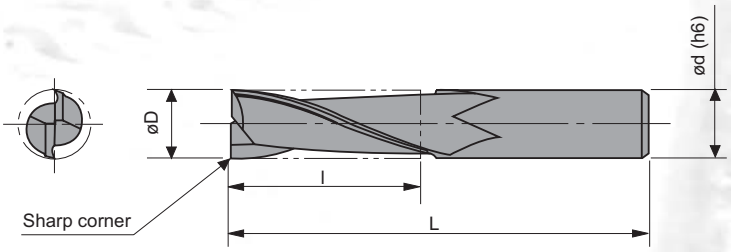
■ AL-SEEL2 (Long Type)

- For aluminium alloys
- Sharp corner
- Helix angle 45°
- 2 Flutes
- Long cutting edge

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø25.0 Up to	0.000 -0.020





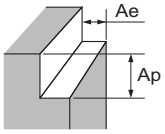
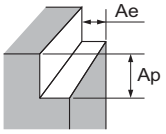
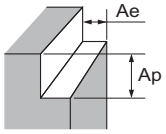
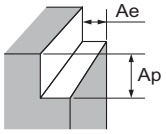
Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
AL-SEEL2030	●	3.0	22	65	6	2			
AL-SEEL2040	●	4.0	26	65	6	2			
AL-SEEL2050	●	5.0	32	75	6	2			
AL-SEEL2060	●	6.0	32	75	6	2			
AL-SEEL2070	●	7.0	42	95	8	2			
AL-SEEL2080	●	8.0	42	95	8	2			
AL-SEEL2090	●	9.0	42	110	10	2			
AL-SEEL2100	●	10.0	53	120	10	2			
AL-SEEL2120	●	12.0	53	120	12	2			
AL-SEEL2130	●	13.0	65	130	12	2			
AL-SEEL2140	●	14.0	75	140	16	2			
AL-SEEL2150	●	15.0	75	140	16	2			
AL-SEEL2160	●	16.0	75	140	16	2			
AL-SEEL2180	●	18.0	75	150	20	2			
AL-SEEL2200	●	20.0	75	150	20	2			
AL-SEEL2210	●	21.0	85	160	25	2			
AL-SEEL2220	●	22.0	85	160	25	2			
AL-SEEL2230	●	23.0	85	160	25	2			
AL-SEEL2240	●	24.0	85	160	25	2			
AL-SEEL2250	●	25.0	85	160	25	2			

● Stock in Japan

" Aluminium End Mills "

■ *Recommended cutting conditions for AL-SEEL-2 type*

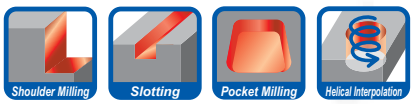
1. Shoulder cutting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.2D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
3	19,000	1,200	16,000	1,000	19,000	1,200	10,000	660
4	14,000	1,200	12,000	1,000	14,000	1,200	8,000	660
5	11,000	1,200	9,500	1,000	11,000	1,200	6,000	660
6	9,500	1,200	8,000	1,000	9,500	1,200	5,000	660
8	7,000	1,200	6,000	1,000	7,000	1,200	4,000	660
10	5,700	1,200	4,800	1,000	5,700	1,200	3,200	660
12	4,700	1,200	4,000	1,000	4,700	1,200	2,600	660
16	3,500	1,000	3,000	900	3,500	1,000	2,000	600
20	2,800	800	2,400	700	2,800	800	1,600	500
25	2,300	800	1,900	650	2,300	800	1,300	500

■ Note:

1. Above cutting conditions are for general guidance.
   The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
2. Ramping is not recommended. But in case of working, reduce 30-60% of above data.
3. If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
4. Full slotting is not recommended. But in case of working, reduce depth of cut up to 0.2D and reduce the feed speed 30 to 60% above data.

" Aluminium End Mills "

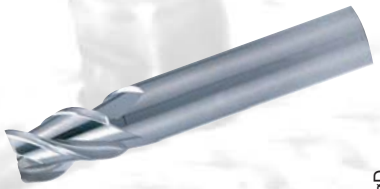


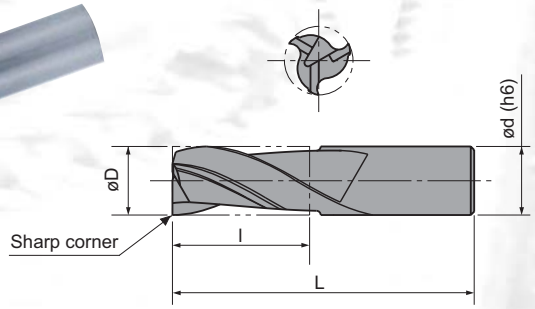
■ AL-SEES3 (Standard Type)

- For Aluminium alloys
- Sharp corner
- Helix angle 45°
- 3 Flutes
- Regular cutting edge
- For high speed machining

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø25.0 Up to	0.000 -0.020



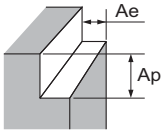
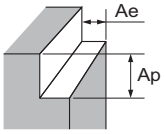
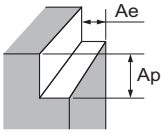
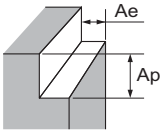


Cod.No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
AL-SEES3030	●	3.0	5	50	6	3			
AL-SEES3040	●	4.0	6	50	6	3			
AL-SEES3050	●	5.0	8	50	6	3			
AL-SEES3060	●	6.0	9	55	6	3			
AL-SEES3080	●	8.0	12	65	8	3			
AL-SEEE3100	●	10.0	15	75	10	3			
AL-SEES3120	●	12.0	18	80	12	3			
AL-SEES3160	●	16.0	24	95	16	3			
AL-SEES3200	●	20.0	30	115	20	3			
AL-SEES3250	●	25.0	38	130	25	3			

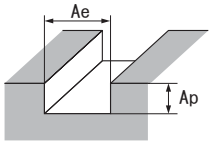
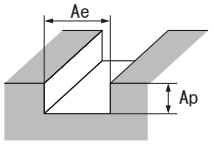
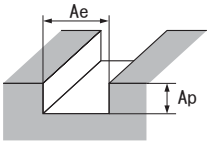
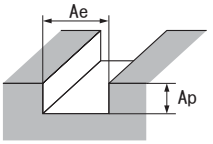
" Aluminium End Mills "

■ Recommended cutting conditions for AL-SEES3 type

1. Shoulder cutting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D		 Ap=1.5D Ae=0.3D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
3	24,000	4,800	22,000	4,400	24,000	4,800	17,000	3,400
4	18,000	4,500	16,000	4,000	18,000	4,500	13,000	3,200
5	15,000	4,500	13,000	4,000	15,000	4,500	10,000	3,200
6	12,000	4,200	10,000	3,500	12,000	4,200	8,500	3,000
8	9,000	3,600	8,000	3,200	9,000	3,600	6,500	2,600
10	7,300	3,200	6,000	2,700	7,300	3,200	5,000	2,200
12	6,000	3,000	5,000	2,500	6,000	3,000	4,000	2,000
16	4,500	2,500	4,000	2,200	4,500	2,500	3,000	1,600
20	3,600	2,100	3,000	1,800	3,600	2,100	2,500	1,500
25	3,000	1,800	2,500	1,500	3,000	1,800	2,000	1,200

2. Slotting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=D Ae=D		 Ap=D Ae=D		 Ap=D Ae=D		 Ap=D Ae=D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
3	21,000	3,100	18,000	2,700	21,000	3,100	14,000	2,100
4	16,000	2,500	13,000	2,000	16,000	2,500	11,000	1,700
5	12,000	2,100	10,000	1,800	12,000	2,100	8,900	1,600
6	10,000	2,000	9,000	1,800	10,000	2,000	7,400	1,500
8	8,000	2,000	7,000	1,750	8,000	2,000	5,500	1,400
10	6,000	1,800	5,500	1,650	6,000	1,800	4,500	1,350
12	5,000	1,800	4,500	1,600	5,000	1,800	3,700	1,300
16	4,000	1,600	3,300	1,300	4,000	1,600	2,700	1,000
20	3,000	1,350	2,700	1,200	3,000	1,350	2,200	1,000
25	2,500	1,100	2,000	900	2,500	1,100	1,800	800

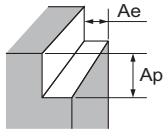
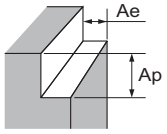
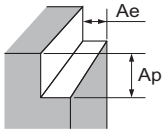
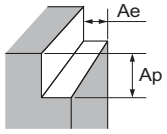
■ Note:

1. Above cutting conditions are for general guidance.
   The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
2. Ramping is not recommended. But in case of working, reduce 30-60% of above data.
3. If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
4. Full slotting is not recommended. But in case of working, reduce depth of cut up to 0.2D and reduce the feed speed 30 to 60% above data.

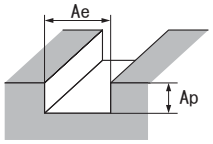
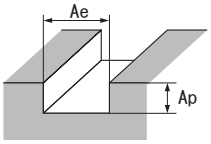
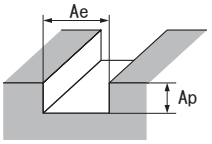
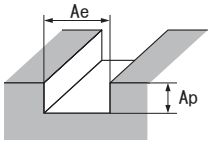
" Aluminium End Mills "

■ H.S.C. Recommended cutting conditions for AL-SEES3 type

1. Shoulder cutting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.2D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
3	50,000	9,000	45,000	8,100	50,000	9,000	37,000	6,600
4	40,000	8,000	34,000	6,800	40,000	8,000	27,000	5,400
5	32,000	8,000	27,000	6,800	32,000	8,000	22,000	5,400
6	27,000	6,800	22,000	5,500	27,000	6,800	18,000	4,500
8	20,000	6,000	17,000	5,000	20,000	6,000	14,000	4,200
10	16,000	5,600	13,000	4,500	16,000	5,600	11,000	3,900
12	13,000	5,200	11,000	4,400	13,000	5,200	9,000	3,600
16	10,000	4,500	8,500	3,800	10,000	4,500	7,000	3,100
20	8,000	4,000	7,000	3,500	8,000	4,000	5,500	2,800
25	6,500	3,200	5,500	2,800	6,500	3,200	4,500	2,200

2. Slotting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=0.5D Ae=D		 Ap=0.5D Ae=D		 Ap=0.5D Ae=D		 Ap=0.5D Ae=D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
3	48,000	5,600	40,000	4,800	48,000	5,600	32,000	3,800
4	36,000	5,600	30,000	4,800	36,000	5,600	23,000	3,800
5	28,000	5,600	24,000	4,800	28,000	5,600	19,000	3,800
6	23,000	5,600	20,000	4,800	23,000	5,600	16,000	3,800
8	18,000	5,000	15,000	4,200	18,000	5,000	12,000	3,300
10	14,000	4,200	12,000	3,600	14,000	4,200	9,500	2,800
12	12,000	3,800	10,000	3,200	12,000	3,800	8,000	2,600
16	9,000	3,100	8,000	2,800	9,000	3,100	6,000	2,100
20	7,000	2,800	6,000	2,400	7,000	2,800	4,800	1,900
25	5,700	2,200	4,800	1,900	5,700	2,200	3,800	1,500

■ Note:

1. Above cutting conditions are for general guidance.
   The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
2. Ramping is not recommended. But in case of working, reduce 30-60% of above data.
3. If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
4. Full slotting is not recommended. But in case of working, reduce depth of cut up to 0.2D and reduce the feed speed 30 to 60% above data.

" Aluminium End Mills "

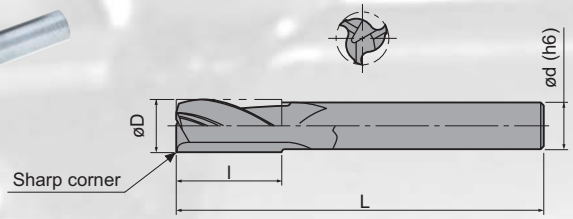
Shoulder Milling | Slotting

AL-SEES3-LS (Long Shank Type)

- For Aluminium alloys
- Sharp corner
- Helix angle 45°
- 3 Flutes
- Long shank type
- For high speed machining

■ Tolerance for øD (mm)

øD	Tolerance
ø6.0 ~ ø12.0 Up to	0.000 -0.020
ø14.0 ~ ø22.0 Up to	0.000 -0.020



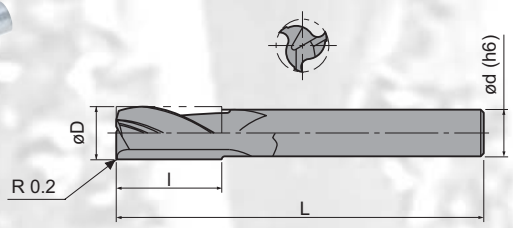
Cod.No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
AL-SEES3060-LS	●	6.0	9	80	4	3			
AL-SEES3080-LS	●	8.0	12	100	6	3			
AL-SEES3100-LS	●	10.0	15	130	8	3			
AL-SEES3120-LS	●	12.0	18	150	10	3			
AL-SEES3140-LS	●	14.0	21	160	12	3			
AL-SEES3180-LS	●	18.0	27	180	16	3			
NEW AL-SEES3200-LS	●	20.0	30	200	18	3			
AL-SEES3220-LS	●	22.0	33	200	20	3			

AL-SEES3-LS-R0.2 (Long Shank Type)

- For Aluminium alloys
- Corner radius 0.2
- Helix angle 45°
- 3 Flutes
- Long shank type
- For high speed machining

■ Tolerance for øD (mm)

øD	Tolerance
ø6.0 ~ ø12.0 Up to	0.000 -0.020
ø14.0 ~ ø22.0 Up to	0.000 -0.020



Cod.No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
AL-SEES3060-LS-R02	●	6.0	9	80	4	3			
AL-SEES3080-LS-R02	●	8.0	12	100	6	3			
AL-SEES3100-LS-R02	●	10.0	15	130	8	3			
AL-SEES3120-LS-R02	●	12.0	18	150	10	3			
AL-SEES3140-LS-R02	●	14.0	21	160	12	3			
AL-SEES3160-LS-R02	●	16.0	24	180	14	3			
AL-SEEE3180-LS-R02	●	18.0	27	180	16	3			
NEW AL-SEES3200-LS-R02	●	20.0	30	200	18	3			
AL-SEES3220-LS-R02	●	22.0	33	200	20	3			

" Aluminium End Mills "

Shoulder Milling | Slotting

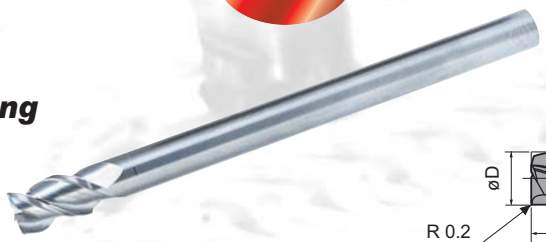
■ AL-SEES3-XLS-R0.2 (Extra Long Shank Type)

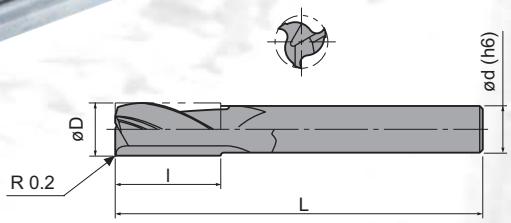
- For Aluminium alloys
- Corner radius 0.2
- Helix angle 45°
- 3 Flutes
- Extra long shank type
- For high speed machining

NEW

■ Tolerance for øD (mm)

øD	Tolerance
ø10.0 ~ ø12.0 Up to	0.000 -0.020
ø14.0 ~ ø22.0 Up to	0.000 -0.020



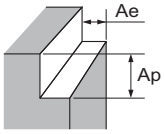
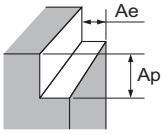
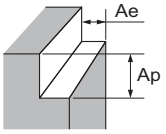
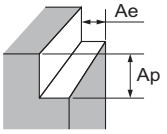


Cod.No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
AL-SEES3060-XLS-R02	●	6.0	9	100	5	3			
AL-SEES3080-XLS-R02	●	8.0	12	140	7	3			
AL-SEES3100-XLS-R02	●	10.0	15	160	9	3			
AL-SEES3120-XLS-R02	●	12.0	18	180	11	3			
AL-SEES3140-XLS-R02	●	14.0	21	200	13	3			
AL-SEES3160-XLS-R02	●	16.0	24	220	15	3			
AL-SEES3180-XLS-R02	●	18.0	27	240	17	3			
AL-SEES3200-XLS-R02	●	20.0	30	250	18	3			
AL-SEEE3220-XLS-R02	●	22.0	33	250	20	3			

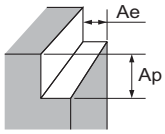
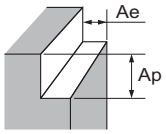
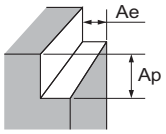
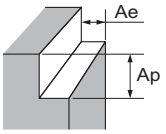
" Aluminium End Mills "

■ Recommended cutting conditions for AL-SEES3-LS and LS 02 type

1. Shoulder cutting LS

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.05D		 Ap=1.5D Ae=0.05D		 Ap=1.5D Ae=0.05D		 Ap=1.5D Ae=0.05D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
6	9,500	1,400	8,000	1,200	9,500	1,400	5,000	750
8	7,000	1,100	6,000	1,000	7,000	1,100	4,000	650
10	5,700	1,000	4,800	850	5,700	1,000	3,200	570
12	4,700	940	4,000	800	4,700	940	2,600	520
14	4,000	880	3,400	750	4,000	880	2,200	500
16	3,500	800	3,000	700	3,500	800	2,000	450
18	3,200	800	2,600	650	3,200	800	1,800	450
20	2,800	700	2,400	600	2,800	700	1,600	400
22	2,600	650	2,100	520	2,600	650	1,400	350

1. Shoulder cutting LS 02

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.05D		 Ap=1.5D Ae=0.05D		 Ap=1.5D Ae=0.05D		 Ap=1.5D Ae=0.05D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
6	10,000	1,500	9,000	1,350	10,000	1,500	7,400	1,100
8	8,000	1,400	7,000	1,250	8,000	1,400	5,500	1,000
10	6,000	1,200	5,500	1,100	6,000	1,200	4,500	900
12	5,000	1,100	4,500	1,000	5,000	1,100	3,700	800
14	4,500	1,000	3,900	900	4,500	1,000	3,200	750
16	4,000	1,000	3,300	800	4,000	1,000	2,700	670
18	3,500	950	3,000	800	3,500	950	2,500	670
20	3,000	900	2,700	800	3,000	900	2,200	670
22	2,900	900	2,500	750	2,900	900	2,000	600

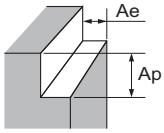
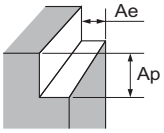
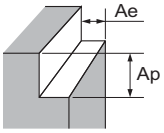
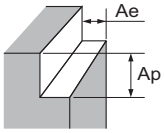
■ Note:

1. Above cutting conditions are for general guidance.
   The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
2. Ramping is not recommended. But in case of working, reduce 30-60% of above data.
3. If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
4. Full slotting is not recommended. But in case of working, reduce depth of cut up to 0.2D and reduce the feed speed 30 to 60% above data.

" Aluminium End Mills "

■ H.S.C. Recommended cutting conditions for AL-SEES3-LS02 type

1. Shoulder cutting

Work Materials	Aluminum alloy (A 5052)		Aluminum alloy (A7075)		Cast aluminum alloy (Up to 13% Si)		Copper alloy C1100	
Type of machining	 Ap=1.5D Ae=0.04D		 Ap=1.5D Ae=0.04D		 Ap=1.5D Ae=0.04D		 Ap=1.5D Ae=0.04D	
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
6	20,000	2,600	17,000	2,200	20,000	2,600	12,000	1,600
8	15,000	2,100	13,000	1,800	15,000	2,100	9,000	1,300
10	12,000	2,000	10,000	1,800	12,000	2,000	7,300	1,200
12	10,000	2,000	9,000	1,800	10,000	2,000	6,000	1,200
14	8,500	1,850	7,500	1,600	8,500	1,850	5,000	1,100
16	7,500	1,650	6,500	1,400	7,500	1,650	4,500	1,000
18	6,500	1,500	6,000	1,400	6,500	1,500	4,000	1,000
20	6,000	1,500	5,000	1,250	6,000	1,500	3,600	900
22	5,500	1,400	4,800	1,200	5,500	1,400	3,300	800

■ Note:

1. Above cutting conditions are for general guidance.
   The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
2. Ramping is not recommended. But in case of working, reduce 30-60% of above data.
3. If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
4. Full slotting is not recommended. But in case of working, reduce depth of cut up to 0.2D and reduce the feed speed 30 to 60% above data.

" One-Cut End Mills "

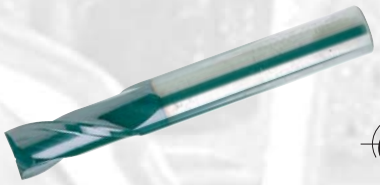
Shoulder Milling Slotting

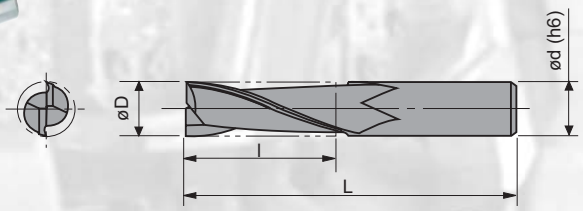
■ DZ-OCZX-2 (Standard Type)

- Helix angle 30°
- 2 Flutes
- Regular cutting edge
- For shrink-fit holder

■ Tolerance for øD (mm)

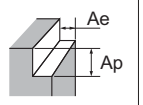
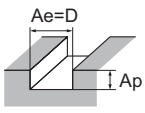
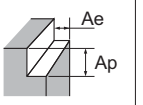
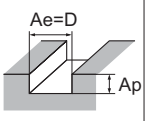
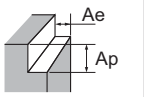
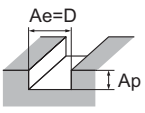
øD	Tolerance
ø1.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø12.0 Up to	0.000 -0.020





Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
DZ-OCZX2010	●	1.0	2.5	40	4	2			
DZ-OCZX2015	●	1.5	4	40	4	2			
DZ-OCZX2020	●	2.0	6	40	4	2			
DZ-OCZX2025	●	2.5	8	40	4	2			
DZ-OCZX2030	●	3.0	8	45	6	2			
DZ-OCZX2040	●	4.0	11	45	6	2			
DZ-OCZX2050	●	5.0	13	50	6	2			
DZ-OCZX2060	●	6.0	13	50	6	2			
DZ-OCZX2080	●	8.0	19	60	8	2			
DZ-OCZX2100	●	10.0	22	70	10	2			
DZ-OCZX2120	●	12.0	25	75	12	2			

■ Recommended cutting conditions for DZ-OCZX-2

Work Materials	Carbon steel, alloy steel, Cast iron below 25HRc			Alloy steel, Tool steel 25 - 40HRc			Hardened steel 40 - 50HRc		
Type of machining		 Ap=1.5D Ae≦0.2D	 Ap≦0.2D (D≦φ3) Ap≦0.5D (D＞φ3)		 Ap=1.5D Ae≦0.2D	 Ap≦0.2D (D≦φ3) Ap≦0.5D (D＞φ3)		 Ap=1.5D Ae≦0.2D	 Ap≦0.2D (D≦φ3) Ap≦0.5D (D＞φ3)
TooløD (mm)	N (min⁻¹)	Shoulder Vf (mm/min)	Slotting Vf (mm/min)	N (min⁻¹)	Shoulder Vf (mm/min)	Slotting Vf (mm/min)	N (min⁻¹)	Shoulder VF (mm/min)	Slotting VF (mm/min)
1	31,800	140	230	19,100	80	140	9,500	40	60
2	15,900	240	280	9,500	140	170	4,770	65	75
3	10,600	240	280	6,400	140	170	3,180	65	75
4	8,000	240	280	4,800	140	170	2,380	65	75
5	6,300	240	280	3,800	140	170	1,900	65	75
6	5,300	340	400	3,200	200	240	1,600	90	110
8	4,000	340	400	2,400	200	240	1,200	90	110
10	3,200	340	400	1,900	200	240	950	90	110
12	2,700	360	400	1,600	220	240	800	100	110

" One-Cut End Mills "

Shoulder Milling | Slotting

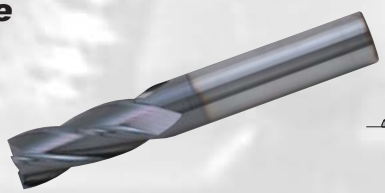
■ DZ-OCZX-4 (Standard Type)

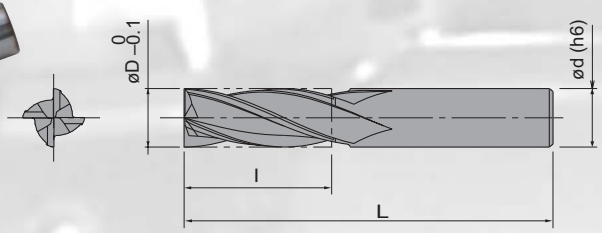
- Helix angle 30°
- 4 Flutes
- Regular cutting edge
- For shrink-fit holder

NEW

■ Tolerance for øD (mm)

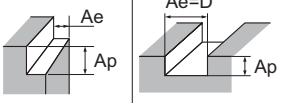
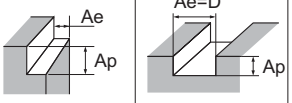
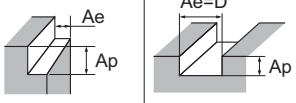
øD	Tolerance
de ø6.0 ~ a ø8.0	0.000 -0.010
de ø10.0 ~ a ø12.0	0.000 -0.010





Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
DZ-OCZX4020	●	2.0	6	40	4	4			
DZ-OCZX4030	●	3.0	9	45	6	4			
DZ-OCZX4040	●	4.0	12	45	6	4			
DZ-OCZX4050	●	5.0	14	50	6	4			
DZ-OCZX4060	●	6.0	15	50	6	4			
DZ-OCZX4080	●	8.0	22	60	8	4			
DZ-OCZX4100	●	10.0	25	70	10	4			
DZ-OCZX4120	●	12.0	28	75	12	4			

■ Recommended cutting conditions for DZ-OCZX-4

Work Materials	Carbon steel, alloy steel, Cast iron below 25HRc			Alloy steel, Tool steel 25 - 40HRc			Hardened steel 40 - 50HRc		
Type of machining		 Ap=1.5D Ae≦0.2D	Ap≦0.5D		 Ap=1.5D Ae≦0.2D	Ap≦0.5D		 Ap=1.5D Ae≦0.2D	Ap≦0.5D
TooløD (mm)	N (min⁻¹)	Shoulder Vf (mm/min)	Slotting Vf (mm/min)	N (min⁻¹)	Shoulder Vf (mm/min)	Slotting Vf (mm/min)	N (min⁻¹)	Shoulder Vf (mm/min)	Slotting Vf (mm/min)
2	15,900	400	500	9,500	240	300	4,770	110	140
3	10,600	400	500	6,400	240	300	3,180	110	140
4	8,000	400	520	4,800	240	310	2,380	110	140
5	6,300	400	520	3,800	240	310	1,900	110	140
6	5,300	600	520	3,200	360	310	1,600	160	140
8	4,000	600	520	2,400	360	310	1,200	160	140
10	3,200	600	520	1,900	360	310	950	160	140
12	2,700	600	520	1,600	360	310	800	160	140

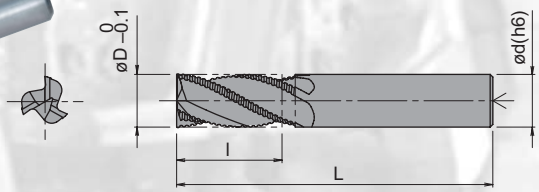
" One-Cut End Mills "

■ DZ-OCRS (Standard Type)

- Low cutting force
- For roughing formed cutting edge
- Helix angle 20°
- 3-4 Flutes
- High feed machining

■ Tolerance for øD (mm)

øD	Tolerance
ø6.0 ~ ø8.0 Up to	0.000 -0.010
ø10.0 ~ ø12.0 Up to	0.000 -0.010

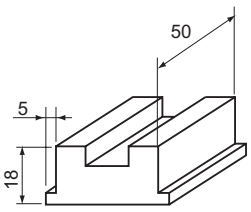


Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
DZ-OCRS3060	●	6.0	14	57	6	3			
DZ-OCRS3080	●	8.0	17	63	8	3			
DZ-OCRS4100	●	10.0	23	72	10	4			
DZ-OCRS4120	●	12.0	28	83	12	4			

● Stock in Japan

■ DZ-OCRS Cutting Data

Sholder

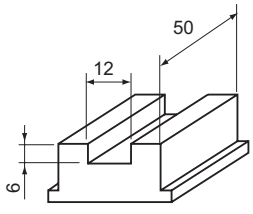


Result

No chatter: Good condition of cutting edge and work surface.

Tool	Cod. No.	DZ-OCRS4120 (ø12)
Work	Material	C45, S45C
Cutting data	N	1,800(min^{-1})
	Vc	68 (m/min)
	Vf	360 (mm/min)
	fz	0.2 (mm/rev)
	Ap/Ae	Ap=18mm, Ae=5mm
	Coolant	Dry Cut (Air blow)

Slotting



Result

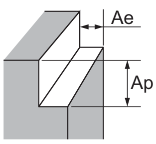
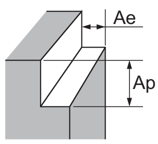
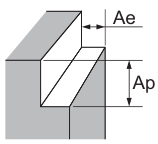
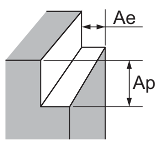
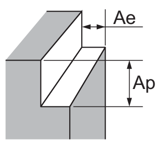
No chatter: Good conditions of cutting edges and work surface. High efficient machining 5 times faster than H.S.S. end mill.

Tool	Cod. No.	DZ-OCRS4120 (ø12)
Work	Material	C45, S45C
Cutting data	N	1,800(min^{-1})
	Vc	68 (m/min)
	Vf	360 (mm/min)
	fz	0.2 (mm/rev)
	Ap/Ae	Ap=6mm, Ae=12mm
	Coolant	Dry Cut (Air blow)

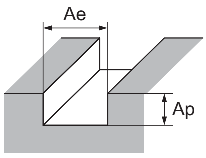
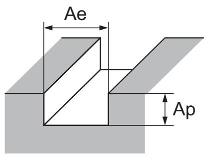
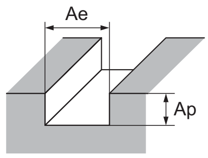
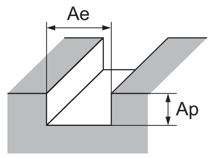
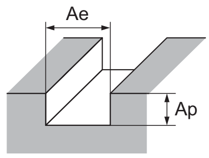
“ Super One-Cut End Mills ”

■ *Recommended cutting conditions for DZ-OCRS*

● *Shoulder cutting*

Materials	Carbon steel(C45C) ~280HB		Alloy steel(1.7225) ~280HB		Tool steel(1.1545) ~255HB		Alloy tool steel (1.2379,)~255HB		Pre-hardened steel (P20,1.2311)35~45HRc	
	Cast Iron(GG25) ~260HB		Nodular cast iron (GGG) ~300HB				Alloy tool steel (1.2344,)~255HB			
Type of Machining	 Ap=1.5D Ae=0.25 ~ 0.5D		 Ap=1.5D Ae=0.25 ~ 0.5D		 Ap=1.5D Ae=0.25 ~ 0.5D		 Ap=1.5D Ae=0.25 ~ 0.5D		 Ap=1.5D Ae=0.25 ~ 0.5D	
Tool øD (mm)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)
6	5.300	440	5.300	400	3.200	200	3.700	280	2.300	90
8	4.000	480	4.000	430	2.400	220	2.800	300	1.700	110
10	3.200	640	3.200	580	1.900	290	2.200	400	1.400	130
12	2.700	630	2.700	570	1.600	280	1.900	400	1.100	120

● *Slotting*

Materials	Carbon steel(C45C) ~280HB		Alloy steel(1.7225) ~280HB		Tool steel(1.1545) ~255HB		Alloy tool steel (1.2379,)~255HB		Pre-hardened steel (P20,1.2311)35~45HRc	
	Cast Iron(GG25) ~260HB		Nodular cast iron (GGG) ~300HB				Alloy tool steel (1.2344,)~255HB			
Type of Machining	 Ae=1D Ap=0.75~0.5D		 Ae=1D Ap=0.75~0.5D		 Ae=1D Ap=0.75~0.5D		 Ae=1D Ap=0.75～0.5D		 Ae=1D Ap=0.75~0.5D	
Tool øD (mm)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)
6	5.300	330	5.300	300	3.200	150	3.700	210	2.300	70
8	4.000	360	4.000	320	2.400	170	2.800	230	1.700	100
10	3.200	480	3.200	430	1.900	220	2.200	220	1.400	110
12	2.700	470	2.700	420	1.600	210	1.900	210	1.100	100

" Super One-Cut End Mills "

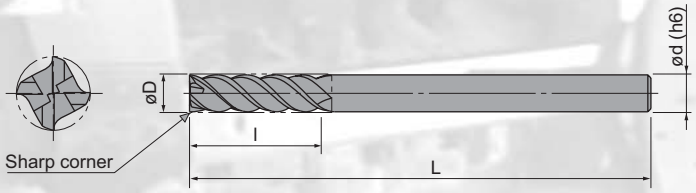
Shoulder Milling Slotting

■ DZ-SOCS (Standard Type)

- Sharp corner
- Helix angle 45°
- 4 Flutes
- Up to 50 HRc
- Regular cutting edge

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0	-0.014 -0.028
ø4.0 Over ~ ø6.0 Up to	-0.020 -0.038
ø7.0 Over ~ ø22 Up to	-0.025 -0.047



Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
DZ-SOCS4030	●	3.0	8.0	60	6	4			
DZ-SOCS4040	●	4.0	11.0	60	6	4			
DZ-SOCS4050	●	5.0	13.0	60	6	4			
DZ-SOCS4060	●	6.0	13.0	60	6	4			
DZ-SOCS4070	●	7.0	16.0	70	8	4			
DZ-SOCS4080	●	8.0	19.0	75	8	4			
DZ-SOCS4090	●	9.0	19.0	80	10	4			
NEW DZ-SOCS4100-S8	●	10.0	22.0	80	8	4			
DZ-SOCS4100	●	10.0	22.0	80	10	4			
DZ-SOCS4110	●	11.0	22.0	100	12	4			
NEW DZ-SOCS4120-S10	●	12.0	26.0	100	10	4			
DZ-SOCS4120	●	12.0	26.0	100	12	4			
DZ-SOCS4130	●	13.0	26.0	100	12	4			
NEW DZ-SOCS4140-S12	●	14.0	26.0	110	12	4			
DZ-SOCS4140	●	14.0	26.0	110	14	4			
DZ-SOCS4150	●	15.0	26.0	110	16	4			
NEW DZ-SOCS4160-S14	●	16.0	32.0	110	14	4			
DZ-SOCS4160	●	16.0	32.0	110	16	4			
DZ-SOCS4170	●	17.0	32.0	110	16	4			
NEW DZ-SOCS4180-S16	●	18.0	32.0	125	16	4			
DZ-SOCS4180	●	18.0	32.0	125	20	4			
DZ-SOCS4190	●	19.0	32.0	125	20	4			
NEW DZ-SOCS4200-S18	●	20.0	38.0	125	18	4			
DZ-SOCS4200	●	20.0	38.0	125	20	4			
NEW DZ-SOCS4220-S20	●	22.0	40.0	130	20	4			

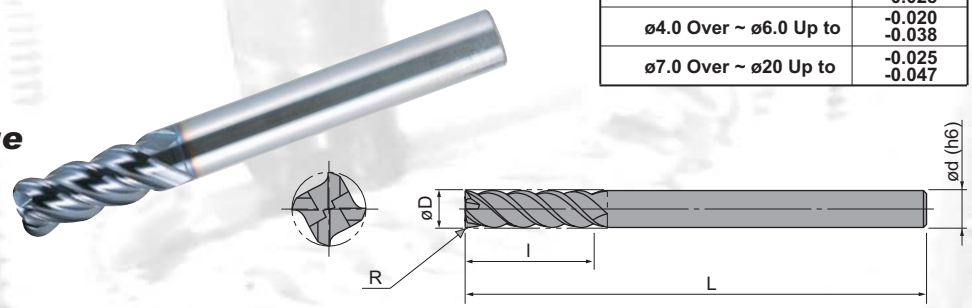
● Stock in Japan

" Super One-Cut End Mills "

Shoulder Milling | Slotting

DZ-SOCS (Standard Type)

- Corner radius
- Helix angle 45°
- 4 Flutes
- Up to 50 HRc
- Regular cutting edge



■ Tolerance for øD (mm)

øD	Tolerance
ø3.0	-0.014 -0.028
ø4.0 Over ~ ø6.0 Up to	-0.020 -0.038
ø7.0 Over ~ ø20 Up to	-0.025 -0.047

Cat. No.	Stock	Dimensions (mm)							
		R	øD	l	L	ød	Z		
DZ-SOCS4030-02	●	0.2	3.0	8	60	6	4		
DZ-SOCS4030-05	●	0.5	3.0	8	60	6	4		
DZ-SOCS4040-02	●	0.2	4.0	11	60	6	4		
DZ-SOCS4040-05	●	0.5	4.0	11	60	6	4		
DZ-SOCS4040-10	●	1.0	4.0	11	60	6	4		
DZ-SOCS4050-02	●	0.2	5.0	13	60	6	4		
DZ-SOCS4050-05	●	0.5	5.0	13	60	6	4		
DZ-SOCS4050-10	●	1.0	5.0	13	60	6	4		
DZ-SOCS4060-03	●	0.3	6.0	13	60	6	4		
DZ-SOCS4060-05	●	0.5	6.0	13	60	6	4		
DZ-SOCS4060-10	●	1.0	6.0	13	60	6	4		
DZ-SOCS4060-15	●	1.5	6.0	13	60	6	4		
DZ-SOCS4080-03	●	0.3	8.0	19	75	8	4		
DZ-SOCS4080-05	●	0.5	8.0	19	75	8	4		
DZ-SOCS4080-10	●	1.0	8.0	19	75	8	4		
DZ-SOCS4080-15	●	1.5	8.0	19	75	8	4		
DZ-SOCS4080-20	●	2.0	8.0	19	75	8	4		
DZ-SOCS4100-03	●	0.3	10.0	22	80	10	4		
DZ-SOCS4100-05	●	0.5	10.0	22	80	10	4		
DZ-SOCS4100-10	●	1.0	10.0	22	80	10	4		
DZ-SOCS4100-15	●	1.5	10.0	22	80	10	4		
DZ-SOCS4100-20	●	2.0	10.0	22	80	10	4		
DZ-SOCS4120-05	●	0.5	12.0	26	100	12	4		
DZ-SOCS4120-10	●	1.0	12.0	26	100	12	4		
DZ-SOCS4120-15	●	1.5	12.0	26	100	12	4		
DZ-SOCS4120-20	●	2.0	12.0	26	100	12	4		
DZ-SOCS4120-30	●	3.0	16.0	26	100	12	4		
DZ-SOCS4160-10	●	1.0	16.0	32	110	16	4		
DZ-SOCS4160-15	●	1.5	16.0	32	110	16	4		
DZ-SOCS4160-20	●	2.0	16.0	32	110	16	4		
DZ-SOCS4160-30	●	3.0	16.0	32	110	16	4		
DZ-SOCS4200-10	●	1.0	20.0	38	125	20	4		
DZ-SOCS4200-15	●	1.5	20.0	38	125	20	4		
DZ-SOCS4200-20	●	2.0	20.0	38	125	20	4		
DZ-SOCS4200-30	●	3.0	20.0	38	125	20	4		

" Super One-Cut End Mills "

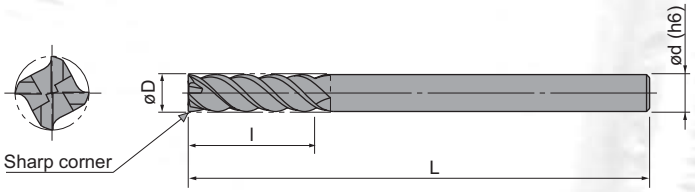
Shoulder Milling Slotting

■ DZ-SOCM (Medium Type)

- Sharp corner
- Helix angle 45°
- 4 Flutes
- Up to 50 HRc
- Medium cutting edge

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0	-0.014 -0.028
ø4.0 Over ~ ø6.0 Up to	-0.020 -0.038
ø7.0 Over ~ ø20 Up to	-0.025 -0.047



Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
DZ-SOCM4030	●	3.0	16	60	6	4			
DZ-SOCM4040	●	4.0	18	60	6	4			
DZ-SOCM4050	●	5.0	21	60	6	4			
DZ-SOCM4060	●	6.0	21	60	6	4			
DZ-SOCM4070	○	7.0	24	70	6	4			
DZ-SOCM4080	●	8.0	26	75	8	4			
DZ-SOCM4090	○	9.0	26	80	10	4			
DZ-SOCM4100	●	10.0	34	90	10	4			
DZ-SOCM4110	○	11.0	34	100	12	4			
DZ-SOCM4120	●	12.0	38	100	12	4			
DZ-SOCM4130	○	13.0	38	100	12	4			
DZ-SOCM4140	○	14.0	38	110	16	4			
DZ-SOCM4150	○	15.0	38	110	16	4			
DZ-SOCM4160	●	16.0	48	110	16	4			
DZ-SOCM4170	○	17.0	48	110	16	4			
DZ-SOCM4180	●	18.0	48	125	20	4			
DZ-SOCM4190	○	19.0	48	125	20	4			
DZ-SOCM4200	●	20.0	56	130	20	4			

○ Stock in Japan

" Super One-Cut End Mills "

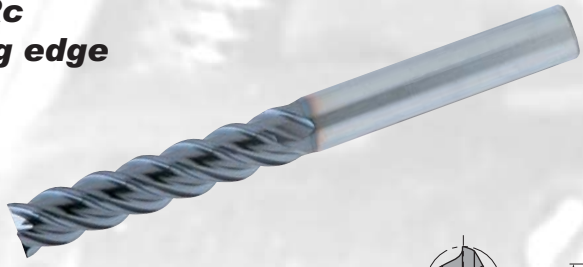
Shoulder Milling | Slotting

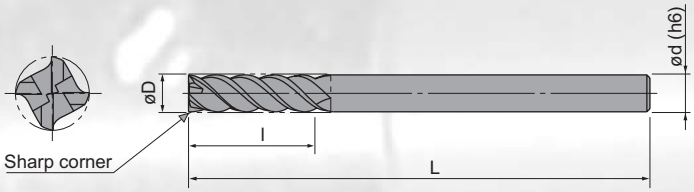
■ DZ-SOCL (Long Type)

- Sharp corner
- Helix angle 45°
- 4 Flutes
- Up to 50 HRc
- Long cutting edge

■ Tolerance for øD (mm)

øD	Tolerance
ø3 Over ~ ø6.0 Up to	-0.020 -0.038
ø7.0 Over ~ ø20 Up to	-0.025 -0.047





Cat. No.	Stock	Dimensions (mm)							
		øD	l	L	ød	Z			
DZ-SOCL4060	●	6.0	25	70	6	4			
DZ-SOCL4080	●	8.0	35	90	8	4			
DZ-SOCL4100	●	10.0	45	100	10	4			
DZ-SOCL4120	●	12.0	55	120	12	4			
DZ-SOCL4160	●	16.0	65	135	16	4			
DZ-SOCL4200	●	20.0	75	155	20	4			

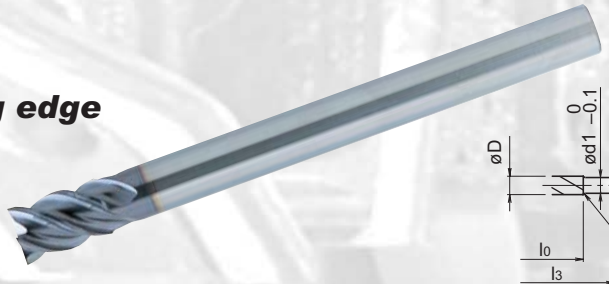
" Super One-Cut End Mills "

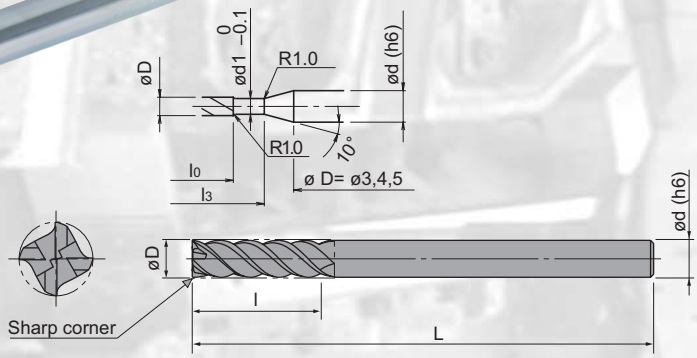
DZ-SOCLS (Long Shank Type)

- Sharp corner
- Helix angle 45°
- 4 Flutes
- Up to 50 HRc
- Regular cutting edge

■ Tolerance for øD (mm)

øD	Tolerance
ø3.0	-0.014 -0.028
ø4.0 Over ~ ø6.0 Up to	-0.020 -0.038
ø7.0 Over ~ ø22 Up to	-0.025 -0.047





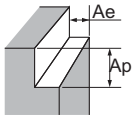
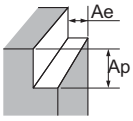
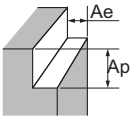
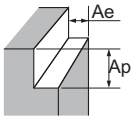
Cat. No.	Stock	Dimensions (mm)							
		øD	l0	ød1	l3	L	ød1	Z	
DZ-SOCLS4030	●	3.0	5	2.9	10.5	80	6	4	
DZ-SOCLS4040	●	4.0	6	3.8	14	80	6	4	
DZ-SOCLS4050	●	5.0	8	4.8	17.5	100	6	4	
DZ-SOCLS4060	●	6.0	9	-	-	120	5	4	
NEW DZ-SOCLS4060-S5.8	●	6.0	9	-	-	120	5.8	4	
DZ-SOCLS4070	○	7.0	9	-	-	120	6	4	
DZ-SOCLS4080	●	8.0	12	-	-	135	7	4	
NEW DZ-SOCLS4080-S7.8	●	8.0	12	-	-	135	7.8	4	
DZ-SOCLS4090	○	9.0	12	-	-	135	8	4	
DZ-SOCLS4100	●	10.0	15	-	-	150	9	4	
DZ-SOCLS4110	○	11.0	15	-	-	150	10	4	
DZ-SOCLS4120	●	12.0	18	-	-	160	11	4	
DZ-SOCLS4130	○	13.0	18	-	-	160	12	4	
DZ-SOCLS4140	○	14.0	18	-	-	160	13	4	
DZ-SOCLS4150	○	15.0	22	-	-	180	14	4	
DZ-SOCLS4160	●	16.0	24	-	-	180	15	4	
DZ-SOCLS4170	○	17.0	24	-	-	180	16	4	
DZ-SOCLS4180	○	18.0	27	-	-	180	16	4	
DZ-SOCLS4190	○	19.0	30	-	-	200	16	4	
DZ-SOCLS4200	●	20.0	30	-	-	200	20	4	
DZ-SOCLS4200-S18	●	20.0	30	-	-	200	18	4	
DZ-SOCLS4220-S20	●	22.0	35	-	-	220	20	4	

● Stock in Japan

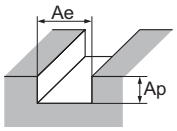
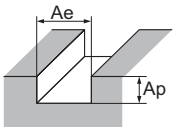
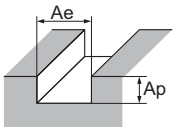
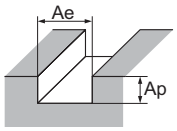
" Super One-Cut End Mills "

■ Recommended cutting conditions for DZ-SOC

● Shoulder

Work Materials	Carbon steel, alloy steel, Cast iron below 25HRc		Alloy steel, Tool steel 25 - 30HRc		Alloy steel, Tool steel 40 - 50HRc		Stainless steel AISI 304	
Type of machining	 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.2D		 Ap=1.5D Ae=0.1D		 Ap=1.5D Ae=0.1D	
TooløD (mm)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)
3	10,600	650	6,400	390	3,180	170	6,400	260
4	8,000	750	4,800	480	2,380	180	4,800	390
5	6,300	750	3,800	540	1,900	180	3,800	460
6	5,300	950	3,200	570	1,600	240	3,200	450
8	4,000	1,000	2,400	600	1,200	240	2,400	440
10	3,200	1,000	1,900	600	950	200	1,900	420
12	2,700	900	1,600	540	800	210	1,600	420
16	2,000	800	1,200	480	600	170	1,200	390
20	1,600	800	950	480	480	150	950	350

● Slotting

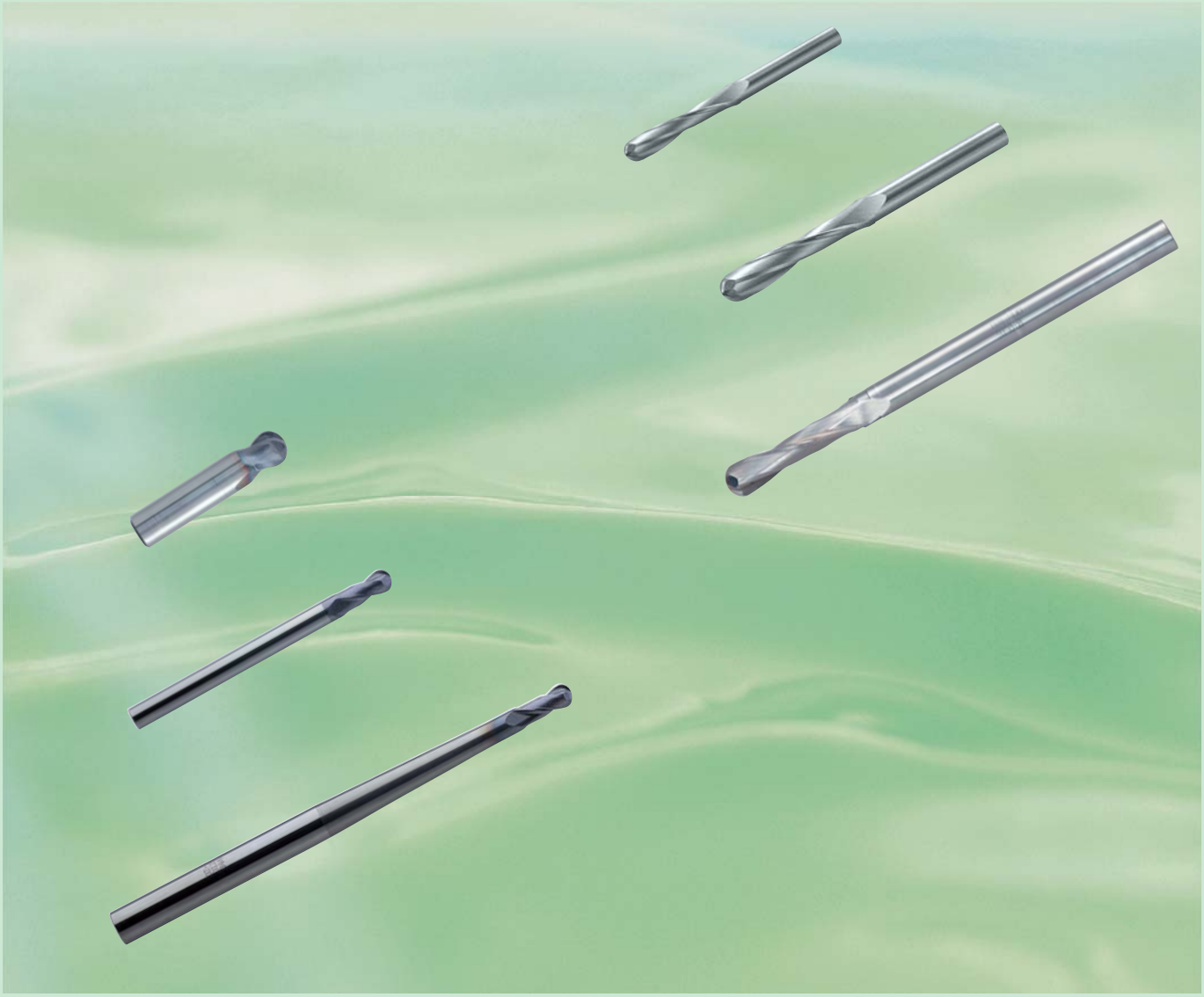
Work Materials	Carbon steel, alloy steel, Cast iron below 25HRc		Alloy steel, Tool steel 25 - 30HRc		Alloy steel, Tool steel 40 - 50HRc		Stainless steel AISI 304	
Type of machining	 Ap=1D Ae=1D		 Ap=1D Ae=1D		 Ap=0.2D Ae=1D		 Ap=0.5D Ae=1D	
TooløD (mm)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)	N (min-1)	Vf (mm/min)
3	8,500	750	5,300	470	2,650	150	5,300	320
4	6,400	780	4,000	490	2,000	200	4,000	400
5	5,100	780	3,200	490	1,600	200	3,200	440
6	4,250	780	2,650	490	1,350	200	2,650	420
8	3,200	780	2,000	490	1,000	200	2,000	400
10	2,550	780	1,600	490	800	190	1,600	380
12	2,100	780	1,400	490	660	170	1,400	390
16	1,600	610	1,000	380	500	140	1,000	340
20	1,250	580	800	320	400	120	800	320

“ Super One-Cut End Mills ”

Memo

" Carbide End Mills "

■ Ball Nose End Mills

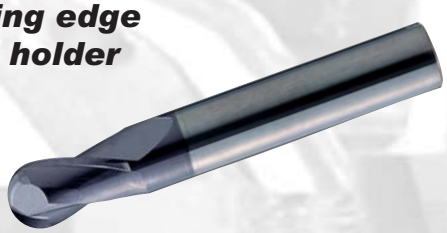


“ Super-Short Ball Nose ”

Copy Milling | Slotting | Pocket Milling

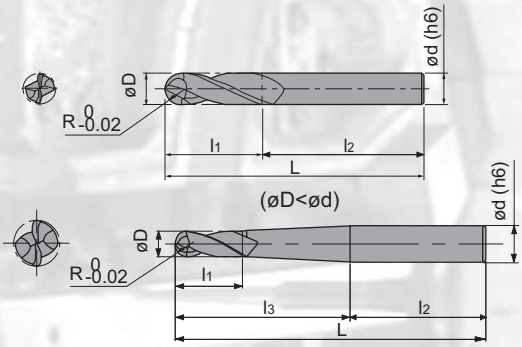
■ DZ-SSB (Super Short Type)

- Ball nose
- Stub overall lenght
- Helix angle 25°
- 2 Flutes
- Regular cutting edge
- For shrink-fit holder



■ Tolerance for øD (mm)

øD	Tolerance
ø3.0 ~ ø6.0 Up to	0.000 -0.020
ø7.0 ~ ø12.0 Up to	0.000 -0.020



Cat. No.	Stock	Dimensions (mm)							
		R	øD	l1	l3	l2	L	ød	Z
DZ-SSB2030S025	●	1.5	**3.0**	3	—	19	25	3	2
DZ-SSB2030S035	●	1.5	**3.0**	3	—	26	35	3	2
DZ-SSB2030S045	●	1.5	**3.0**	3	—	36	45	3	2
DZ-SSB2030T040-6	●	1.5	**3.0**	3	12	28	40	6	2
DZ-SSB2030T045-6	●	1.5	**3.0**	3	17	28	45	6	2
DZ-SSB2040S030	●	2.0	**4.0**	4	—	23	30	4	2
DZ-SSB2040S040	●	2.0	**4.0**	4	—	30	40	4	2
DZ-SSB2040S050	●	2.0	**4.0**	4	—	40	50	4	2
DZ-SSB2040T040-6	●	2.0	**4.0**	4	12	28	40	6	2
DZ-SSB2040T050-6	●	2.0	**4.0**	4	22	28	50	6	2
DZ-SSB2050T040-6	●	2.5	**5.0**	5	12	28	40	6	2
DZ-SSB2050T050-6	●	2.5	**5.0**	5	22	28	50	6	2
DZ-SSB2050T060-6	●	2.5	**5.0**	5	32	28	60	6	2
DZ-SSB2060S040	●	3.0	**6.0**	6	—	28	40	6	2
DZ-SSB2060S050	●	3.0	**6.0**	6	—	38	50	6	2
DZ-SSB2060S060	●	3.0	**6.0**	6	—	48	60	6	2
DZ-SSB2070T050-8	●	3.5	**7.0**	7	16	34	50	8	2
DZ-SSB2070T070-8	●	3.5	**7.0**	7	36	34	70	8	2
DZ-SSB2070T090-8	●	3.5	**7.0**	7	56	34	90	8	2
DZ-SSB2080S050	●	4.0	**8.0**	8	—	36	50	8	2
DZ-SSB2080S070	●	4.0	**8.0**	8	—	56	70	8	2
DZ-SSB2080S090	●	4.0	**8.0**	8	—	76	90	8	2
DZ-SSB2090T060-10	●	4.5	**9.0**	9	20	40	60	10	2
DZ-SSB2090T080-10	●	4.5	**9.0**	9	40	40	80	10	2
DZ-SSB2090T100-10	●	4.5	**9.0**	9	60	40	100	10	2
DZ-SSB2100S060	●	5.0	**10.0**	10	—	44	60	10	2
DZ-SSB2100S080	●	5.0	**10.0**	10	—	64	80	10	2
DZ-SSB2100S100	●	5.0	**10.0**	10	—	84	100	10	2
DZ-SSB2110T065-12	●	5.5	**11.0**	11	24	41	65	12	2
DZ-SSB2110T085-12	●	5.5	**11.0**	11	44	41	85	12	2
DZ-SSB2110T110-12	●	5.5	**11.0**	11	69	41	110	12	2
DZ-SSB2120S065	●	6.0	**12.0**	12	—	47	65	12	2
DZ-SSB2120S085	●	6.0	**12.0**	12	—	67	85	12	2
DZ-SSB2120S110	●	6.0	**12.0**	12	—	92	110	12	2

● Stock in Japan

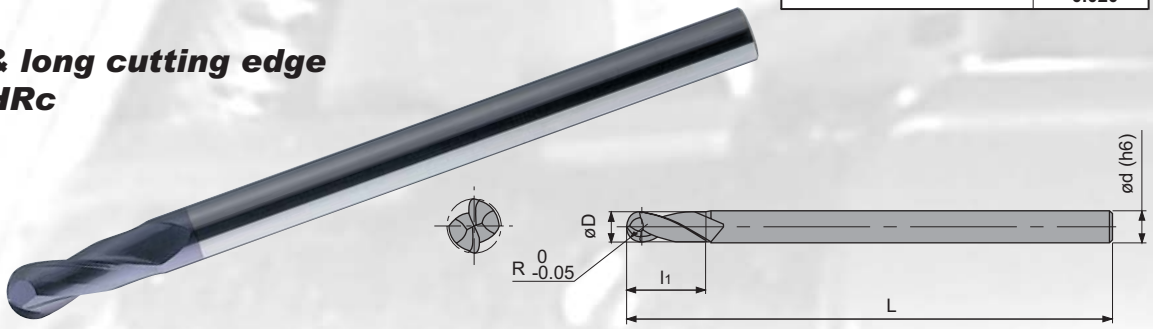
" One-Cut Ball Nose "

■ DZ-OCLB-S (Extra Long Type)

- Ball nose
- Helix angle 30°
- 2 Flutes
- Regular & long cutting edge
- Up to 45HRc

■ Tolerance for øD (mm)

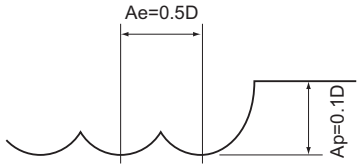
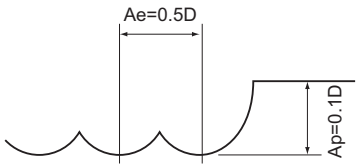
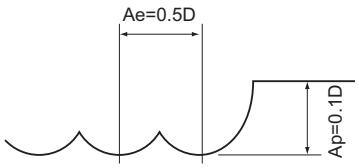
øD	Tolerance
ø4.0 ~ ø8.0 Up to	0.000 -0.020
ø10.0 ~ ø25.0 Up to	0.000 -0.020



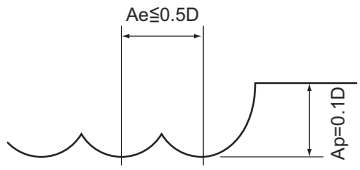
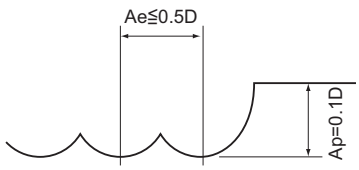
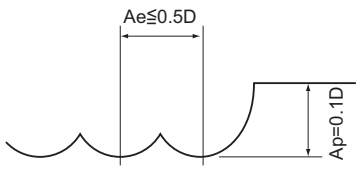
Cat. No.	Stock	Dimensions (mm)							
		R	øD	l1	L	ød	Z		
DZ-OCLB2040-12S120	●	2.0	**4.0**	12	120	4	2		
DZ-OCLB2040-20S120	●	2.0	**4.0**	20	120	4	2		
DZ-OCLB2060-18S160	●	3.0	**6.0**	18	160	6	2		
DZ-OCLB2060-22S160	●	3.0	**6.0**	22	160	6	2		
DZ-OCLB2060-18S220	●	3.0	**6.0**	18	220	6	2		
DZ-OCLB2060-22S220	●	3.0	**6.0**	22	220	6	2		
DZ-OCLB2080-22S160	●	4.0	**8.0**	22	160	8	2		
DZ-OCLB2080-22S220	●	4.0	**8.0**	22	220	8	2		
DZ-OCLB2100-25S160	●	5.0	**10.0**	25	160	10	2		
DZ-OCLB2100-35S160	●	5.0	**10.0**	35	160	10	2		
DZ-OCLB2100-25S220	●	5.0	**10.0**	25	220	10	2		
DZ-OCLB2100-35S220	●	5.0	**10.0**	35	220	10	2		
DZ-OCLB2120-35S160	●	6.0	**12.0**	35	160	12	2		
DZ-OCLB2120-35S220	●	6.0	**12.0**	35	220	12	2		
DZ-OCLB2120-45S220	●	6.0	**12.0**	45	220	12	2		
DZ-OCLB2160-40S220	●	8.0	**16.0**	40	220	16	2		
DZ-OCLB2160-40S280	●	8.0	**16.0**	40	280	16	2		
DZ-OCLB2160-50S280	●	8.0	**16.0**	50	280	16	2		
DZ-OCLB2200-40S220	●	10.0	**20.0**	40	220	20	2		
DZ-OCLB2200-50S280	●	10.0	**20.0**	50	280	20	2		
DZ-OCLB2250-50S220	●	12.5	**25.0**	50	220	25	2		
DZ-OCLB2250-50S280	●	12.5	**25.0**	50	280	25	2		
DZ-OCLB2250-70S280	●	12.5	**25.0**	70	280	25	2		

“ One-Cut Ball Nose ”

■ Recommended cutting conditions for DZ-SSB

Work Materials	Carbon steel (C55) (180-280HB)		Alloy steel (1.7225) (180-280HB)		Mold steel (1.2311,P20) (35-45HRc)	
Type of machining						
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
3	11,700	110	9,500	90	6,400	55
4	8,800	150	7,200	120	4,800	75
5	7,000	170	5,700	140	3,800	85
6	5,800	230	4,800	190	3,200	110
7	5,000	230	4,100	190	2,700	110
8	4,400	350	3,600	290	2,400	170
10	3,500	420	2,900	340	1,900	210
12	2,900	480	2,400	390	1,600	240

■ Recommended cutting conditions for DZ-OCLB-S

Work Materials	Carbon steel, Cast iron ~ 25HRc		Alloy steel, Tool steel ~ 30HRc		Hardened steel ~ 45HRc	
Type of machining						
TooløD (mm)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)	N (min^{-1})	Vf (mm/min)
4	8,800	30	7,200	25	4,800	15
6	5,800	~30	4,800	~25	3,200	~15
8	4,400	20~65	3,600	15~55	2,400	10~30
10	3,500	35~120	2,900	30~100	1,900	15~60
12	2,900	55~240	2,400	45~200	1,600	25~120
16	2,200	45~120	1,800	35~100	1,200	20~60
20	1,750	85~250	1,400	70~200	950	40~120
25	1,400	160~560	1,100	130~460	750	80~270

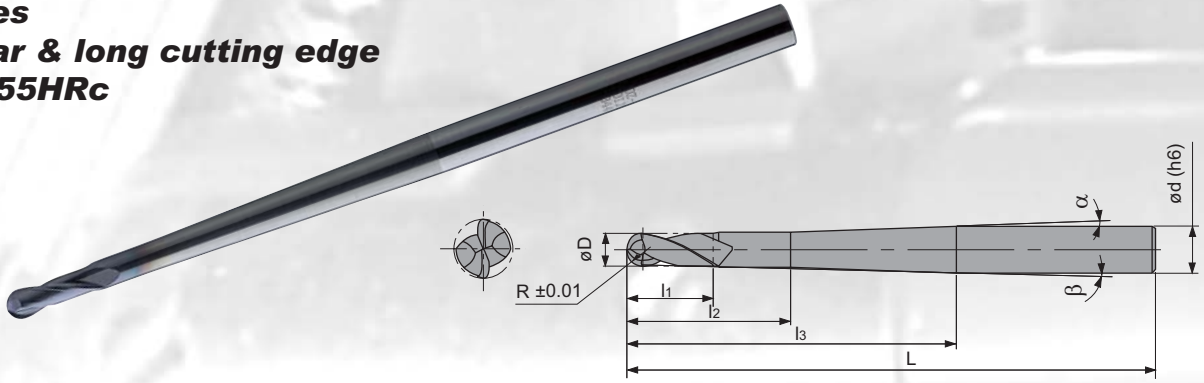
" One-Cut Ball Nose "

■ DZ-OCLB-T (Extra Long Taper Neck)

- Ball nose
- Helix angle 30°
- 2 Flutes
- Regular & long cutting edge
- Up to 55HRc

■ Tolerance for øD (mm)

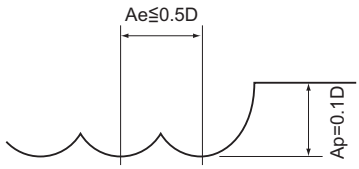
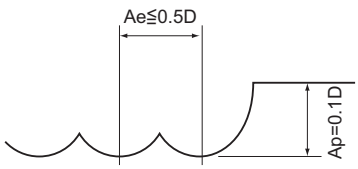
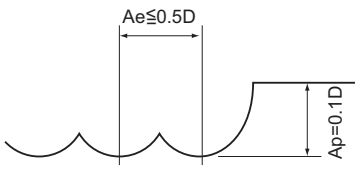
øD	Tolerance
ø4.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø12.0 Up to	0.000 -0.020



Cat. No.	Stock	Dimensions (mm)								
		R	øD	α°	l1	l2	l3	β°	L	ød
DZ-OCLB2040-10T160	●	2.0	**4.0**	2°39'	10	20	85	2°05'	160	10
DZ-OCLB2040-16T160	●	2.0	**4.0**	2°39'	16	35	100	1°46'	160	10
DZ-OCLB2040-10T220	●	2.0	**4.0**	1°43'	10	20	120	1°28'	220	10
DZ-OCLB2040-16T220	●	2.0	**4.0**	2°01'	16	35	120	1°28'	220	10
DZ-OCLB2040-10T280	●	2.0	**4.0**	1°19'	10	20	150	1°10'	280	10
DZ-OCLB2040-16T280	●	2.0	**4.0**	1°30'	16	35	150	1°10'	280	10
DZ-OCLB2060-17T160	●	3.0	**6.0**	2°52'	17	30	90	1°59'	160	12
DZ-OCLB2060-22T160	●	3.0	**6.0**	2°46'	22	38	100	1°47'	160	12
DZ-OCLB2060-17T220	●	3.0	**6.0**	1°55'	17	30	120	1°29'	220	12
DZ-OCLB2060-22T220	●	3.0	**6.0**	2°06'	22	38	120	1°29'	220	12
DZ-OCLB2060-17T280	●	3.0	**6.0**	1°26'	17	30	150	1°11'	280	12
DZ-OCLB2060-22T280	●	3.0	**6.0**	1°32'	22	38	150	1°11'	280	12
DZ-OCLB2080-20T160	●	4.0	**8.0**	1°55'	20	30	90	1°20'	160	12
DZ-OCLB2080-24T160	●	4.0	**8.0**	1°51'	24	38	100	1°12'	160	12
DZ-OCLB2080-20T220	●	4.0	**8.0**	1°16'	20	30	120	1°00'	220	12
DZ-OCLB2080-24T220	●	4.0	**8.0**	1°24'	24	38	120	1°00'	220	12
DZ-OCLB2080-20T280	●	4.0	**8.0**	0°57'	20	30	150	0°48'	280	12
DZ-OCLB2080-24T280	●	4.0	**8.0**	1°01'	24	38	150	0°48'	280	12
DZ-OCLB2100-25T160	●	5.0	**10.0**	3°07'	25	35	90	2°02'	160	16
DZ-OCLB2100-33T160	●	5.0	**10.0**	2°46'	33	38	100	1°50'	160	16
DZ-OCLB2100-25T220	●	5.0	**10.0**	2°01'	25	35	120	1°30'	220	16
NEW DZ-OCLB2100-25T220A	●	5.0	**10.0**	1°30'	25	35	150	1°12'	220	16
DZ-OCLB2100-33T220	●	5.0	**10.0**	2°06'	33	38	120	1°30'	220	16
DZ-OCLB2100-25T280	●	5.0	**10.0**	1°30'	25	35	150	1°12'	280	16
DZ-OCLB2100-33T280	●	5.0	**10.0**	1°32'	33	38	150	1°12'	280	16
DZ-OCLB2120-30T160	●	6.0	**12.0**	2°12'	30	38	90	1°22'	160	16
DZ-OCLB2120-33T160	●	6.0	**12.0**	1°51'	33	38	100	1°14'	160	16
NEW DZ-OCLB2120-30T220	●	6.0	**12.0**	1°24'	30	38	120	1°01'	220	16
DZ-OCLB2120-33T220	●	6.0	**12.0**	1°24'	33	38	120	1°01'	220	16
DZ-OCLB2160-33T280	●	6.0	**12.0**	1°01'	33	38	150	0°48'	280	16

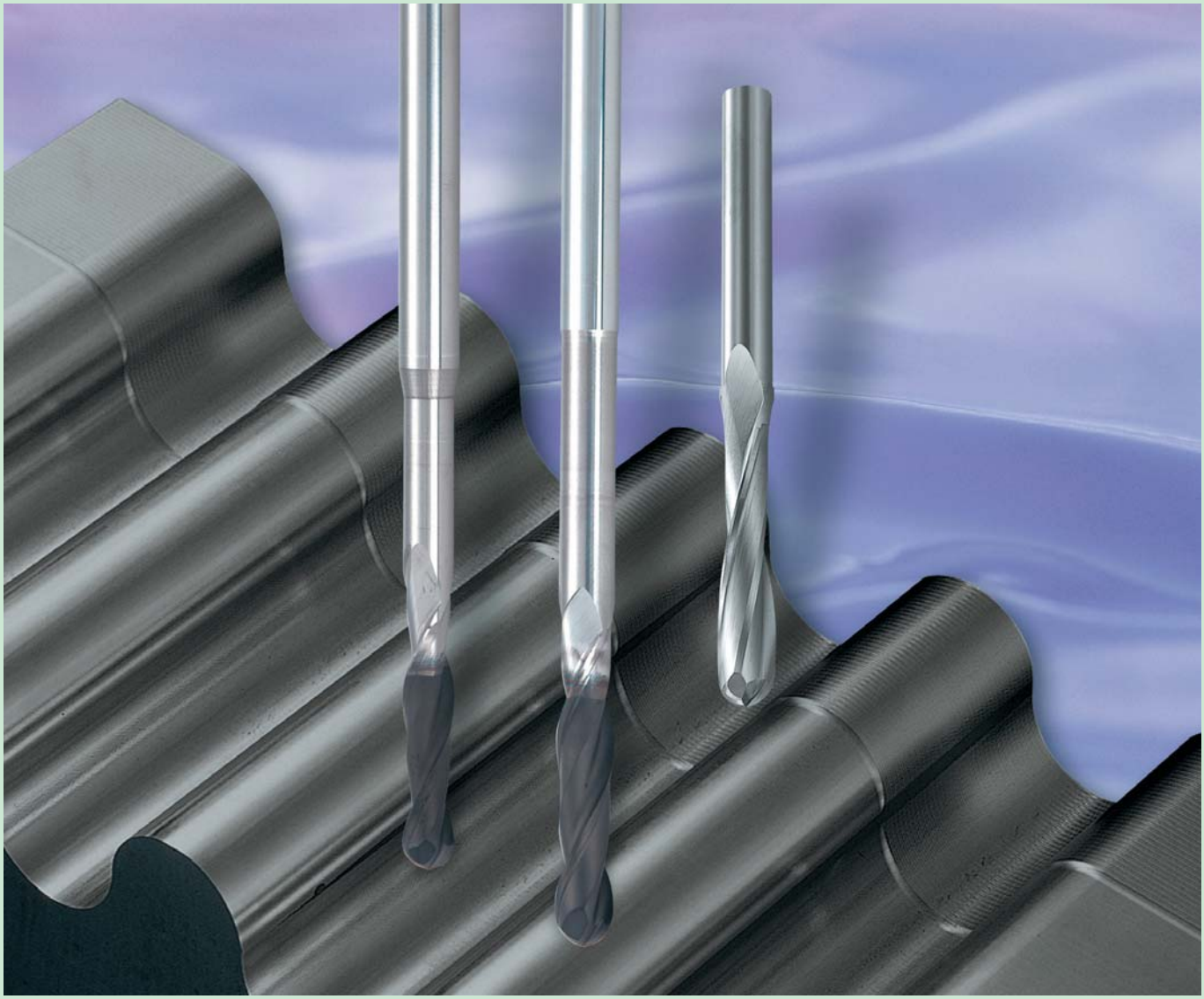
“ One-Cut Ball Nose ”

■ *Recommended cutting conditions for DZ-OCLB-T*

Work Materials	Carbon steel, Cast iron ~ 25HRc		Alloy steel, Tool steel ~ 30HRc		Hardened steel ~ 45HRc	
Type of machining						
TooløD (mm)	**N** (min^{-1})	**Vf** (mm/min)	**N** (min^{-1})	**Vf** (mm/min)	**N** (min^{-1})	**Vf** (mm/min)
4	8,800	30	7,200	25	4,800	15
6	5,800	25~60	4,800	20~50	3,200	10~30
8	4,400	40~110	3,600	30~90	2,400	20~55
10	3,500	60~150	2,900	50~120	1,900	30~75
12	2,900	70~210	2,400	60~170	1,600	35~100

“ Carbide End Mills ”

■ *Graphite Ball Nose End Mills*



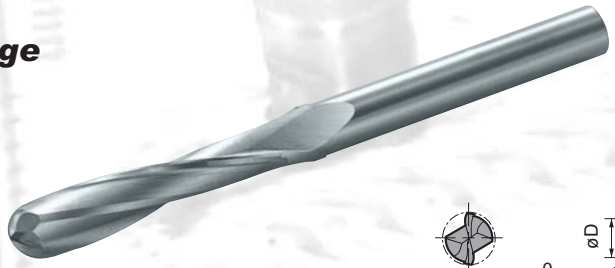
" Graphite Ball Nose "

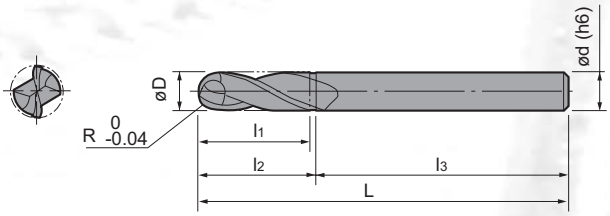
GF-SBR (Standard Type)

- Ball nose
- Helix angle 15°
- 2 Flutes
- Long cutting edge
- For graphite

■ Tolerance for øD (mm)

øD	Tolerance
ø2.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø12.0 Up to	0.000 -0.020

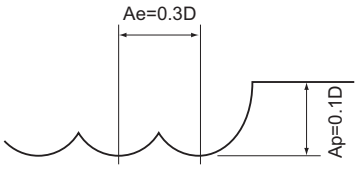
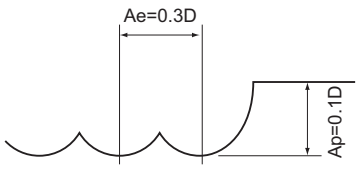
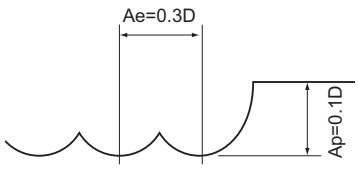




Cat. No.	Stock	Dimensions (mm)							
		R	øD	l1	l2	l3	L	ød	Z
GF-SBR 2020	●	1.0	**2.0**	10	15	65	80	4	2
GF-SBR 2020S6	●	1.0	**2.0**	10	15	65	80	6	2
GF-SBR 2030	●	1.5	**3.0**	15	25	55	80	4	2
GF-SBR 2030S6	●	1.5	**3.0**	15	25	55	80	6	2
GF-SBR 2040	●	2.0	**4.0**	20	30	50	80	4	2
GF-SBR 2040S6	●	2.0	**4.0**	20	30	50	80	6	2
GF-SBR 2060	●	3.0	**6.0**	30	40	60	100	6	2
GF-SBR 2080	●	4.0	**8.0**	40	50	60	110	8	2
GF-SBR 2100	●	5.0	**10.0**	50	60	60	120	10	2
GF-SBR 2120	●	6.0	**12.0**	55	65	65	130	12	2

● Stock in Japan

Recommended cutting conditions for GF-SBR

Work Materials	Graphite		
Type of machining			
TooløD (mm)	**Vc** (m/min)	**N** (min^{-1})	**Vf** (mm/min)
2	50	8,000	380
3	75	8,000	540
4	100	8,000	600
6	150	8,000	1,000
8	200	8,000	1,200
10	250	8,000	1,400
12	300	8,000	2,100

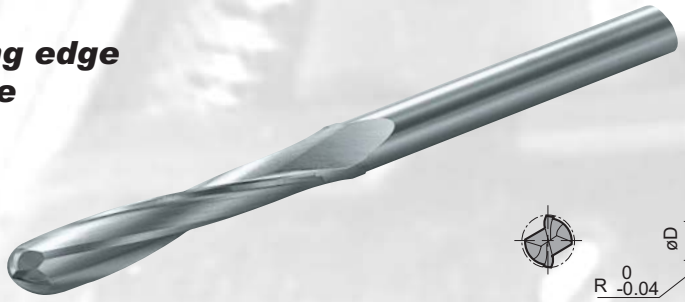
" Graphite Ball Nose "

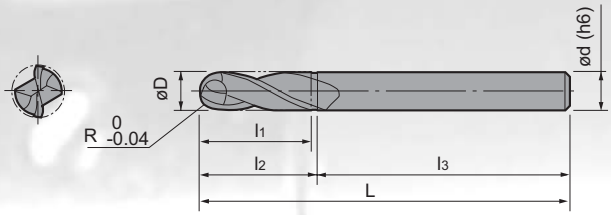
GF-SBL (Long Type)

- Ball nose
- Helix angle 15°
- 2 Flutes
- Long cutting edge
- For graphite

■ Tolerance for øD (mm)

øD	Tolerance
ø2.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø12.0 Up to	0.000 -0.020

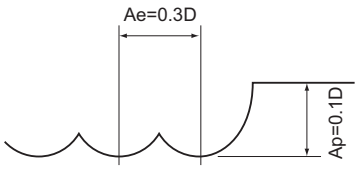
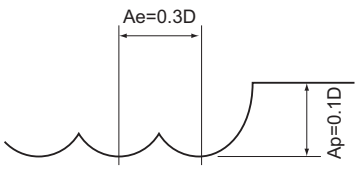
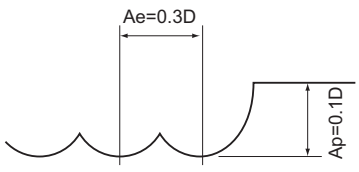




Cat. No.	Stock	Dimensions (mm)							
		R	øD	l1	l2	l3	L	ød	Z
GF-SBL 2020	●	1.0	**2.0**	10	20	80	100	4	2
GF-SBL 2020S6	●	1.0	**2.0**	10	20	80	100	6	2
GF-SBL 2040	●	2.0	**4.0**	20	30	70	100	4	2
GF-SBL 2040S6	●	2.0	**4.0**	20	30	70	100	6	2
GF-SBL 2060	●	3.0	**6.0**	30	40	110	150	6	2
GF-SBL 2080	●	4.0	**8.0**	40	50	100	150	8	2
GF-SBL 2100	●	5.0	**10.0**	50	60	120	180	10	2
GF-SBL 2120	●	6.0	**12.0**	55	65	135	200	12	2

● Stock in Japan

Recommended cutting conditions for GF-SBL

Work Materials	Graphite		
Type of machining			
TooløD (mm)	Vc (m/min)	N (min^{-1})	Vf (mm/min)
2	50	8,000	380
4	100	8,000	600
6	150	8,000	1,000
8	200	8,000	1,200
10	250	8,000	1,400
12	300	8,000	2,100

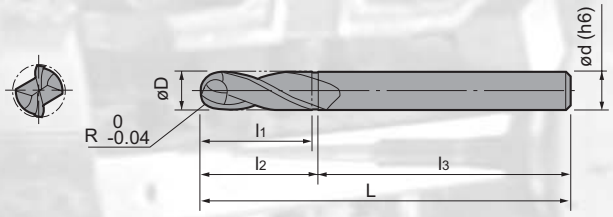
" Graphite Ball Nose "

GF-SBX *(Extra-Long Type)*

- **Ball nose**
- **Helix angle 30°**
- **2 Flutes**
- **Long cutting edge**
- **For graphite**

■ Tolerance for øD (mm)

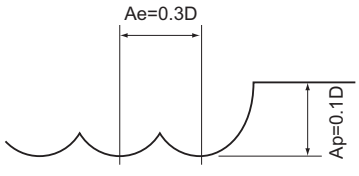
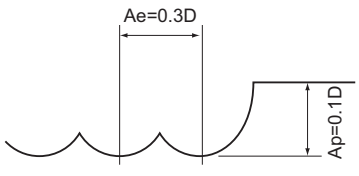
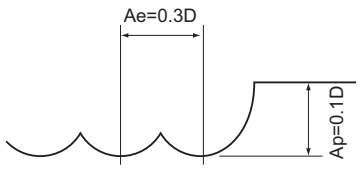
øD	Tolerance
ø2.0 ~ ø6.0 Up to	0.000 -0.020
ø8.0 ~ ø12.0 Up to	0.000 -0.020



Cat. No.	Stock	Dimensions (mm)							
		R	øD	l1	l2	l3	L	ød	Z
GF-SBX 2020	●	1.0	**2.0**	20	30	70	100	6	2
GF-SBX 2040	●	2.0	**4.0**	60	70	40	110	6	2
GF-SBX 2060	●	3.0	**6.0**	80	90	40	130	6	2
GF-SBX 2080	●	4.0	**8.0**	100	110	40	150	8	2
GF-SBX 2100	●	5.0	**10.0**	120	130	40	170	10	2
GF-SBX 2120	●	6.0	**12.0**	130	140	50	190	12	2

● Stock in Japan

Recommended cutting conditions for GF-SBX

Work Materials	Graphite		
Type of machining			
TooløD (mm)	Vc (m/min)	N (min^{-1})	Vf (mm/min)
2	50	8,000	70
4	100	8,000	70
6	150	8,000	90
8	200	8,000	120
10	250	8,000	140
12	300	8,000	220

“ Graphite Ball Nose ”

Memo