

Our Long Reach End Mills Are Engineered For Maximum Rigidity In High Speed Milling Applications

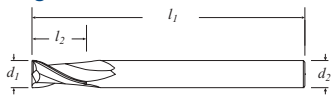
SGS' Long Reach end mill, with its longer shank and shorter flute length, is designed for deep pocket and contour milling applications such as forging dies, molds, electrodes and impellers.

The two-flute, center-cutting, heavy-duty construction allows machining in a wide range of steels, including pre-hardened steels to 60 HRC; under dry and lubricated machining conditions. The eccentric side-relief is ideal for high-speed machining applications in today's technology.

Long Reach End Mills are available from stock in square and ball ends; in a range of metric* and fractional sizes; and with SGS' exclusive Ti-NAMITE (TiN), Ti-NAMITE-A (AlTiN) and Ti-NAMITE-C (TiCN) coatings for extended tool life and exceptional tool performance.

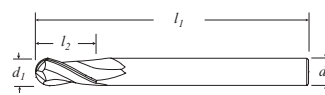
Fractional

Long Reach™ - Series 59 - 2 Flute - Square End



Cutting Diameter d ₁	Length of Cut l ₂	Overall Length l ₁	Shank Diameter d ₂	Ti-NAMITE (TiN) EDP	Ti-NAMITE-C (TiCN) EDP	Ti-NAMITE-A (AlTiN) EDP
1/8	3/8	2-1/2	1/4	32280	32260	32270
3/16	9/16	3	1/4	32281	32261	32271
1/4	5/8	3-1/2	1/4	32282	32262	32272
5/16	11/16	4	5/16	32283	32263	32273
3/8	7/8	4	3/8	32284	32264	32274
1/2	1	4-1/2	1/2	32285	32265	32275
5/8	1-1/8	5	5/8	32286	32266	32276
3/4	1-3/8	5-1/4	3/4	32287	32267	32277

Long Reach™ - Series 59B - 2 Flute - Ball End



Cutting Diameter d ₁	Length of Cut l ₂	Overall Length l ₁	Shank Diameter d ₂	Ti-NAMITE (TiN) EDP	Ti-NAMITE-C (TiCN) EDP	Ti-NAMITE-A (AlTiN) EDP
1/8	3/8	2-1/2	1/4	32210	32290	32200
3/16	9/16	3	1/4	32211	32291	32201
1/4	5/8	3-1/2	1/4	32212	32292	32202
5/16	11/16	4	5/16	32213	32293	32203
3/8	7/8	4	3/8	32214	32294	32204
1/2	1	4-1/2	1/2	32215	32295	32205
5/8	1-1/8	5	5/8	32216	32296	32206
3/4	1-3/8	5-1/4	3/4	32217	32297	32207

Speed & Feed Recommendations

Square End diameter	Steels < 30 Rc Ad = 50% dia			Steels > 30 - 45 Rc Ad = 50% dia			Steels > 45 - 55 Rc Ad = 50% dia		
	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth
1/8	.0625	3,700	.0004	.0625	2,650	.0003	.0625	1,600	.0002
3/16	.0938	2,200	.0008	.0938	1,600	.0007	.0938	950	.0006
1/4	.1250	1,850	.0010	.1250	1,300	.0008	.1250	800	.0007
5/16	.1563	1,400	.0014	.1563	1,000	.0010	.1563	600	.0009
3/8	.1875	1,100	.0016	.1875	800	.0012	.1875	500	.0011
1/2	.2500	950	.0018	.2500	650	.0014	.2500	400	.0012
5/8	.3125	700	.0020	.3125	500	.0017	.3125	300	.0014
3/4	.3750	550	.0024	.3750	400	.0020	.3750	250	.0016

Ball End diameter	Steels < 40 Rc Ad = 3% dia			Steels > 40 - 50 Rc Ad = 2% dia			Steels > 50 - 60 Rc Ad = 1% dia		
	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth
1/8	.0040	25,000	.0023	.0025	21,200	.0018	.0013	19,000	.0013
3/16	.0060	16,700	.0028	.0038	14,200	.0023	.0019	12,700	.0018
1/4	.0075	12,500	.0039	.0050	10,600	.0029	.0025	9,500	.0022
5/16	.0095	10,000	.0046	.0063	8,500	.0039	.0031	7,600	.0030
3/8	.0110	8,300	.0062	.0075	7,100	.0046	.0038	6,300	.0035
1/2	.0150	6,300	.0077	.0100	5,300	.0057	.0050	4,700	.0044
5/8	.0200	5,000	.0084	.0125	4,200	.0063	.0063	3,800	.0047
3/4	.0230	4,200	.0091	.0150	3,500	.0070	.0075	3,200	.0050

P (pitch) = dependent on finish requirement (see formulas)

Formulas - Inch

sfm = rpm x .262 x cutting diameter

rpm = sfm x 3.82 / cutting diameter

feed (inches / minute) = feed per tooth x number of teeth x rpm

cusp height* = (tool diameter / 2) - √(tool diameter² - pitch²) / 4

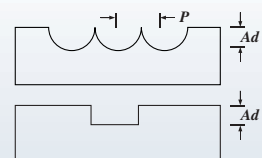
pitch = √(4 x (cusp height x tool diameter) - 4 x (cusp height)²)

TOLERANCES

Cutting Diameter d ₁	Shank Diameter d ₂
1/8-1/4 = +.0000 / -.0012	1/4-3/8 = -.0001 / -.0003
>1/4-3/8 = +.0000 / -.0016	>3/8-3/4 = -.0001 / -.0004
>3/8-3/4 = +.0000 / -.0020	

* on flat surface ¹ suggested maximum

² if recommendation exceeds your machine limit use the maximum available

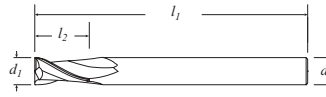




Metric

Long Reach™ - Series 59M - 2 Flute - Square End

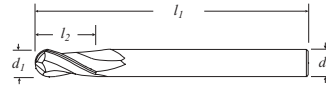
Cutting Diameter d_1 mm	Length of Cut l_2 mm	Overall Length l_1 mm	Shank Diameter d_2 mm	Uncoated EDP No.	Ti-NAMITE (TiN) EDP No.	Ti-NAMITE-C (TiCN) EDP No.	Ti-NAMITE-A (AlTiN) EDP No.
3	9	60	6	43910	43920	43930	43950
4	12	70	6	43911	43921	43931	43951
6	15	80	6	43912	43922	43932	43952
8	20	90	8	43913	43923	43933	43953
10	25	100	10	43914	43924	43934	43954
12	30	110	12	43915	43925	43935	43955
14	35	120	16	43916	43926	43936	43956
16	40	120	16	43917	43927	43937	43957
18	40	130	20	43918	43928	43938	43958
20	45	130	20	43919	43929	43939	43959



TOLERANCES	
Cutting Diameter d_1	Shank Diameter d_2
3-6 = +.00 / -.03	6 = -.0025 / -.0076
> 6-10 = +.00 / -.04	> 6-20 = -.0025 / -.0100
> 10-20 = +.00 / -.05	

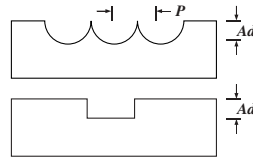
Long Reach™ - Series 59MB - 2 Flute - Ball End

Cutting Diameter d_1 mm	Length of Cut l_2 mm	Overall Length l_1 mm	Shank Diameter d_2 mm	Uncoated EDP No.	Ti-NAMITE (TiN) EDP No.	Ti-NAMITE-C (TiCN) EDP No.	Ti-NAMITE-A (AlTiN) EDP No.
3	9	60	6	43900	49622	49632	49642
4	12	70	6	43901	49623	49633	49643
6	15	80	6	43902	49624	49634	49644
8	20	90	8	43903	49625	49635	49645
10	25	100	10	43904	49626	49636	49646
12	30	110	12	43905	49627	49637	49647
14	35	120	16	43906	49628	49638	49648
16	40	120	16	43907	49629	49639	49649
18	40	130	20	43908	49630	49640	49650
20	45	130	20	43909	49631	49641	49651



Formulas

- $m / \min = (3.14 \times \text{cutting diameter} \times \text{rpm}) / 1000$
- $\text{rpm} = (1000 \times m / \min) / (3.14 \times \text{cutting diameter})$
- $\text{feed (mm / minute)} = \text{feed per tooth} \times \text{number of teeth} \times \text{rpm}$
- $\text{cusp height}^* = (\text{tool diameter} / 2) - \sqrt{(\text{tool diameter} / 2)^2 - \text{pitch}^2} / 4$
- $\text{pitch} = \sqrt{4 \times (\text{cusp height} \times \text{tool diameter}) - 4 \times (\text{cusp height}^2)}$



- * on flat surface
- ¹ suggested maximum
- ² if recommendation exceeds your machine limit use the maximum available

Speed & Feed Recommendations

Square End diameter	Steels < 30 Rc Ad = 50% dia			Steels > 30 - 45 Rc Ad = 50% dia			Steels > 45 - 55 Rc Ad = 50% dia		
	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth
3	1.5	4,045	.010	1.5	2,750	.008	1.5	1,680	.005
4	2.0	3,030	.020	2.0	2,060	.018	2.0	1,260	.015
6	3.0	2,020	.025	3.0	1,375	.020	3.0	840	.018
8	4.0	1,515	.035	4.0	1,030	.025	4.0	630	.022
10	5.0	1,210	.040	5.0	825	.030	5.0	500	.028
12	6.0	1,010	.045	6.0	685	.035	6.0	420	.030
14	7.0	865	.045	7.0	590	.035	7.0	360	.030
16	8.0	760	.050	8.0	515	.045	8.0	315	.035
18	9.0	675	.050	9.0	460	.045	9.0	280	.035
20	10.0	600	.055	10.0	410	.055	10.0	250	.040

Ball End diameter	Steels < 40 Rc Ad = 3% dia			Steels > 40 - 50 Rc Ad = 2% dia			Steels > 50 - 60 Rc Ad = 1% dia		
	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth	axial depth ¹	rpm ²	feed / tooth
3	.09	26,685	.055	.06	22,640	.045	.03	19,890	.030
4	.12	20,000	.070	.08	16,980	.060	.04	14,945	.045
6	.18	13,340	.100	.12	11,320	.075	.06	9,945	.055
8	.24	10,000	.120	.16	8,490	.100	.08	7,470	.075
10	.30	8,000	.155	.20	6,790	.120	.10	5,965	.090
12	.36	6,670	.195	.24	5,660	.145	.12	4,975	.110
14	.42	5,720	.200	.28	4,850	.155	.14	4,260	.110
16	.48	5,000	.215	.32	4,245	.160	.16	3,735	.120
18	.54	4,445	.220	.36	3,775	.170	.18	3,315	.120
20	.60	4,000	.230	.40	3,400	.175	.20	2,985	.125

P (pitch) = dependent on finish requirement (see formulas)

LONG REACH HIGH PERFORMANCE