MORSE CUTTING TOOLS

Carbide Cutting Tools

MORSE CUTTING TOOLS 150 Years

- For High Performance, Production and General Machining Applications.
- Excellent Rigidity, Wear Resistance and Heat Resistance for Higher Cutting Speeds and Longer Tool Life.
- Over 3,600 New Tools.

Quick Index

DRILLS

MISCELLANEOUS

END MILLS

New & Expanded

DRILLS

- **SHEARDRILL™** HP Drills 5xD Without Coolant Holes
- **DRILL-MILL™** Additional Sizes

COUNTERSINKS

- 1-Flute, 3-Flute & 6-Flute Countersinks Additional Sizes & Sets
- Double End Countersinks
- Chamfer Mills

BURRS

- 1/8" Shank Burrs Additional Sizes
- 1/4" Shank Burrs Additional Sizes
- 1/4" Shank Non-Ferrous Burrs Additional Sizes
- Piloted Die Trimmers

END MILLS

- **VP2-End Mill** High Performance 4-Flute Single End Mills
- **vari-FLUTE®** Ultra-High Performance 7-Flute & 9-Flute Single End Mills
- Miniature Single End Mills
- 2-Flute Square End & Ball Nose Single End Mills Additional Sizes & Lengths
- 4-Flute Square End & Ball Nose Single End Mills Additional Sizes & Lengths
- Extra Length of Cut 4-Flute Single End Mills
- Corner Radius 2-Flute & 4-Flute Single End Mills Additional Sizes
- Weldon Flat Single End Mills
- Fine Pitch & Medium Pitch Roughing End Mills
- **DRILL-MILL™** Additional Sizes
- Chamfer Mills

MORSE CUTTING TOOLS

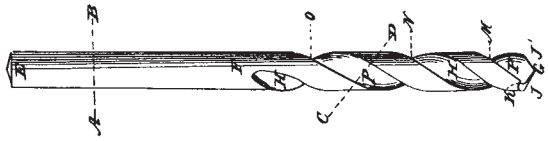
MORSE CUTTING TOOLS 150 Years

United States Patent Office.

STEPHEN A. MORSE, OF EAST BRIDGEWATER, MASSACHUSETTS.

IMPROVEMENT IN DRILL BITS.

Specification forming part of Letters Patent No. 38.119, dated April 7, 1863.



MORSE CUTTING TOOLS

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SHEARDRILL™
High Performance Drills

List No. 5600 3xD and List No. 5603 5xD Non-Coolant Through

List No. 5601 3xD Short Length Coolant Through

List No. 5602 5xD Long Length Coolant Through

Premium Submicron Carbide

TiALN – Titanium Aluminum Nitride Coating increases wear resistance, heat resistance and chip flow and resists chip welding.

140° Self-Centering High Performance Point

Coolant-Through design delivers coolant directly to the drill point enabling higher speeds and chip loads.

Recommended for a wide range of materials including carbon steels, cast steels, alloy steels, stainless steels and cast iron.

SHEARDRILL™
3xD and 5xD Non-Coolant Through High Performance Drills

MORSE CUTTING TOOLS

Premium Submicron Carbide

TiALN – Titanium Aluminum Nitride Coating increases wear resistance, heat resistance and chip flow and resists chip welding.

140° Self-Centering High Performance Point

Recommended for a wide range of materials including carbon steels, cast steels, alloy steels, stainless steels and cast iron.

WITHOUT COOLANT HOLES

3XD NON-COOLANT THROUGH DRILLS			
Drill and Shank Diameter Tolerances			
Diameter Range		Drill Dia.	Shank Dia.
INCH	.1181 - .2360	+.000 / -.00071	-.0001 / -.0005
INCH	.2361 - .3940	+..000 / -.00087	-.0001 / -.0005
INCH	.3941 - .7090	+.000 / -.00106	-.0001 / -.0005

Speeds & Feeds: Page 9

(continued)

3xD Non-Coolant Through

WITHOUT COOLANT HOLES
Drilling up to 3xD

Tolerances: Page 2

List No. 5600 Non-Coolant Through

SIZE				DEC.	SHANK	FLUTE		EDP
FRACTIONAL	WIRE GAGE	LETTER	METRIC	EQUIV.	DIA.	LENGTH	OAL	NO.
1/8				.1250	1/8	45/64	1-59/64	98700
9/64				.1406	9/64	25/32	2-3/64	98701
5/32				.1562	5/32	7/8	2-3/16	98702
11/64				.1719	11/64	15/16	2-9/32	98703
3/16				.1875	3/16	1	2-7/16	98704
13/64				.2031	13/64	1	2-7/16	98705
7/32				.2188	7/32	1-1/8	2-5/8	98706
15/64				.2344	15/64	1-1/8	2-5/8	98707
1/4		E		.2500	1/4	1-5/8	3-3/16	98708
		F		.2570	F	1-11/16	3-17/64	98709
17/64				.2656	17/64	1-11/16	3-17/64	98710
		I		.2720	I	1-11/16	3-17/64	98711
9/32				.2812	9/32	1-3/4	3-7/16	98712
19/64				.2969	19/64	1-7/8	3-9/16	98713
5/16				.3125	5/16	1-7/8	3-9/16	98714
21/64				.3281	21/64	2-1/16	3-3/4	98715
		Q		.3320	Q	2-1/16	3-3/4	98716
11/32				.3438	11/32	2-3/16	3-7/8	98717
23/64				.3594	23/64	2-9/32	4	98718
		U		.3680	U	2-9/32	4	98719
3/8				.3750	3/8	2-3/8	4-1/8	98720
25/64				.3906	25/64	2-3/8	4-1/8	98721
13/32				.4062	13/32	2-5/8	4-13/32	98722
27/64				.4219	27/64	2-11/16	4-1/2	98723
7/16				.4375	7/16	2-13/16	4-5/8	98724
29/64				.4531	29/64	2-7/8	4-3/4	98725
15/32				.4688	15/32	2-7/8	4-3/4	98726
31/64				.4844	31/64	3	5-5/16	98727
1/2				.5000	1/2	3-1/16	5-3/8	98728
33/64				.5156	33/64	3-11/32	5-11/16	98729
17/32				.5312	17/32	3-11/32	5-11/16	98730
9/16				.5625	9/16	3-1/2	5-15/16	98731
37/64				.5781	37/64	3-37/64	6	98732
5/8				.6250	5/8	3-25/32	6-19/64	98733

5xD Non-Coolant Through

WITHOUT COOLANT HOLES
Drilling up to 5xD

Tolerances: Page 4

List No. 5603 Non-Coolant Through

SIZE				DEC.	SHANK	FLUTE		EDP
FRACTIONAL	WIRE GAGE	LETTER	METRIC	EQUIV.	DIA.	LENGTH	OAL	NO.
13/64				.2031	13/64	1-3/4	3-15/16	98851
7/32				.2188	7/32	1-57/64	3-15/16	98852
1/4		E		.2500	1/4	2-3/64	4-19/64	98853
		F		.2570	F	2-13/64	4-19/64	98854
17/64				.2656	17/64	2-13/64	4-19/64	98855
9/32				.2812	9/32	2-23/64	4-41/64	98856
5/16				.3125	5/16	2-33/64	4-41/64	98857
11/32				.3438	11/32	2-27/32	5	98858
3/8				.3750	3/8	3-5/32	5-23/64	98859
25/64				.3906	25/64	3-5/32	5-23/64	98860
13/32				.4062	13/32	3-5/16	5-7/8	98861
27/64				.4219	27/64	3-15/32	5-7/8	98862
7/16				.4375	7/16	3-5/8	6-7/32	98863
1/2				.5000	1/2	4-3/32	6-37/64	98864

SHEAR*DRILL*™

Coolant-Through 3xD Short Length High Performance Drills

Premium Submicron Carbide

TiALN – Titanium Aluminum Nitride Coating increases wear resistance, heat resistance and chip flow and resists chip welding.

140° Self-Centering High Performance Point

Coolant-Through design delivers coolant directly to the drill point enablling higher speeds and chip loads.

Recommended for a wide range of materials including carbon steels, cast steels, alloy steels, stainless steels and cast iron.

5XD NON-COOLANT THROUGH DRILLS & COOLANT THROUGH DRILLS			
Drill and Shank Diameter Tolerances			
Diameter Range		Drill Dia. m7	Shank Dia. h6
INCH	.1182 - .2362	+.00016 / + .00063	+.000 / -.00031
METRIC (mm)	> 3.0 - 6.0	+.004 / +.016	+.000 / -.008
INCH	.2363 - .3937	+.00024 / +.00083	+.000 / -.00035
METRIC (mm)	> 6.0 - 10.0	+.006 / +.021	+.000 / -.009
INCH	.3938 - .7087	+.00027 / + .00098	+.000 / -.00043
METRIC (mm)	> 10.0 - 18.0	+.007 / + .025	+.000 / -.011
INCH	.7088 - .7874	+.00031 / +.00114	+.000 / -.00051
METRIC (mm)	> 18.0 - 20.0	+.008 / +.029	+.000 / -.013

Speeds & Feeds: Page 9

List No. 5601 Short Length Coolant Through

COOLANT-THROUGH

SIZE				DEC.	SHANK	FLUTE		EDP
FRACTIONAL	WIRE GAGE	LETTER	METRIC	EQUIV.	DIA.	LENGTH	OAL	NO.
5/32				.1562	6	24	66	98734
			4.0	.1575	6	24	66	98735
	21			.1590	6	24	66	98736
			4.2	.1654	6	24	66	98737
			4.5	.1772	6	24	66	98738
3/16				.1875	6	24	66	98739
			4.8	.1890	6	28	66	98740
			5.0	.1969	6	28	66	98741
	3			.2130	6	28	66	98742
			5.5	.2165	6	28	66	98743
7/32				.2188	6	28	66	98744
	2			.2210	6	28	66	98745
			5.8	.2283	6	28	66	98746
		A		.2340	6	28	66	98747
			6.0	.2362	6	28	66	98748
		C		.2420	8	34	79	98749
1/4		E		.2500	8	34	79	98750
			6.5	.2559	8	34	79	98751
		F		.2570	8	34	79	98752
		H		.2660	8	34	79	98753
			6.8	.2677	8	34	79	98754
		I		.2720	8	34	79	98755
			7.0	.2756	8	34	79	98756
		J		.2770	8	34	79	98757
9/32				.2812	8	41	79	98758
			7.5	.2953	8	41	79	98759
19/64				.2969	8	41	79	98760
5/16				.3125	8	41	79	98761
			8.0	.3150	8	41	79	98762
			8.2	.3228	10	47	89	98763

(continued)

SHEAR*DRILL*™
Coolant-Through 3xD Short Length High Performance Drills

Premium Submicron Carbide

TiALN – Titanium Aluminum Nitride Coating increases wear resistance, heat resistance and chip flow and resists chip welding.

140° Self-Centering High Performance Point

Coolant-Through design delivers coolant directly to the drill point enablling higher speeds and chip loads.

Recommended for a wide range of materials including carbon steels, cast steels, alloy steels, stainless steels and cast iron.

To achieve Optimal Results all Components of the Drilling System must be considered

Technical Information: See Page 8

Recommended Speeds & Feeds: See Page 9

Speeds & Feeds: Page 9

(continued)

List No. 5601 Short Length Coolant Through

COOLANT-THROUGH

SIZE				DEC.	SHANK	FLUTE		EDP
FRACTIONAL	WIRE GAGE	LETTER	METRIC	EQUIV.	DIA.	LENGTH	OAL	NO.
21/64				.3281	10	47	89	98764
		Q		.3320	10	47	89	98765
			8.5	.3346	10	47	89	98766
			9.0	.3543	10	47	89	98767
23/64				.3594	10	47	89	98768
		U		.3680	10	47	89	98769
			9.5	.3740	10	47	89	98770
3/8				.3750	10	47	89	98771
25/64				.3906	10	47	89	98772
			10.0	.3937	10	47	89	98773
13/32				.4062	12	55	102	98774
			10.5	.4134	12	55	102	98775
27/64				.4219	12	55	102	98776
			11.0	.4331	12	55	102	98777
7/16				.4375	12	55	102	98778
			11.5	.4528	12	55	102	98779
15/32				.4688	12	55	102	98780
			12.0	.4724	12	55	102	98781
			12.5	.4921	14	60	107	98782
1/2				.5000	14	60	107	98783
			13.0	.5118	14	60	107	98784
			13.5	.5315	14	60	107	98785
			14.0	.5512	14	60	107	98786
9/16				.5625	16	65	115	98787
			14.5	.5709	16	65	115	98788
			15.0	.5906	16	65	115	98789
5/8				.6250	16	65	115	98790
			16.0	.6299	16	65	115	98791
3/4				.7500	20	79	131	98792

SHEAR*DRILL*™

Coolant-Through 5xD Long Length High Performance Drills

Premium Submicron Carbide

TiALN – Titanium Aluminum Nitride Coating increases wear resistance, heat resistance and chip flow and resists chip welding.

140° Self-Centering High Performance Point

Coolant-Through design delivers coolant directly to the drill point enablling higher speeds and chip loads.

Recommended for a wide range of materials including carbon steels, cast steels, alloy steels, stainless steels and cast iron.

5XD NON-COOLANT THROUGH DRILLS & COOLANT THROUGH DRILLS			
Drill and Shank Diameter Tolerances			
Diameter Range		Drill Dia. m7	Shank Dia. h6
INCH	.1182 - .2362	+.00016 / + .00063	+.000 / -.00031
METRIC (mm)	> 3.0 - 6.0	+.004 / +.016	+.000 / -.008
INCH	.2363 - .3937	+.00024 / +.00083	+.000 / -.00035
METRIC (mm)	> 6.0 - 10.0	+.006 / +.021	+.000 / -.009
INCH	.3938 - .7087	+.00027 / + .00098	+.000 / -.00043
METRIC (mm)	> 10.0 - 18.0	+.007 / + .025	+.000 / -.011
INCH	.7088 - .7874	+.00031 / +.00114	+.000 / -.00051
METRIC (mm)	> 18.0 - 20.0	+.008 / +.029	+.000 / -.013

List No. 5602 Long Length Coolant Through

COOLANT-THROUGH

SIZE				DEC.	SHANK	FLUTE		EDP
FRACTIONAL	WIRE GAGE	LETTER	METRIC	EQUIV.	DIA.	LENGTH	OAL	NO.
5/32				.1562	6	36	74	98793
			4.0	.1575	6	36	74	98794
	21			.1590	6	36	74	98795
			4.2	.1654	6	36	74	98796
			4.5	.1772	6	36	74	98797
3/16				.1875	6	36	74	98798
			4.8	.1890	6	44	82	98799
			5.0	.1969	6	44	82	98800
	3			.2130	6	44	82	98801
			5.5	.2165	6	44	82	98802
7/32				.2188	6	44	82	98803
	2			.2210	6	44	82	98804
			5.8	.2283	6	44	82	98805
		A		.2340	6	44	82	98806
			6.0	.2362	6	44	82	98807
		C		.2420	8	53	91	98808
1/4		E		.2500	8	53	91	98809
			6.5	.2559	8	53	91	98810
		F		.2570	8	53	91	98811
		H		.2660	8	53	91	98812
			6.8	.2677	8	53	91	98813
		I		.2720	8	53	91	98814
			7.0	.2756	8	53	91	98815
		J		.2770	8	53	91	98816
9/32				.2812	8	53	91	98817
			7.5	.2953	8	53	91	98818
19/64				.2969	8	53	91	98819
5/16				.3125	8	53	91	98820
			8.0	.3150	8	53	91	98821
			8.2	.3228	10	61	103	98822

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SHEAR*DRILL*™
Coolant-Through 5xD Long Length High Performance Drills

Premium Submicron Carbide

TiALN – Titanium Aluminum Nitride Coating increases wear resistance, heat resistance and chip flow and resists chip welding.

140° Self-Centering High Performance Point

Coolant-Through design delivers coolant directly to the drill point enablling higher speeds and chip loads.

Recommended for a wide range of materials including carbon steels, cast steels, alloy steels, stainless steels and cast iron.

To achieve Optimal Results all Components of the Drilling System must be considered

Technical Information: See Page 8

Recommended Speeds & Feeds: See Page 9

Speeds & Feeds: Page 9

(continued)

List No. 5602 Long Length Coolant Through

COOLANT-THROUGH

SIZE				DEC.	SHANK	FLUTE		EDP
FRACTIONAL	WIRE GAGE	LETTER	METRIC	EQUIV.	DIA.	LENGTH	OAL	NO.
21/64				.3281	10	61	103	98823
		Q		.3320	10	61	103	98824
			8.5	.3346	10	61	103	98825
			9.0	.3543	10	61	103	98826
23/64				.3594	10	61	103	98827
		U		.3680	10	61	103	98828
			9.5	.3740	10	61	103	98829
3/8				.3750	10	61	103	98830
			10.0	.3937	10	61	103	98831
13/32				.4062	12	71	118	98832
			10.5	.4134	12	71	118	98833
27/64				.4219	12	71	118	98834
			11.0	.4331	12	71	118	98835
7/16				.4375	12	71	118	98836
			11.5	.4528	12	71	118	98837
15/32				.4688	12	71	118	98838
			12.0	.4724	12	71	118	98839
			12.5	.4921	14	77	124	98840
1/2				.5000	14	77	124	98841
			13.0	.5118	14	77	124	98842
			13.5	.5315	14	77	124	98843
			14.0	.5512	14	77	124	98844
9/16				.5625	16	83	133	98845
			14.5	.5709	16	83	133	98846
			15.0	.5906	16	83	133	98847
5/8				.6250	16	83	133	98848
			16.0	.6299	16	83	133	98849
3/4				.7500	20	101	153	98850

SHEAR*DRILL*™
Technical Information

All components of the drilling system contribute to the achievement of the quality of the hole produced and the productivity that can be realized. In order to maximize success the following should be considered.

1. Toolholding – High quality tool holders should be used. Total indicated tool run out measured at the point should be less than .001".
2. Machine – A rigid machine with a high quality spindle is required.
3. Workholding – The workpiece must be held rigidly so that it cannot deflect or vibrate during drilling
4. Drilling and Chamfering – A chamfer should be added to a hole only after drilling, never before.
5. The drill should be perpendicular to the surface being drilled. An inclined or rough surface should be pre-machined with an end mill to make it perpendicular before drilling.
6. Drilling On Turning Machines – When drilling on a turning machine the drill must be on center. The tolerance range for centrality should not exceed ±.001. When drilling more than 3XD the drill may require a reduction in speed.
7. Coolant – **SHEAR*DRILL*™** drills are high penetration drills. To perform to their potential they must be properly cooled. A high pressure and high volume with a quality high lubricity coolant will aid chip removal, enhance tool life and, increase hole quality.
    - Without adequate coolant, drills can heat up quickly and expand, sometimes leading to the drill seizing in the hole.
    - Heat at the drill point can cause coolant to vaporize resulting in thermal damage to the point. Coolant pressure should be high enough to break this barrier keeping the point within acceptable operating parameters.
    - See Minimum Favorable Coolant Pressure chart below for coolant-through drills

SHEAR*DRILL*™

Speeds and Feeds

Material Group	Examples	Composition / Structure		Hardness BRN	Cutting Speed (SFM)	D = 0.125"	D = 0.250"	D = 0.375	D = 0.500"	D = 0.625"	D = 0.750"
Unalloyed steel, cast steel, machining steel	1008, 1108, 1018, 10L18, 12L15, ASTM A426: Gr. CP1	C = 0.10 - 0.25	Annealed, Long Chipping	125	390	0.004"	0.005"	0.006"	0.008"	0.009"	0.012"
		C = 0.10 - 0.25	Annealed, Short Chipping	125	410	0.004"	0.005"	0.006"	0.009"	0.011"	0.013"
	1030, 1055, 1070, 1524, 1050, 1060, ASTM 352 Gr. LCA, ASTM 356 Gr. 1, 1536	C = 0.25 - 0.55	Annealed, Long Chipping	190	360	0.004"	0.005"	0.006"	0.009"	0.011"	0.013"
		C = 0.25 - 0.55	Annealed, Short Chipping	190	390	0.004"	0.006"	0.007"	0.009"	0.011"	0.014"
		C = 0.25 - 0.55	Tempered	250	300	0.004"	0.006"	0.007"	0.009"	0.011"	0.015"
		C = 0.25 - 0.80	Annealed	270	260	0.004"	0.006'	0.007"	0.009"	0.011"	0.015"
		C = 0.25 - 0.80	Tempered	300	260	0.004"	0.006"	0.007"	0.009"	0.011"	0.015"
Low-alloy steel, cast steel, machining steel	1330, 2515, 3140, 4130, 4140, 4320, 4340, 5140, 8620, 9315, 9840	Annealed		180	260	0.004"	0.006"	0.007"	0.009"	0.012"	0.015"
		Tempered		275	260	0.004"	0.006"	0.007"	0.009"	0.011"	0.014"
		Tempered		300	260	0.004"	0.005"	0.006"	0.008"	0.010"	0.013"
		Tempered		350	230	0.004"	0.006"	0.007"	0.009"	0.011"	0.013"
High-alloy steel, cast steel, high alloy tool steel	D2, M2, T15	Annealed		200	200	0.003"	0.004"	0.005"	0.006"	0.008"	0.010"
		Hardened and Tempered		325	160	0.002"	0.004"	0.004"	0.006"	0.008"	0.010"
Gray cast iron	ASTM A48 Cl. 25, ASE J431c: Gr.G3000, ASTM A48 Cl. 30	Pearlitic / Ferritic		180	540	0.006"	0.007"	0.009"	0.012"	0.014"	0.018"
		Pearlitic (Martensitic)		260	360	0.005"	0.006"	0.008"	0.010"	0.013"	0.016"
Ductile cast iron	ASTM A536 Gr. 60-40-18, SAE J434c: Gr.D5506	Ferritic		160	360	0.005"	0.006"	0.008"	0.010"	0.012"	0.015"
		Pearlitic		250	360	0.004"	0.005"	0.006"	0.007"	0.009"	0.012"
Malleable cast iron	ASTM A47 Gr.32510, SAE J158 Gr. M4504, M5003	Ferritic		130	430	0.005"	0.006"	0.007"	0.009"	0.012"	0.015"
		Pearlitic		230	430	0.004"	0.005"	0.006"	0.008"	0.010"	0.012"
Austenitic Stainless Steels	202, 303, 304, 316, 316L	Easy to Moderate Machining		200	180	0.003"	0.004"	0.005"	0.006"	0.008"	0.010"
Ferritic, Martenistic, and PH stainless steels	405, 410, 440C, 502, AM350, 17-4PH	Annealed		200	180	0.003"	0.004"	0.005"	0.006"	0.008"	0.010"
		Hardened and Tempered		325	160	0.002"	0.004"	0.004"	0.006"	0.008"	0.010"

SPEED AND FEED RATES FOR NON-COOLANT-THROUGH DRILLS SHOULD EACH BE REDUCED BY 20%

Better drilling productivity is obtained by knowing the properties of the workpiece material. The hardness, chip forming characteristics, and machining characteristics help to select optimal machining parameters. Contact Morse Cutting Tools for more information.

SPEEDS and FEEDS are suggested starting points and may be increased or decreased depending upon material and machining conditions. Start conservatively and increase until machining cycle is optimized.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

Solid Carbide Standard Length Drills

Recommended for drilling cast iron, non ferrous alloys, plastics, aluminum and other easily machined materials.

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. High rigidity enhances hole accuracy and quality.

Aluminum Titanium Nitride (ALTiN) Coating is an excellent all around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding.

Speeds & Feeds: Page 18

List No. 5374 - Uncoated

List No. 5374T - ALTiN Coated

118° Point - Split Point for sizes over 1/16"

25° Helix Angle

TOLERANCES
All sizes +.0000/-.0005

STANDARD PACKAGE
All sizes — 1 each

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5374 UNCOATED EDP NO.	5374T ALTiN EDP NO.
80	.0135	3/16	1-1/4	51000	—
79	.0145	3/16	1-1/4	51001	—
1/64	.0156	3/16	1-1/4	51002	—
78	.0160	3/16	1-1/4	51003	—
77	.0180	3/16	1-1/4	51004	—
76	.0200	1/4	1-1/4	51005	—
75	.0210	1/4	1-1/4	51006	—
74	.0225	1/4	1-1/4	51007	—
73	.0240	1/4	1-1/4	51008	—
72	.0250	5/16	1-1/4	51009	—
71	.0260	5/16	1-1/4	51010	—
70	.0280	5/16	1-1/4	51011	—
69	.0292	5/16	1-1/4	51012	—
68	.0310	5/16	1-1/4	51013	—
1/32	.0312	5/16	1-1/4	51014	92090
67	.0320	5/16	1-1/4	51015	—
66	.0330	5/16	1-1/4	51016	—
65	.0350	5/8	1-3/8	51017	—
64	.0360	5/8	1-3/8	51018	—
63	.0370	5/8	1-3/8	51019	—
62	.0380	5/8	1-3/8	51020	—
61	.0390	5/8	1-3/8	51021	—
1.00 mm	.0394	5/8	1-1/2	51022	92091
60	.0400	3/4	1-1/2	51023	—
59	.0410	3/4	1-1/2	51024	—
58	.0420	3/4	1-1/2	51025	—
57	.0430	3/4	1-1/2	51026	—
56	.0465	3/4	1-1/2	51027	92092
3/64	.0469	3/4	1-1/2	51028	92093
55	.0520	3/4	1-1/2	51029	92094
54	.0550	3/4	1-1/2	51030	92095
1.50 mm	.0591	3/4	1-1/2	50977	92096
53	.0595	3/4	1-1/2	51031	92097
1/16	.0625	3/4	1-1/2	51032	92098
52	.0635	3/4	1-1/2	51033	92099
51	.0670	3/4	1-1/2	51034	92100
50	.0700	7/8	1-3/4	51035	92101
49	.0730	7/8	1-3/4	51036	92102
48	.0760	7/8	1-3/4	51037	92103
5/64	.0781	7/8	1-3/4	51038	92104
47	.0785	7/8	1-3/4	51039	92105
2.00 mm	.0787	7/8	1-3/4	50978	92106
46	.0810	7/8	1-3/4	51040	92107
45	.0820	7/8	1-3/4	51041	92108
44	.0860	1	2	51042	92109
43	.0890	1	2	51043	92110
42	.0935	1	2	51044	92111
3/32	.0938	1	2	51045	92112
41	.0960	1	2	51046	92113
40	.0980	1	2	51047	92114
2.50 mm	.0984	1	2	50979	92115
39	.0995	1-1/4	2-1/4	51048	92116
38	.1015	1-1/4	2-1/4	51049	92117
37	.1040	1-1/4	2-1/4	51050	92118
36	.1065	1-1/4	2-1/4	51051	92119
7/64	.1094	1-1/4	2-1/4	51052	92120
35	.1100	1-1/4	2-1/4	51053	92121
34	.1110	1-1/4	2-1/4	51054	92122
33	.1130	1-1/4	2-1/4	51055	92123
32	.1160	1-1/4	2-1/4	51056	92124
3.00 mm	.1181	1-1/4	2-1/4	50980	92125
31	.1200	1-1/4	2-1/4	51057	92126
1/8	.1250	1-1/4	2-1/4	51058	92127
30	.1285	1-1/4	2-1/4	51059	92128
29	.1360	1-3/8	2-1/2	51060	92129
3.50 mm	.1378	1-3/8	2-1/2	50981	92130
28	.1405	1-3/8	2-1/2	51061	92131
9/64	.1406	1-3/8	2-1/2	51062	92132
27	.1440	1-3/8	2-1/2	51063	92133
26	.1470	1-3/8	2-1/2	51064	92134
25	.1495	1-3/8	2-1/2	51065	92135
24	.1520	1-3/8	2-1/2	51066	92136
23	.1540	1-3/8	2-1/2	51067	92137
5/32	.1562	1-3/8	2-1/2	51068	92138
22	.1570	1-3/8	2-1/2	51069	92139
4.00 mm	.1575	1-3/8	2-1/2	50982	92140
21	.1590	1-3/8	2-1/2	51070	92141
20	.1610	1-3/8	2-1/2	51071	92142
19	.1660	1-5/8	2-3/4	51072	92143
18	.1695	1-5/8	2-3/4	51073	92144

Tool Coatings Also Available

(continued)

Solid Carbide Standard Length Drills

Recommended for drilling cast iron, non ferrous alloys, plastics, aluminum and other easily machined materials.

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. High rigidity enhances hole accuracy and quality.

Aluminum Titanium Nitride (ALTiN) Coating is an excellent all around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding.

List No. 5374 - Uncoated

List No. 5374T - ALTiN Coated

118° Point - Split Point for sizes over 1/16"

25° Helix Angle

TOLERANCES
All sizes +.0000/-.0005

STANDARD PACKAGE
All sizes — 1 each

(continued)

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5374 UNCOATED EDP NO.	5374T ALTiN EDP NO.
11/64	.1719	1-5/8	2-3/4	**51074**	**92145**
17	.1730	1-5/8	2-3/4	**51075**	**92146**
16	.1770	1-5/8	2-3/4	**51076**	**92147**
4.50 mm	.1772	1-5/8	2-3/4	**50983**	**92148**
15	.1800	1-5/8	2-3/4	**51077**	**92149**
14	.1820	1-5/8	2-3/4	**51078**	**92150**
13	.1850	1-5/8	2-3/4	**51079**	**92151**
3/16	.1875	1-5/8	2-3/4	**51080**	**92152**
12	.1890	1-5/8	2-3/4	**51081**	**92153**
11	.1910	1-5/8	2-3/4	**51082**	**92154**
10	.1935	1-5/8	2-3/4	**51083**	**92155**
9	.1960	1-3/4	3	**51084**	**92156**
5.00 mm	.1969	1-3/4	3	**50984**	**92157**
8	.1990	1-3/4	3	**51085**	**92158**
7	.2010	1-3/4	3	**51086**	**92159**
13/64	.2031	1-3/4	3	**51087**	**92160**
6	.2040	1-3/4	3	**51088**	**92161**
5	.2055	1-3/4	3	**51089**	**92162**
4	.2090	1-3/4	3	**51090**	**92163**
3	.2130	1-3/4	3	**51091**	**92164**
5.50 mm	.2165	1-3/4	3	**50985**	**92165**
7/32	.2188	1-3/4	3	**51092**	**92166**
2	.2210	1-3/4	3	**51093**	**92167**
1	.2280	1-3/4	3	**51094**	**92168**
A	.2340	2	3-1/4	**51095**	**92169**
15/64	.2344	2	3-1/4	**51096**	**92170**
6.00 mm	.2362	2	3-1/4	**50986**	**92171**
B	.2380	2	3-1/4	**51097**	**92172**
C	.2420	2	3-1/4	**51098**	**92173**
D	.2460	2	3-1/4	**51099**	**92174**
1/4 (E)	.2500	2	3-1/4	**51100**	**92175**
6.50 mm	.2559	2	3-1/4	**50987**	**92176**
F	.2570	2	3-1/4	**51102**	**92177**
G	.2610	2-1/8	3-1/2	**51103**	**92178**
17/64	.2656	2-1/8	3-1/2	**51104**	**92179**
H	.2660	2-1/8	3-1/2	**51105**	**92180**
I	.2720	2-1/8	3-1/2	**51106**	**92181**
7.00 mm	.2756	2-1/8	3-1/2	**50988**	**92182**
J	.2770	2-1/8	3-1/2	**51107**	**92183**
K	.2810	2-1/8	3-1/2	**51108**	**92184**
9/32	.2812	2-1/8	3-1/2	**51109**	**92185**
L	.2900	2-1/8	3-1/2	**51110**	**92186**
M	.2950	2-3/8	3-3/4	**51111**	**92187**
7.50 mm	.2953	2-3/8	3-3/4	**50989**	**92188**
19/64	.2969	2-3/8	3-3/4	**51112**	**92189**
N	.3020	2-3/8	3-3/4	**51113**	**92190**
5/16	.3125	2-3/8	3-3/4	**51114**	**92191**
8.00 mm	.3150	2-3/8	3-3/4	**50990**	**92192**
O	.3160	2-3/8	3-3/4	**51115**	**92193**
P	.3230	2-3/8	3-3/4	**51116**	**92194**
21/64	.3281	2-1/2	4	**51117**	**92195**
Q	.3320	2-1/2	4	**51118**	**92196**
8.50 mm	.3346	2-1/2	4	**50991**	**92197**
R	.3390	2-1/2	4	**51119**	**92198**
11/32	.3438	2-1/2	4	**51120**	**92199**
S	.3480	2-1/2	4	**51121**	**92200**
9.00 mm	.3543	2-1/2	4	**50992**	**92201**
T	.3580	2-3/4	4-1/4	**51122**	**92202**
23/64	.3594	2-3/4	4-1/4	**51123**	**92203**
U	.3680	2-3/4	4-1/4	**51124**	**92204**
9.50 mm	.3740	2-3/4	4-1/4	**50993**	**92205**
3/8	.3750	2-3/4	4-1/4	**51125**	**92206**
V	.3770	2-3/4	4-1/4	**51126**	**92207**
W	.3860	2-7/8	4-1/2	**51127**	**92208**
25/64	.3906	2-7/8	4-1/2	**51128**	**92209**
10.00 mm	.3937	2-7/8	4-1/2	**50994**	**92210**
X	.3970	2-7/8	4-1/2	**51129**	**92211**
Y	.4040	2-7/8	4-1/2	**51130**	**92212**
13/32	.4062	2-7/8	4-1/2	**51131**	**92213**
Z	.4130	2-7/8	4-1/2	**51132**	**92214**
10.50 mm	.4134	2-7/8	4-1/2	**50995**	**92215**
27/64	.4219	2-7/8	4-1/2	**51133**	**92216**
11.00 mm	.4331	2-7/8	4-1/2	**50996**	**92217**
7/16	.4375	2-7/8	4-1/2	**51134**	**92218**
11.50 mm	.4528	3	4-3/4	**50997**	**92219**
29/64	.4531	3	4-3/4	**51135**	**92220**
15/32	.4688	3	4-3/4	**51136**	**92221**
12.00 mm	.4724	3	4-3/4	**50998**	**92222**
31/64	.4844	3	4-3/4	**51137**	**92223**
12.50 mm	.4921	3	4-3/4	**50999**	**92224**
1/2	.5000	3	4-3/4	**51138**	**92225**

Solid Carbide Screw Machine Length Drills

For Tough Drilling Applications

Recommended for tough drilling applications including carbon steel, stainless steel, cast iron, inconel, titanium, high temperature alloy steel, tool steel, work hardened and gummy materials and other high strength ferrous materials.

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. High rigidity enhances hole accuracy and quality.

Aluminum Titanium Nitride (ALTiN) Coating is an excellent all around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

135° Self-centering split point eliminates "walking" and reduces thrust.

List No. 5375 - Uncoated

List No. 5375T -ALTiN Coated

135° Point – 15° Helix Angle
Split Point on sizes 3/32" and larger.

TOLERANCES
All sizes +.0000/-.0005

STANDARD PACKAGE
All sizes — 1 each

Speeds & Feeds: Page 18

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5375 UNCOATED EDP NO.	5375T ALTiN EDP NO.
1/32	.0312	1/2	1-1/2	**50860**	**92230**
1.0 mm	.0394	13 mm	38 mm	**54825**	**93005**
#60	.0400	1/2	1-1/2	**54826**	**93006**
#59	.0410	1/2	1-1/2	**54827**	**93007**
#58	.0420	1/2	1-1/2	**54828**	**93008**
#57	.0430	1/2	1-1/2	**54829**	**93009**
56	.0465	1/2	1-1/2	**50861**	**92231**
3/64	.0469	1/2	1-1/2	**50862**	**92232**
55	.0520	1/2	1-1/2	**50863**	**92233**
54	.0550	1/2	1-1/2	**50864**	**92234**
1.5 mm	.0591	13 mm	38 mm	**54830**	**93010**
53	.0595	1/2	1-1/2	**50865**	**92235**
1/16	.0625	5/8	1-5/8	**50866**	**92236**
52	.0635	11/16	1-11/16	**50867**	**92237**
51	.0670	11/16	1-11/16	**50868**	**92238**
50	.0700	11/16	1-11/16	**50869**	**92239**
49	.0730	11/16	1-11/16	**50870**	**92240**
48	.0760	11/16	1-11/16	**50871**	**92241**
5/64	.0781	11/16	1-11/16	**50872**	**92242**
47	.0785	3/4	1-3/4	**50873**	**92243**
2.0 mm	.0787	19 mm	45 mm	**54831**	**93011**
46	.0810	3/4	1-3/4	**50874**	**92244**
45	.0820	3/4	1-3/4	**50875**	**92245**
44	.0860	3/4	1-3/4	**50876**	**92246**
43	.0890	3/4	1-3/4	**50877**	**92247**
42	.0935	3/4	1-3/4	**50878**	**92248**
3/32	.0938	3/4	1-3/4	**50879**	**92249**
41	.0960	13/16	1-13/16	**50880**	**92250**
40	.0980	13/16	1-13/16	**50881**	**92251**
2.5 mm	.0984	21 mm	46 mm	**54832**	**93012**
39	.0995	13/16	1-13/16	**50882**	**92252**
38	.1015	13/16	1-13/16	**50883**	**92253**
37	.1040	13/16	1-13/16	**50884**	**92254**
36	.1065	13/16	1-13/16	**50885**	**92255**
7/64	.1094	13/16	1-13/16	**50886**	**92256**
35	.1100	7/8	1-7/8	**50887**	**92257**
34	.1110	7/8	1-7/8	**50888**	**92258**
33	.1130	7/8	1-7/8	**50889**	**92259**
32	.1160	7/8	1-7/8	**50890**	**92260**
3.0 mm	.1181	22 mm	48 mm	**54833**	**93013**
31	.1200	7/8	1-7/8	**50891**	**92261**
1/8	.1250	7/8	1-7/8	**50892**	**92262**
30	.1285	15/16	1-15/16	**50893**	**92263**
29	.1360	15/16	1-15/16	**50894**	**92264**
3.5 mm	.1378	24 mm	49 mm	**54834**	**93014**
28	.1405	15/16	1-15/16	**50895**	**92265**
9/64	.1406	15/16	1-15/16	**50896**	**92266**
27	.1440	1	2-1/16	**50897**	**92267**
26	.1470	1	2-1/16	**50898**	**92268**
25	.1495	1	2-1/16	**50899**	**92269**
24	.1520	1	2-1/16	**50900**	**92270**
23	.1540	1	2-1/16	**50901**	**92271**
5/32	.1562	1	2-1/16	**50902**	**92272**
22	.1570	1-1/16	2-1/8	**50903**	**92273**
4.0 mm	.1575	27 mm	54 mm	**54835**	**93015**
21	.1590	1-1/16	2-1/8	**50904**	**92274**
20	.1610	1-1/16	2-1/8	**50905**	**92275**
19	.1660	1-1/16	2-1/8	**50906**	**92276**
18	.1695	1-1/16	2-1/8	**50907**	**92277**
11/64	.1719	1-1/16	2-1/8	**50908**	**92278**
17	.1730	1-1/8	2-3/16	**50909**	**92279**
16	.1770	1-1/8	2-3/16	**50910**	**92280**
4.5 mm	.1772	29 mm	56 mm	**54836**	**93016**
15	.1800	1-1/8	2-3/16	**50911**	**92281**
14	.1820	1-1/8	2-3/16	**50912**	**92282**
13	.1850	1-1/8	2-3/16	**50913**	**92283**
3/16	.1875	1-1/8	2-3/16	**50914**	**92284**
12	.1890	1-3/16	2-1/4	**50915**	**92285**
11	.1910	1-3/16	2-1/4	**50916**	**92286**
10	.1935	1-3/16	2-1/4	**50917**	**92287**
9	.1960	1-3/16	2-1/4	**50918**	**92288**
5.0 mm	.1969	30 mm	57 mm	**54837**	**93017**
8	.1990	1-3/16	2-1/4	**50919**	**92289**

Tool Coatings Also Available

(continued)

Solid Carbide Screw Machine Length Drills

For Tough Drilling Applications

Recommended for tough drilling applications including carbon steel, stainless steel, cast iron, inconel, titanium, high temperature alloy steel, tool steel, work hardened and gummy materials and other high strength ferrous materials.

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. High rigidity enhances hole accuracy and quality.

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135° Self-centering split point eliminates "walking" and reduces thrust.

List No. 5375 - Uncoated

List No. 5375T - ALTiN Coated

135° Point – 15° Helix Angle
Split Point on sizes 3/32" and larger.

TOLERANCES
All sizes +.0000/-.0005

STANDARD PACKAGE
All sizes — 1 each

Drill-Mills: Page 49

(continued)

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5375 UNCOATED EDP NO.	5375T ALTiN EDP NO.
7	.2010	1-3/16	2-1/4	50920	92290
13/64	.2031	1-3/16	2-1/4	50921	92291
6	.2040	1-1/4	2-3/8	50922	92292
5	.2055	1-1/4	2-3/8	50923	92293
4	.2090	1-1/4	2-3/8	50924	92294
3	.2130	1-1/4	2-3/8	50925	92295
5.5 mm	.2165	32 mm	60 mm	54838	93018
7/32	.2188	1-1/4	2-3/8	50926	92296
2	.2210	1-5/16	2-7/16	50927	92297
1	.2280	1-5/16	2-7/16	50928	92298
A	.2340	1-5/16	2-7/16	50929	92299
15/64	.2344	1-5/16	2-7/16	50930	92300
6.0 mm	.2362	33 mm	62 mm	54839	93019
B	.2380	1-3/8	2-1/2	50931	92301
C	.2420	1-3/8	2-1/2	50932	92302
D	.2460	1-3/8	2-1/2	50933	92303
1/4 (E)	.2500	1-3/8	2-1/2	50934	92304
6.5 mm	.2559	35 mm	64 mm	54840	93020
F	.2570	1-7/16	2-5/8	50935	92305
G	.2610	1-7/16	2-5/8	50936	92306
17/64	.2656	1-7/16	2-5/8	50937	92307
H	.2660	1-1/2	2-11/16	50938	92308
I	.2720	1-1/2	2-11/16	50939	92309
7.0 mm	.2756	38 mm	68 mm	54841	93021
J	.2770	1-1/2	2-11/16	50940	92310
K	.2810	1-1/2	2-11/16	50941	92311
9/32	.2812	1-1/2	2-11/16	50942	92312
L	.2900	1-9/16	2-3/4	50943	92313
M	.2950	1-9/16	2-3/4	50944	92314
7.5 mm	.2953	40 mm	70 mm	54842	93022
19/64	.2969	1-9/16	2-3/4	50945	92315
N	.3020	1-5/8	2-13/16	50946	92316
5/16	.3125	1-5/8	2-13/16	50947	92317
8.0 mm	.3150	41 mm	72 mm	54843	93023
O	.3160	1-11/16	2-15/16	50948	92318
P	.3230	1-11/16	2-15/16	50949	92319
21/64	.3281	1-11/16	2-15/16	50950	92320

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5375 UNCOATED EDP NO.	5375T ALTiN EDP NO.
Q	.3320	1-11/16	3	50951	92321
8.5 mm	.3346	43 mm	76 mm	54844	93024
R	.3390	1-11/16	3	50952	92322
11/32	.3438	1-11/16	3	50953	92323
S	.3480	1-3/4	3-1/16	50954	92324
9.0 mm	.3543	45 mm	78 mm	54845	93025
T	.3580	1-3/4	3-1/16	50955	92325
23/64	.3594	1-3/4	3-1/16	50956	92326
U	.3680	1-13/16	3-1/8	50957	92327
9.5 mm	.3740	46 mm	79 mm	54846	93026
3/8	.3750	1-13/16	3-1/8	50958	92328
V	.3770	1-7/8	3-1/4	50959	92329
W	.3860	1-7/8	3-1/4	50960	92330
25/64	.3906	1-7/8	3-1/4	50961	92331
10.0 mm	.3937	48 mm	83 mm	54847	93027
X	.3970	1-15/16	3-5/16	50962	92332
Y	.4040	1-15/16	3-5/16	50963	92333
13/32	.4062	1-15/16	3-5/16	50964	92334
Z	.4130	2	3-3/8	50965	92335
10.5 mm	.4134	51 mm	86 mm	54848	93028
27/64	.4219	2	3-3/8	50966	92336
11.0 mm	.4331	51 mm	86 mm	54849	93029
7/16	.4375	2-1/16	3-7/16	50967	92337
11.5 mm	.4528	52 mm	88 mm	54850	93030
29/64	.4531	2-1/8	3-9/16	50968	92338
15/32	.4688	2-1/8	3-5/8	50969	92339
12.0 mm	.4724	54 mm	92 mm	54851	93031
31/64	.4844	2-3/16	3-11/16	50970	92340
12.5 mm	.4921	56 mm	94 mm	54852	93032
1/2	.5000	2-1/4	3-3/4	50971	92341
33/64	.5156	2-3/8	3-7/8	54853	93033
17/32	.5312	2-3/8	3-7/8	54854	93034
35/64	.5469	2-3/8	3-7/8	54855	93035
9/16	.5625	2-1/2	4	54856	93036
5/8	.6250	2-3/4	4-1/4	54857	93037
11/16	.6875	3	4-5/8	54858	93038
3/4	.7500	3-1/8	5	54859	93039

Solid Carbide Straight Flute Drills

For Hardened & Abrasive Applications

Recommended for hardened, high strength & abrasive materials. Produce close tolerance holes in stainless steels, alloy steels, aerospace alloys, exotic alloys, cryogenic alloys and other materials 40Rc hardness and higher.

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. High rigidity enhances hole accuracy and quality.

Aluminum Titanium Nitride (ALTiN) Coating is an excellent all around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

List No. 5376 - Uncoated

List No. 5376T - ALTiN Coated

2-Flute – 140° Notch Point

TOLERANCES
All sizes +.0000/-.0005

STANDARD PACKAGE
All sizes — 1 each

Speeds & Feeds: Page 18

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5376 UNCOATED EDP NO.	5376T ALTiN EDP NO.
1/32	.0312	1/2	1-1/2	50720	92660
#65	.0350	1/2	1-1/2	54860	93040
#64	.0360	1/2	1-1/2	54861	93041
#63	.0370	1/2	1-1/2	54862	93042
#62	.0380	1/2	1-1/2	54863	93043
#61	.0390	1/2	1-1/2	54864	93044
1.0 MM	.0394	1/2	1-1/2	50721	92661
#60	.0400	1/2	1-1/2	54865	93045
#59	.0410	1/2	1-1/2	54866	93046
#58	.0420	1/2	1-1/2	54867	93047
#57	.0430	1/2	1-1/2	54868	93048
56	.0465	1/2	1-1/2	50722	92662
3/64	.0469	1/2	1-1/2	50723	92663
55	.0520	1/2	1-1/2	50724	92664
54	.0550	1/2	1-1/2	50725	92665
1.5 MM	.0591	1/2	1-1/2	50726	92666
53	.0595	1/2	1-1/2	50727	92667
1/16	.0625	5/8	1-5/8	50728	92668
52	.0635	11/16	1-11/16	50729	92669
51	.0670	11/16	1-11/16	50730	92670
50	.0700	11/16	1-11/16	50731	92671
49	.0730	11/16	1-11/16	50732	92672
48	.0760	11/16	1-11/16	50733	92673
5/64	.0781	11/16	1-11/16	50734	92674
47	.0785	3/4	1-3/4	50735	92675
2.0 MM	.0787	3/4	1-3/4	50736	92676
46	.0810	3/4	1-3/4	50737	92677
45	.0820	3/4	1-3/4	50738	92678
44	.0860	3/4	1-3/4	50739	92679
43	.0890	3/4	1-3/4	50740	92680
42	.0935	3/4	1-3/4	50741	92681
3/32	.0938	3/4	1-3/4	50742	92682
41	.0960	13/16	1-13/16	50743	92683
40	.0980	13/16	1-13/16	50744	92684
2.5 MM	.0984	13/16	1-13/16	50745	92685
39	.0995	13/16	1-13/16	50746	92686
38	.1015	13/16	1-13/16	50747	92687
37	.1040	13/16	1-13/16	50748	92688
36	.1065	13/16	1-13/16	50749	92689
7/64	.1094	13/16	1-13/16	50750	92690

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5376 UNCOATED EDP NO.	5376T ALTiN EDP NO.
35	.1100	7/8	1-7/8	50751	92691
34	.1110	7/8	1-7/8	50752	92692
33	.1130	7/8	1-7/8	50753	92693
32	.1160	7/8	1-7/8	50754	92694
3.0 MM	.1181	7/8	1-7/8	50755	92695
31	.1200	7/8	1-7/8	50756	92696
1/8	.1250	7/8	1-7/8	50757	92697
30	.1285	15/16	1-15/16	50758	92698
29	.1360	15/16	1-15/16	50759	92699
3.5 MM	.1378	15/16	1-15/16	50760	92700
28	.1405	15/16	1-15/16	50761	92701
9/64	.1406	15/16	1-15/16	50762	92702
27	.1440	1	2-1/16	50763	92703
26	.1470	1	2-1/16	50764	92704
25	.1495	1	2-1/16	50765	92705
24	.1520	1	2-1/16	50766	92706
23	.1540	1	2-1/16	50767	92707
5/32	.1562	1	2-1/16	50768	92708
22	.1570	1-1/16	2-1/8	50769	92709
4.0 MM	.1575	1-1/16	2-1/8	50770	92710
21	.1590	1-1/16	2-1/8	50771	92711
20	.1610	1-1/16	2-1/8	50772	92712
19	.1660	1-1/16	2-1/8	50773	92713
18	.1695	1-1/16	2-1/8	50774	92714
11/64	.1719	1-1/16	2-1/8	50775	92715
17	.1730	1-1/8	2-3/16	50776	92716
16	.1770	1-1/8	2-3/16	50777	92717
4.5 MM	.1772	1-1/8	2-3/16	50778	92718
15	.1800	1-1/8	2-3/16	50779	92719
14	.1820	1-1/8	2-3/16	50780	92720
13	.1850	1-1/8	2-3/16	50781	92721
3/16	.1875	1-1/8	2-3/16	50782	92722
12	.1890	1-3/16	2-1/4	50783	92723
11	.1910	1-3/16	2-1/4	50784	92724
10	.1935	1-3/16	2-1/4	50785	92725
9	.1960	1-3/16	2-1/4	50786	92726
5.0 MM	.1969	1-3/16	2-1/4	50787	92727
8	.1990	1-3/16	2-1/4	50788	92728
7	.2010	1-3/16	2-1/4	50789	92729

Tool Coatings Also Available

(continued)

Solid Carbide Straight Flute Drills

For Hardened & Abrasive Materials

Recommended for hardened, high strength & abrasive materials. Produce close tolerance holes in stainless steels, alloy steels, aerospace alloys, exotic alloys, cryogenic alloys and other materials 40Rc hardness and higher.

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. High rigidity enhances hole accuracy and quality.

Aluminum Titanium Nitride (ALTiN) Coating is an excellent all around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

List No. 5376 - Uncoated

List No. 5376T - ALTiN Coated

2-Flute – 140° Notch Point

TOLERANCES
All sizes +.0000/-.0005

STANDARD PACKAGE
All sizes — 1 each

Drill-Mills: Page 49

(continued)

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5376 UNCOATED EDP NO.	5376T ALTiN EDP NO.
13/64	.2031	1-3/16	2-1/4	50790	92730
6	.2040	1-1/4	2-3/8	50791	92731
5	.2055	1-1/4	2-3/8	50792	92732
4	.2090	1-1/4	2-3/8	50793	92733
3	.2130	1-1/4	2-3/8	50794	92734
5.5 MM	.2165	1-1/4	2-3/8	50795	92735
7/32	.2188	1-1/4	2-3/8	50796	92736
2	.2210	1-5/16	2-7/16	50797	92737
1	.2280	1-5/16	2-7/16	50798	92738
A	.2340	1-5/16	2-7/16	50799	92739
15/64	.2344	1-5/16	2-7/16	50800	92740
6.0 MM	.2362	1-5/16	2-7/16	50801	92741
B	.2380	1-3/8	2-1/2	50802	92742
C	.2420	1-3/8	2-1/2	50803	92743
D	.2460	1-3/8	2-1/2	50804	92744
1/4 (E)	.2500	1-3/8	2-1/2	50805	92745
6.5 MM	.2559	1-3/8	2-1/2	50806	92746
F	.2570	1-7/16	2-5/8	50807	92747
G	.2610	1-7/16	2-5/8	50808	92748
17/64	.2656	1-7/16	2-5/8	50809	92749
H	.2660	1-1/2	2-11/16	50810	92750
I	.2720	1-1/2	2-11/16	50811	92751
7.0 MM	.2756	1-1/2	2-11/16	50812	92752
J	.2770	1-1/2	2-11/16	50813	92753
K	.2810	1-1/2	2-11/16	50814	92754
9/32	.2812	1-1/2	2-11/16	50815	92755
L	.2900	1-9/16	2-3/4	50816	92756
M	.2950	1-9/16	2-3/4	50817	92757
7.5 MM	.2953	1-9/16	2-3/4	50818	92758
19/64	.2969	1-9/16	2-3/4	50819	92759
N	.3020	1-5/8	2-13/16	50820	92760
5/16	.3125	1-5/8	2-13/16	50821	92761
8.0 MM	.3150	1-5/8	2-13/16	50822	92762
O	.3160	1-11/16	2-15/16	50823	92763
P	.3230	1-11/16	2-15/16	50824	92764
21/64	.3281	1-11/16	2-15/16	50825	92765
Q	.3320	1-11/16	3	50826	92766
8.5 MM	.3346	1-11/16	3	50827	92767

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	5376 UNCOATED EDP NO.	5376T ALTiN EDP NO.
R	.3390	1-11/16	3	50828	92768
11/32	.3438	1-11/16	3	50829	92769
S	.3480	1-3/4	3-1/16	50830	92770
9.0 MM	.3543	1-3/4	3-1/16	50831	92771
T	.3580	1-3/4	3-1/16	50832	92772
23/64	.3594	1-3/4	3-1/16	50833	92773
U	.3680	1-13/16	3-1/8	50834	92774
9.5 MM	.3740	1-13/16	3-1/8	50835	92775
3/8	.3750	1-13/16	3-1/8	50836	92776
V	.3770	1-7/8	3-1/4	50837	92777
W	.3860	1-7/8	3-1/4	50838	92778
25/64	.3906	1-7/8	3-1/4	50839	92779
10.0 MM	.3937	1-7/8	3-1/4	50840	92780
X	.3970	1-15/16	3-5/16	50841	92781
Y	.4040	1-15/16	3-5/16	50842	92782
13/32	.4062	1-15/16	3-5/16	50843	92783
Z	.4130	2	3-3/8	50844	92784
10.5 MM	.4134	2	3-3/8	50845	92785
27/64	.4219	2	3-3/8	50846	92786
11.0 MM	.4331	2	3-3/8	50847	92787
7/16	.4375	2-1/16	3-7/16	50848	92788
11.5 MM	.4528	2-1/16	3-7/16	50849	92789
29/64	.4531	2-1/8	3-9/16	50850	92790
15/32	.4688	2-1/8	3-5/8	50851	92791
12.0 MM	.4724	2-1/8	3-5/8	50852	92792
31/64	.4844	2-3/16	3-11/16	50853	92793
12.5 MM	.4921	2-3/16	3-11/16	50854	92794
1/2	.5000	2-1/4	3-3/4	50855	92795
33/64	.5156	1-1/8	3-1/2	54869	93049
17/32	.5312	1-1/8	3-1/2	54870	93050
35/64	.5469	1-1/8	3-1/2	54871	93051
9/16	.5625	1-1/8	3-1/2	54872	93052
5/8	.6250	1-1/4	3-1/2	54873	93053
11/16	.6875	1-1/2	4	54874	93054
3/4	.7500	1-1/2	4	54875	93055

Solid Carbide NC Spotting Drills

Micrograin Carbide

90°, 120° & 140° Points

Ideal for close tolerance NC spotting operations. Provides a more accurate and faster spotting location for follow-up drilling. Eliminates wandering.

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance, and long tool life.

ALTiN – Aluminum Titanium Nitride Coating is an excellent all-around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

List No. 1440 Uncoated

List No. 1440T ALTiN Coated

TOLERANCES

Dia.	+.0000 - .0005
Shank Dia.	+.0000 - .0005

				UNCOATED LIST NO. 1440			ALTIN COATED LIST NO. 1440T		
				90°	120°	140°	90°	120°	140°
SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	EDP NO.	EDP NO.	EDP NO.	EDP NO.	EDP NO.	EDP NO.
1/8	.1250	5/8	2	54767	54773	54779	92947	92953	92959
3/16	.1875	3/4	2	54768	54774	54780	92948	92954	92960
1/4	.2500	3/4	2-1/2	54769	54775	54781	92949	92955	92961
5/16	.3125	1	2-1/2	54770	54776	54782	92950	92956	92962
3/8	.3750	1	2-1/2	54771	54777	54783	92951	92957	92963
1/2	.5000	1-1/4	3	54772	54778	54784	92952	92958	92964

Carbide Tipped Jobber Length Drills

Excellent wear resistance. Recommended for drilling cast iron, non-ferrous metals, composites, hard plastics, fiberglass and other abrasive non-ferrous materials.

NOT FOR USE IN STEEL.

List No. 5330

118° Point

STANDARD PACKAGE All sizes — 1 each

SIZE						
FRACTIONAL	LETTER	WIRE GAGE	DEC. EQUIV.	FLUTE LENGTH	OAL	EDP NO.
1/8			.1250	1 5/8	2 3/4	50358
		30	.1285	1 5/8	2 3/4	50359*
		29	.1360	1 3/4	2 7/8	50360*
		28	.1405	1 3/4	2 7/8	50361*
9/64			.1406	1 3/4	2 7/8	50362
		26	.1470	1 7/8	3	50364*
		25	.1495	1 7/8	3	50365*
		24	.1520	2	3 1/8	50366*
		23	.1540	2	3 1/8	50367*
5/32			.1562	2	3 1/8	50368
		22	.1570	2	3 1/8	50369*
		20	.1610	2 1/8	3 1/4	50371*
11/64			.1719	2 1/8	3 1/4	50374
		15	.1800	2 3/16	3 3/8	50377*
		13	.1850	2 5/16	3 1/2	50379*
3/16			.1875	2 5/16	3 1/2	50380
13/64			.2031	2 7/16	3 5/8	50387
		6	.2040	2 1/2	3 3/4	50388*
		4	.2090	2 1/2	3 3/4	50390*
7/32			.2187	2 1/2	3 3/4	50392
		2	.2210	2 5/8	3 7/8	50393*
	A		.2340	2 5/8	3 7/8	50395*
15/64			.2344	2 5/8	3 7/8	50396
	B		.2380	2 3/4	4	50397*
1/4	E		.2500	2 3/4	4	50401
17/64			.2656	2 7/8	4 1/8	50404

SIZE					
FRACTIONAL	LETTER	DEC. EQUIV.	FLUTE LENGTH	OAL	EDP NO.
	J	.2770	2 7/8	4 1/8	50407*
	K	.2810	2 15/16	4 1/4	50408*
9/32		.2812	2 15/16	4 1/4	50409
	L	.2900	2 15/16	4 1/4	50410*
	M	.2950	3 1/16	4 3/8	50411*
19/64		.2969	3 1/16	4 3/8	50412
	N	.3020	3 1/16	4 3/8	50413*
5/16		.3125	3 3/16	4 1/2	50414
21/64		.3281	3 5/16	4 5/8	50417
	R	.3390	3 7/16	4 3/4	50419*
11/32		.3437	3 7/16	4 3/4	50420
	S	.3480	3 1/2	4 7/8	50421*
	T	.3580	3 1/2	4 7/8	50422*
23/64		.3594	3 1/2	4 7/8	50423
3/8		.3750	3 5/8	5	50425
25/64		.3906	3 3/4	5 1/8	50428
	Y	.4040	3 7/8	5 1/4	50430*
13/32		.4062	3 7/8	5 1/4	50431
	Z	.4130	3 7/8	5 1/4	50432*
27/64		.4219	3 15/16	5 3/8	50433
7/16		.4375	4 1/16	5 1/2	50434
29/64		.4531	4 3/16	5 5/8	50435
15/32		.4687	4 5/16	5 3/4	50436
31/64		.4844	4 3/8	5 7/8	50437
1/2		.5000	4 1/2	6	50438

* Available While Supplies Last

Solid Carbide Spade Drills

Recommended for thin sheet applications, shallow hole drilling and spot drilling in a wide range of materials

List No. 5377
118° Point – Heavy Duty Web

TOLERANCES
All sizes +.0000/-.0005

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	EDP NO.
1/32	.0312	3/16	1-1/2	50440
3/64	.0469	7/32	1-1/2	50441
1/16	.0625	5/16	1-1/2	50442
3/32	.0938	7/16	1-1/2	50443
7/64	.1094	7/16	1-1/2	50444
1/8	.1250	1/2	1-1/2	50445
9/64	.1406	1/2	2	50446
5/32	.1562	9/16	2	50447
11/64	.1719	9/16	2	50448
3/16	.1875	11/16	2	50449
7/32	.2188	19/32	2	50450
1/4	.2500	11/16	2	50451
9/32	.2812	7/8	2-1/2	50452
5/16	.3125	7/8	2-1/2	50453
11/32	.3438	15/16	2-1/2	50454
3/8	.3750	1-1/8	2-1/2	50455
13/32	.4062	1-1/8	2-1/2	50456
7/16	.4375	1-3/16	2-1/2	50457
15/32	.4688	1-3/16	2-1/2	50458
1/2	.5000	1-3/16	2-1/2	50459

Carbide Tipped Drills For Hardened Steel

For drilling hardened steel of 35 to 65 Rockwell C hardness without the need to anneal the workpiece

List No. 5420

120° Spade Type Point features short heavy constuction for increased rigidity in tougher shallow hole applications up to 2 diameters deep. Drill body diameter is smaller than tip diameter to prevent galling.

List No. 5423

118° Point with two straight flutes. Drill body diameter is smaller than tip diameter to prevent galling.

† Sizes below 7/32" are Solid Carbide Spade Type, not the Fluted Type Shown.

List No. 5420

SIZE	DEC. EQUIV.	OAL	EDP NO.
3/32†	.0938	2	52006
1/8†	.1250	2	52008
5/32†	.1562	2	52010
3/16†	.1875	3	52012
7/32	.2188	3-1/2	52014
1/4	.2500	4	52016
19/64	.2969	4	52019*
5/16	.3125	4	52020
3/8	.3750	4	52024
7/16	.4375	4-1/2	52028
1/2	.5000	5	52032

*** Available While Supplies Last**

List No. 5423

SIZE	DEC. EQUIV.	FLUTE LENGTH	OAL	SHANK DIA.	EDP NO.
3/16	.1875	1-1/2	3-1/2	11/64	52112
7/32	.2188	1-3/4	3-3/4	13/64	52114
1/4	.2500	2	4	7/32	52116
9/32	.2812	2-1/4	4-1/4	1/4	52118
5/16	.3125	2-1/2	4-1/2	17/64	52120
11/32	.3438	2-3/4	4-3/4	19/64	52122
3/8	.3750	3	5	21/64	52124
7/16	.4375	3	5-1/2	25/64	52128
1/2	.5000	3-1/2	6	29/64	52132
9/16	.5625	3-1/2	6	17/32	52136
19/32	.5938	4	7	9/16	52138*
5/8	.6250	4	7	19/32	52140
3/4	.7500	4-3/4	8	23/32	52148

Carbide Tipped Glass and Tile Drills

For drilling glass, tile, porcelain, ceramic and other hard fragile materials without chipping or cracking the material.

List No. 5467 — Spear Point

SIZE	DEC. EQUIV.	OAL	SHANK DIA.	EDP NO.
1/8	.1250	2-1/2	7/64	53551
3/16	.1875	2-1/2	5/32	53552
1/4	.2500	2-1/2	7/32	53553
5/16	.3125	3	1/4	53554
3/8	.3750	3-1/2	5/16	53555
7/16	.4375	3-1/2	3/8	53556
1/2	.5000	3-1/2	7/16	53557
9/16	.5625	4	1/2	53558
5/8	.6250	4	9/16	53559

Solid Carbide Drills
Speed and Feed Recommendations

List No. 5374 Standard Length GP • List No. 5375 Screw Machine Length • List No. 5376 Straight Flute

Workpiece Material	Brinell Hardness (BHN)	Morse List No.	Surface Speed (SFM)	FEED PER REVOLUTION BY DRILL DIAMETER (IPR)			
				1/16"	1/8"	1/4"	1/2"
Low Carbon Steel 1018, 12L12, 1108, 1213	≤ 120	5374	250	0.0015	0.0030	0.0040	0.0080
		5375					
		5376					
Low & Medium Carbon Steel 1018, 1551, 11L44	120 - 250	5374	225	0.0020	0.0040	0.0060	0.0110
		5375					
		5376					
Medium Carbon and Alloyed Steel 1040, 1140, 4340, 8640	≤ 250	5374	200	0.0015	0.0030	0.0040	0.0080
		5375	150	0.0015	0.0030	0.0040	0.0080
		5376					
Tool and Die Steels P20, A2, D2, H12	≤ 250	5374	200	0.0015	0.0030	0.0040	0.0080
		5375					
		5376					
Tool and Die Steels P20, A2, D2, H12	250 - 350	5374	150	0.0010	0.0020	0.0030	0.0060
		5375	125	0.0010	0.0020	0.0030	0.0060
		5376	125	0.0010	0.0020	0.0030	0.0060
Hard Materials, Alloys, Tool Steels 40 Rockwell C and Higher	—	5374					
		5375					
		5376	60	0.0005	0.0010	0.0015	0.0020
Free Machining Stainless Steels 303,410, 416, 440F	≤ 260	5374	100	0.0010	0.0020	0.0030	0.0060
		5375	100	0.0010	0.0020	0.0030	0.0060
		5376					
Moderate Machining Stainless Steels 304, 316	≤ 300	5374					
		5375	75	0.0010	0.0020	0.0030	0.0060
		5376	75	0.0010	0.0020	0.0030	0.0060
Difficult Machining Stainless Steels 17-4PH, 316L, AM350	≤ 450	5374					
		5375	60	0.0010	0.0020	0.0030	0.0060
		5376	60	0.0010	0.0020	0.0030	0.0060
Cast Iron - Soft Gray	≤ 160	5374	250	0.0015	0.0030	0.0040	0.0080
		5375	275	0.0020	0.0040	0.0060	0.0110
		5376	275	0.0015	0.0030	0.0040	0.0080
Cast Iron - Gray	160 - 260	5374	250	0.0015	0.0030	0.0040	0.0080
		5375	275	0.0020	0.0040	0.0060	0.0110
		5376	250	0.0015	0.0030	0.0040	0.0080
Cast Iron - Ductile	250	5374	180	0.0015	0.0030	0.0040	0.0080
		5375	180	0.0020	0.0040	0.0060	0.0110
		5376	175	0.0015	0.0030	0.0040	0.0080
Cast Iron - Malleable	250 - 330	5374	180	0.0015	0.0030	0.0040	0.0080
		5375	180	0.0020	0.0040	0.0060	0.0110
		5376	180	0.0015	0.0030	0.0040	0.0080
Titanium Alloys Commercially Pure 99.0	110 - 170	5374					
		5375	50	0.0005	0.0010	0.0020	0.0045
		5376	50	0.0005	0.0010	0.0020	0.0045
Titanium Alloys Ti-6Al-4V, ASTM B367 Grades C-3, C-4	≤ 250	5374					
		5375	50	0.0005	0.0010	0.0020	0.0045
		5376	50	0.0005	0.0010	0.0020	0.0045
High Temperature Alloys Inconel, Hastelloy, Waspaloy	150 - 250	5374					
		5375	60	0.0005	0.0010	0.0020	0.0045
		5376	60	0.0005	0.0010	0.0020	0.0045
Aluminum Alloys 2025, 6061, A140, 514.0	≤ 150	5374	350	0.0020	0.0040	0.0060	0.0110
		5375					
		5376					
Copper Alloys Brass and Bronze	≤ 200	5374	80	0.0020	0.0040	0.0060	0.0110
		5375					
		5376					
Composites & Plastics	≤ 128	5374	175	0.0010	0.0020	0.0030	0.0060
		5375					
		5376					
Magnesium Alloys AZ80A, HM12A, AM60A, ZE41A	50 - 90	5374	325	0.0020	0.0040	0.0060	0.0110
		5375					
		5376					

SPEEDS and FEEDS are suggested starting points only and may be increased or decreased depending on actual material and machining conditions. Start conservatively and increase speed and feed until drilling cycle is optimized.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

Solid Carbide Combined Drills and Countersinks

Plain Type

60°, 82° & 90° Included Angle

Solid Carbide offers excellent wear resistance, heat resistance and rigidity. Recommended for abrasive materials, difficult-to-drill materials and increased tool life in production applications.

ALTiN – Aluminum Titanium Nitride Coating is an excellent all-around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

Standard Length

Long Length

List No. 5495 Uncoated

List No. 5495T ALTiN Coated

STANDARD PACKAGE All sizes — 1 each

Standard Length

SIZE	DRILL DIA.	BODY DIA.	OAL	60° INCL. ANGLE UNCOATED EDP NO.	60° INCL. ANGLE ALTiN EDP NO.	82° INCL. ANGLE UNCOATED EDP NO.	82° INCL. ANGLE ALTiN EDP NO.	90° INCL. ANGLE UNCOATED EDP NO.	90° INCL. ANGLE ALTiN EDP NO.
00	.025	1/8	1-1/2	53899	93056	53909	93066	53919	93076
0	1/32	1/8	1-1/2	53900	93057	53910	93067	53920	93077
1	3/64	1/8	1-1/2	53901	93058	53911	93068	53921	93078
2	5/64	3/16	1-7/8	53902	93059	53912	93069	53922	93079
3	7/64	1/4	2	53903	93060	53913	93070	53923	93080
4	1/8	5/16	2-1/8	53904	93061	53914	93071	53924	93081
5	3/16	7/16	2-3/4	53905	93062	53915	93072	53925	93082
6	7/32	1/2	3	53906	93063	53916	93073	53926	93083
7	1/4	5/8	3-1/4	53907	93064	53917	93074	53927	93084
8	5/16	3/4	3-1/2	53908	93065	53918	93075	53928	93085

Long Length

SIZE	DRILL DIA.	BODY DIA.	OAL	60° INCL. ANGLE UNCOATED EDP NO.	60° INCL. ANGLE ALTiN EDP NO.	82° INCL. ANGLE UNCOATED EDP NO.	82° INCL. ANGLE ALTiN EDP NO.	90° INCL. ANGLE UNCOATED EDP NO.	90° INCL. ANGLE ALTiN EDP NO.
1	3/64	1/8	4	53929	93086	53883	93094	53891	93102
2	5/64	3/16	4	53930	93087	53884	93095	53892	93103
3	7/64	1/4	4	53931	93088	53885	93096	53893	93104
4	1/8	5/16	4	53932	93089	53886	93097	53894	93105
5	3/16	7/16	6	53933	93090	53887	93098	53895	93106
6	7/32	1/2	6	53934	93091	53888	93099	53896	93107
7	1/4	5/8	6	53935	93092	53889	93100	53897	93108
8	5/16	3/4	6	53936	93093	53890	93101	53898	93109

Carbide Single Flute Countersinks

For countersinking, chamfering, and deburring holes. Produces a smoother finish. Can be used when multi-flute countersinks chatter.

The 1/8 and 1/4 diameters are solid carbide. The larger diameters are brazed construction.

Carbide offers excellent wear resistance, heat resistance and rigidity. Recommended for abrasive materials, difficult-to-drill materials and increased tool life in production applications.

List No. 5752

STANDARD PACKAGE All sizes — 1 each

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°	100°	120°
1/8	1/8	1-1/2	56101	56102	56103	56119	56120
3/16	3/16	2	50628	50629	50630	50631	50632
1/4	1/4	2	56104	56105	56106	56121	56122
3/8	1/4	2-1/2	56107	56108	56109	56123	56124
1/2	1/4	2-1/2	56110	56111	56112	56125	56126
5/8	1/4	2-1/2	50633	50634	50635	50636	50637
3/4	3/8	3	56113	56114	56115	56127	56128
1	1/2	3	56116	56117	56118	56129	56130
1-1/4	3/4	3-1/2	56386	56387	56388	56389	56390
1-1/2	3/4	3-1/2	56391	56392	56393	56394	56395
4-Piece Set in Wood Case Sizes 1/4", 1/2", 3/4" & 1"			50638	50639	50640	50641	50642

Carbide Three Flute Countersinks

For countersinking, chamfering, and deburring holes.

Three flutes allow higher feed rates than single flute countersinks and greater chip clearance than six flute countersinks.

The 1/8 and 1/4 diameters are solid carbide. The larger diameters are brazed construction.

Carbide offers excellent wear resistance, heat resistance and rigidity. Recommended for abrasive materials, difficult-to-drill materials and increased tool life in production applications.

List No. 5753

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°	100°	120°
1/8	1/8	1-1/2	56163	56171	56179	56187	56193
3/16	3/16	2	50643	50644	50645	50646	50647
1/4	1/4	2	56164	56172	56180	56188	56194
3/8	1/4	2-1/2	56165	56173	56181	56189	56195
1/2	1/4	2-1/2	56166	56174	56182	56190	56196
5/8	3/8	2-3/4	50648	50649	50650	50651	50652
3/4	3/8	3	56167	56175	56183	56191	56197
1	1/2	3	56168	56176	56184	56192	56198
1-1/4	3/4	3-1/2	56169	56177	56185	—	—
1-1/2	3/4	3-1/2	56170	56178	56186	—	—
4-Piece Set in Wood Case Sizes 1/4", 1/2", 3/4" &1"			50653	50654	50655	50656	50657

Carbide Four Flute Countersinks

For countersinking, chamfering, and deburring holes.

Four flutes allow higher feed rates than single flute countersinks and greater chip clearance than six flute countersinks.

The 1/8 and 1/4 diameters are solid carbide. The larger diameters are brazed construction.

Carbide offers excellent wear resistance, heat resistance and rigidity. Recommended for abrasive materials, difficult-to-drill materials and increased tool life in production applications.

List No. 5755

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°	100°	120°
1/8	1/8	1-1/2	56628	56635	56642	56649	56656
1/4	1/4	2	56629	56636	56643	56650	56657
3/8	1/4	2-1/2	56630	56637	56644	56651	56658
1/2	3/8	2-1/2	56631	56638	56645	56652	56659
5/8	3/8	2-1/2	56632	56639	56646	56653	56660
3/4	1/2	3	56633	56640	56647	56654	56661
1	1/2	3	56634	56641	56648	56655	56662

Carbide Six Flute Chatterless Countersinks

Cutting edge geometry designed to reduce chatter and harmonics. Six flutes allow higher feed rates and provide longer tool life due to distributing the cutting load over a greater number of teeth.

The 1/4 diameter is solid carbide. The larger diameters are brazed construction.

List No. 5754

STANDARD PACKAGE All sizes — 1 each

Carbide offers excellent wear resistance, heat resistance and rigidity. Recommended for abrasive materials, difficult-to-drill materials and increased tool life in production applications.

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°	100°	120°
1/8	1/8	1-1/2	56096	56097	56098	56099	56100
3/16	3/16	2	50658	50659	50660	50661	50662
1/4	1/4	2	56132	56139	56146	56153	56158
3/8	1/4	2-1/2	56133	56140	56147	56154	56159
1/2	1/4	2-1/2	56134	56141	56148	56155	56160
5/8	3/8	2-3/4	50663	50664	50665	50666	50667
3/4	3/8	3	56135	56142	56149	56156	56161
1	1/2	3	56136	56143	56150	56157	56162
1-1/4	3/4	3-1/2	56137	56144	56151	—	—
1-1/2	3/4	3-1/2	56138	56145	56152	—	—
4-Piece Set in Wood Case Sizes 1/4", 1/2", 3/4" & 1"			50668	50669	50670	50671	50672

Chamfer Mills: Page 70

Solid Carbide Double End Countersinks

Micrograin Carbide

For countersinking, chamfering, and deburring holes.

Carbide offers excellent wear resistance, heat resistance, and rigidity. Recommended for abrasive materials, difficult-to-drill materials and increased tool life in production applications.

Drill Point countersink saves setup and production time by allowing you to spot drill and countersink with the same tool.

List No. 5751 1-Flute

List No. 5751 4-Flute

List No. 5751 4-Flute with Drill Point

List No. 5751 6-Flute

1-Flute

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°	100°	110°	120°
1/8	1/8	1-1/2	50460	50461	50462	50463	50464	50465
3/16	3/16	2	50466	50467	50468	50469	50470	50471
1/4	1/4	2	50472	50473	50474	50475	50476	50477
5/16	5/16	2-1/8	50478	50479	50480	50481	50482	50483
3/8	3/8	2-1/2	50484	50485	50486	50487	50488	50489
1/2	1/2	3	50490	50491	50492	50493	50494	50495
5/8	5/8	3-1/4	50496	50497	50498	50499	50500	50501
3/4	3/4	3-1/2	50502	50503	50504	50505	50506	50507

4-Flute

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°	100°	110°	120°
1/8	1/8	1-1/2	50508	50509	50510	50511	50512	50513
3/16	3/16	2	50514	50515	50516	50517	50518	50519
1/4	1/4	2	50520	50521	50522	50523	50524	50525
5/16	5/16	2-1/8	50526	50527	50528	50529	50530	50531
3/8	3/8	2-1/2	50532	50533	50534	50535	50536	50537
1/2	1/2	3	50538	50539	50540	50541	50542	50543
5/8	5/8	3-1/4	50544	50545	50546	50547	50548	50549
3/4	3/4	3-1/2	50550	50551	50552	50553	50554	50555

4-Flute – Drill Point

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°	100°	110°	120°
1/8	1/8	1-1/2	50556	50557	50558	50559	50560	50561
3/16	3/16	2	50562	50563	50564	50565	50566	50567
1/4	1/4	2	50568	50569	50570	50571	50572	50573
5/16	5/16	2-1/8	50574	50575	50576	50577	50578	50579
3/8	3/8	2-1/2	50580	50581	50582	50583	50584	50585
1/2	1/2	3	50586	50587	50588	50589	50590	50591
5/8	5/8	3-1/4	50592	50593	50594	50595	50596	50597
3/4	3/4	3-1/2	50598	50599	50600	50601	50602	50603

6-Flute

SIZE	SHANK DIA.	OAL	EDP NO. 60°	82°	90°
1/8	1/8	1-1/2	50604	50605	50606
3/16	3/16	2	50607	50608	50609
1/4	1/4	2	50610	50611	50612
5/16	5/16	2-1/8	50613	50614	50615
3/8	3/8	2-1/2	50616	50617	50618
1/2	1/2	3	50619	50620	50621
5/8	5/8	3-1/4	50622	50623	50624
3/4	3/4	3-1/2	50625	50626	50627

Chamfer Mills: Page 70

Solid Carbide Straight Shank Chucking Reamers

Straight Flute

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. High rigidity enhances hole accuracy and quality.

Recommended for general reaming of ferrous and non-ferrous materials including steel, alloy steel, stainless steel, plastic, aluminum and other abrasive non-ferrous materials.

List No. 5661
STANDARD PACKAGE All sizes — 1 each

TOLERANCES
.0280" – .2500" – +.0000/+.0002
.2501" and up – +.0000/+.0003

NO. OF FLUTES
Up to .2550" – 4 Flute
Over .2550" – 6 Flute

SIZE	DEC. SIZE	EDP NO.
70	.0280	53950
	.0285	54736
	.0290	54737
69	.0292	53951
	.0295	54738
	.0300	53952
	.0305	54739
68	.0310	53953
1/32	.0312	53954
	.0315	53955
67	.0320	53956
	.0325	53957
66	.0330	53958
	.0335	53959
	.0340	53960
	.0345	53961
65	.0350	53962
	.0355	53963
64	.0360	53964
	.0365	53965
63	.0370	53966
	.0375	53967
62	.0380	53968
	.0385	53969
61	.0390	53970
1.0 mm	.0394	53971
	.0395	53972
60	.0400	53973
	.0405	53974
59	.0410	53975
	.0415	53976
58	.0420	53977
	.0425	53978
57	.0430	53979
	.0435	53980
	.0440	53981
	.0445	53982
	.0450	53983
	.0455	53984
	.0460	53985
56	.0465	53986
3/64	.0469	53987
	.0470	53988
	.0475	53989
	.0480	53990
	.0485	53991
	.0490	53992
	.0495	53993
	.0500	53994
	.0505	53995
	.0510	53996
	.0515	53997
55	.0520	53998
	.0525	53999
	.0530	54000
	.0535	54001
	.0540	54002
	.0545	54003
54	.0550	54004
	.0555	54005
	.0560	54006
	.0565	54007
	.0570	54008
	.0575	54009
	.0580	54010
	.0585	54011
	.0590	54012
1.5 mm	.0591	54013
53	.0595	54014
	.0600	54015
	.0605	54016
	.0610	54017
	.0615	54018
	.0620	54019
	.0622	54740
	.0623	54741
1/16	.0625	54020
	.0630	54021
52	.0635	54022
	.0640	54023
	.0645	54024
	.0650	54025
	.0655	54026
	.0660	54027
	.0665	54028
51	.0670	54029
	.0675	54030
	.0680	54031
	.0685	54032
	.0690	54033
	.0695	54034
50	.0700	54035
	.0705	54036
	.0710	54037
	.0715	54038
	.0720	54039
	.0725	54040
49	.0730	54041
	.0735	54042
	.0740	54043
	.0745	54044
	.0750	54045
	.0755	54046
48	.0760	54047
	.0765	54048
	.0770	54049
	.0775	54050
	.0780	54051
5/64	.0781	54052
47	.0785	54053
2.0 mm	.0787	54054
	.0790	54055
	.0795	54056
	.0800	54057
	.0805	54058
46	.0810	54059
	.0815	54060
45	.0820	54061
	.0825	54062
	.0830	54063
	.0835	54064
	.0840	54065
	.0845	54066
	.0850	54067
	.0855	54068
44	.0860	54069

(continued)

Tool Coatings Also Available

SIZE RANGE	FLUTE LENGTH	OAL
.0280"-.0415"	1/4	1-1/2
.0420"-.0650"	3/8	1-1/2
.0655"-.0810"	1/2	1-3/4

SIZE RANGE	FLUTE LENGTH	OAL
.0815"-.0965"	1/2	2
.0970"-.1300"	5/8	2-1/4
.1305"-.1605"	3/4	2-1/2

SIZE RANGE	FLUTE LENGTH	OAL
.1610"-.1915"	7/8	2-3/4
.1920"-.2555"	1	3
.2559"-.3165"	1-1/8	3-1/4

SIZE RANGE	FLUTE LENGTH	OAL
.3170"-.4160"	1-1/4	3-1/2
.4170"-.4780"	1-3/8	4
.4790"-.5625"	1-1/2	4
.5905"-.7510"	1-3/4	4

Solid Carbide Straight Shank Chucking Reamers

List No. 5661
STANDARD PACKAGE All sizes — 1 each

(continued)

SIZE	DEC. SIZE	EDP NO.
	.0865	54070
	.0870	54071
	.0875	54072
	.0880	54073
	.0885	54074
43	.0890	54075
	.0895	54076
	.0900	54077
	.0905	54078
	.0910	54079
	.0915	54080
	.0920	54081
	.0925	54082
	.0930	54083
	.0933	54742
42	.0935	54084
	.0937	54743
3/32	.0938	54085
	.0940	54086
	.0945	54087
	.0950	54088
	.0955	54089
41	.0960	54090
	.0965	54091
	.0970	54092
	.0975	54093
40	.0980	54094
2.5 mm	.0984	54095
	.0985	54096
	.0990	54097
39	.0995	54098
	.1000	54099
	.1005	54100
	.1010	54101
38	.1015	54102
	.1020	54103
	.1025	54104
	.1030	54105
	.1035	54106
37	.1040	54107
	.1045	54108
	.1050	54109
	.1055	54110
	.1060	54111
36	.1065	54112
	.1070	54113
	.1075	54114
	.1080	54115
	.1085	54116
	.1090	54117
7/64	.1094	54118
	.1095	54119
35	.1100	54120
	.1105	54121
34	.1110	54122
	.1115	54123
	.1120	54124
	.1125	54125
33	.1130	54126
	.1135	54127
	.1140	54128
	.1145	54129
	.1150	54130
	.1155	54131
32	.1160	54132
	.1165	54133
	.1170	54134
	.1175	54135
	.1180	54136
3.0 mm	.1181	54137
	.1185	54138
	.1190	54139
	.1195	54140
31	.1200	54141
	.1205	54142
	.1210	54143
	.1215	54144
	.1220	54145
	.1225	54146
.1230 D/P	.1230	54147
	.1235	54148
.1240 U/S	.1240	54149
	.1245	54150
.1247 D/P	.1247	54151
1/8	.1250	54152
	.1255	54153
.1260 O/S	.1260	54154
	.1265	54155
	.1270	54156
	.1275	54157
	.1280	54158
30	.1285	54159
	.1290	54160
	.1295	54161
	.1300	54162
	.1305	54163
	.1310	54164
	.1315	54165
	.1320	54166
	.1325	54167
	.1330	54168
	.1335	54169
	.1340	54170
	.1345	54171
	.1350	54172
	.1355	54173
29	.1360	54174
	.1365	54175
	.1370	54176
	.1375	54177
3.5 mm	.1378	54178
	.1380	54179
	.1385	54180
	.1390	54181
	.1395	54182
	.1400	54183
28	.1405	54184
9/64	.1406	54185
	.1410	54186
	.1415	54187
	.1420	54188
	.1425	54189
	.1430	54190
	.1435	54191
27	.1440	54192
	.1445	54193
	.1450	54194
	.1455	54195
	.1460	54196
	.1465	54197
26	.1470	54198
	.1475	54199
	.1480	54200
	.1485	54201
	.1490	54202
25	.1495	54203
	.1500	54204
	.1505	54205
	.1507	54206
	.1510	54207
	.1515	54208
24	.1520	54209
	.1525	54210
	.1530	54211
	.1535	54212
23	.1540	54213
	.1541	54214
	.1545	54215
	.1550	54216
	.1555	54217
	.1560	54218
5/32	.1562	54219
	.1565	54220
22	.1570	54221
4.0 mm	.1575	54222
	.1580	54223
	.1585	54224
21	.1590	54225
	.1595	54226
	.1600	54227
	.1605	54228
20	.1610	54229
	.1615	54230
	.1620	54231

(continued)

SIZE RANGE	FLUTE LENGTH	OAL
.0280"-.0415"	1/4	1-1/2
.0420"-.0650"	3/8	1-1/2
.0655"-.0810"	1/2	1-3/4

SIZE RANGE	FLUTE LENGTH	OAL
.0815"-.0965"	1/2	2
.0970"-.1300"	5/8	2-1/4
.1305"-.1605"	3/4	2-1/2

SIZE RANGE	FLUTE LENGTH	OAL
.1610"-.1915"	7/8	2-3/4
.1920"-.2555"	1	3
.2559"-.3165"	1-1/8	3-1/4

SIZE RANGE	FLUTE LENGTH	OAL
.3170"-.4160"	1-1/4	3-1/2
.4170"-.4780"	1-3/8	4
.4790"-.5625"	1-1/2	4
.5905"-.7510"	1-3/4	4

Solid Carbide Straight Shank Chucking Reamers

List No. 5661
STANDARD PACKAGE All sizes — 1 each

(continued)

SIZE	DEC. SIZE	EDP NO.
	.1625	54232
	.1630	54233
	.1635	54234
	.1640	54235
	.1645	54236
	.1650	54237
	.1655	54238
19	.1660	54239
	.1665	54240
	.1670	54241
	.1675	54242
	.1680	54243
	.1685	54244
	.1690	54245
18	.1695	54246
	.1700	54247
	.1705	54248
	.1710	54249
	.1715	54250
11/64	.1719	54251
	.1720	54252
	.1725	54253
17	.1730	54254
	.1735	54255
	.1740	54256
	.1745	54257
	.1750	54258
	.1755	54259
	.1760	54260
	.1765	54261
16	.1770	54262
4.5 mm	.1772	54263
	.1775	54264
	.1780	54265
	.1785	54266
	.1790	54267
	.1795	54268
15	.1800	54269
	.1805	54270
	.1810	54271
	.1814	54272
	.1815	54273
14	.1820	54274
	.1825	54275
	.1830	54276
	.1835	54277
	.1840	54278
	.1845	54279
13	.1850	54280
.1855 D/P	.1855	54281
	.1860	54282
.1865 U/S	.1865	54283
	.1867	54744
.1870 D/P	.1870	54284
	.1872	54285

SIZE	DEC. SIZE	EDP NO.
3/16	.1875	54286
	.1877	54745
	.1880	54287
.1885 O/S	.1885	54288
12	.1890	54289
	.1895	54290
	.1900	54291
	.1905	54292
11	.1910	54293
	.1915	54294
	.1920	54295
	.1925	54296
	.1930	54297
10	.1935	54298
	.1940	54299
	.1945	54300
	.1950	54301
	.1955	54302
9	.1960	54303
	.1965	54304
5.0 mm	.1969	54305
	.1970	54306
	.1975	54307
	.1980	54308
	.1985	54309
8	.1990	54310
	.1995	54311
	.2000	54312
	.2005	54313
7	.2010	54314
	.2015	54315
	.2020	54316
	.2025	54317
	.2030	54318
13/64	.2031	54319
	.2035	54320
6	.2040	54321
	.2045	54322
	.2050	54323
5	.2055	54324
	.2060	54325
	.2065	54326
	.2070	54327
	.2075	54328
	.2080	54329
	.2085	54330
4	.2090	54331
	.2095	54332
	.2100	54333
	.2105	54334
	.2110	54335
	.2115	54336
	.2120	54337
	.2125	54338
3	.2130	54339

SIZE	DEC. SIZE	EDP NO.
	.2135	54340
	.2140	54341
	.2145	54342
	.2150	54343
	.2155	54344
	.2160	54345
5.5 mm	.2165	54346
	.2170	54347
	.2175	54348
	.2177	54349
	.2180	54350
	.2185	54351
7/32	.2188	54352
	.2190	54353
	.2195	54354
	.2200	54355
	.2205	54356
2	.2210	54357
	.2215	54358
	.2220	54359
	.2225	54360
	.2230	54361
	.2235	54362
	.2240	54363
	.2245	54364
	.2250	54365
	.2255	54366
	.2260	54367
	.2265	54368
	.2270	54369
	.2275	54370
1	.2280	54371
	.2285	54372
	.2290	54373
	.2295	54374
	.2300	54375
	.2305	54376
	.2310	54377
	.2315	54378
	.2320	54379
	.2325	54380
	.2330	54381
	.2335	54382
A	.2340	54383
15/64	.2344	54384
	.2345	54385
	.2350	54386
	.2355	54387
	.2360	54388
6.0 mm	.2362	54389
	.2365	54390
	.2370	54391
	.2375	54392
B	.2380	54393

(continued)

SIZE RANGE	FLUTE LENGTH	OAL
.0280"-.0415"	1/4	1-1/2
.0420"-.0650"	3/8	1-1/2
.0655"-.0810"	1/2	1-3/4

SIZE RANGE	FLUTE LENGTH	OAL
.0815"-.0965"	1/2	2
.0970"-.1300"	5/8	2-1/4
.1305"-.1605"	3/4	2-1/2

SIZE RANGE	FLUTE LENGTH	OAL
.1610"-.1915"	7/8	2-3/4
.1920"-.2555"	1	3
.2559"-.3165"	1-1/8	3-1/4

SIZE RANGE	FLUTE LENGTH	OAL
.3170"-.4160"	1-1/4	3-1/2
.4170"-.4780"	1-3/8	4
.4790"-.5625"	1-1/2	4
.5905"-.7510"	1-3/4	4

Solid Carbide Straight Shank Chucking Reamers

List No. 5661
STANDARD PACKAGE All sizes — 1 each

(continued)

SIZE	DEC. SIZE	EDP NO.
	.2385	54394
	.2390	54395
	.2395	54396
	.2400	54397
	.2405	54398
	.2410	54399
	.2415	54400
C	.2420	54401
	.2425	54402
	.2430	54403
	.2435	54404
	.2440	54405
	.2445	54406
	.2450	54407
	.2455	54408
D	.2460	54409
	.2465	54410
	.2470	54411
	.2475	54412
.2480 D/P	.2480	54413
	.2485	54414
.2490 U/S	.2490	54415
.2495 D/P	.2495	54416
	.2498	54746
1/4 (E)	.2500	54417
	.2502	54747
	.2505	54418
.2510 O/S	.2510	54419
	.2515	54420
	.2520	54421
	.2525	54422
	.2530	54423
	.2535	54424
	.2540	54425
	.2545	54426
	.2550	54427
	.2555	54748
6.5 mm	.2559	54428
	.2560	54429
	.2565	54430
F	.2570	54431
	.2575	54432
	.2580	54433
	.2590	54434
	.2600	54435
G	.2610	54436
	.2620	54437
	.2630	54438
	.2635	54439
	.2640	54440
	.2650	54441
	.2655	54749
17/64	.2656	54442
H	.2660	54443
	.2670	54444
	.2680	54445
	.2685	54750
	.2690	54446
	.2700	54447
	.2710	54448

SIZE	DEC. SIZE	EDP NO.
I	.2720	54449
	.2730	54450
	.2740	54451
	.2750	54452
7.0 mm	.2756	54453
	.2760	54454
	.2765	54751
J	.2770	54455
	.2780	54456
	.2785	54752
	.2790	54457
	.2800	54458
	.2805	54753
K	.2810	54459
9/32	.2812	54460
	.2818	54461
	.2820	54462
	.2830	54463
	.2840	54464
	.2850	54465
	.2860	54466
	.2870	54467
	.2880	54468
	.2890	54469
L	.2900	54470
	.2910	54471
	.2920	54472
	.2930	54473
	.2940	54474
M	.2950	54475
7.5 mm	.2953	54476
	.2960	54477
19/64	.2969	54478
	.2970	54479
	.2980	54480
	.2990	54481
	.3000	54482
	.3010	54483
N	.3020	54484
	.3030	54485
	.3040	54486
	.3050	54487
	.3060	54488
	.3070	54489
	.3080	54490
	.3090	54491
	.3100	54492
.3105 D/P	.3105	54493
	.3110	54494
.3115 U/S	.3115	54495
.3120 D/P	.3120	54496
5/16	.3125	54497
	.3130	54498
.3135 O/S	.3135	54499
	.3140	54500
	.3145	54754
8.0 mm	.3150	54501
	.3155	54755
O	.3160	54502
	.3165	54756

SIZE	DEC. SIZE	EDP NO.
	.3170	54503
	.3175	54757
	.3177	54758
	.3180	54504
	.3185	54759
	.3190	54505
	.3195	54760
	.3200	54506
	.3210	54507
	.3220	54508
P	.3230	54509
	.3240	54510
	.3250	54511
	.3255	54761
	.3260	54512
	.3270	54513
	.3280	54514
21/64	.3281	54515
	.3290	54516
	.3300	54517
	.3310	54518
Q	.3320	54519
	.3330	54520
	.3340	54521
8.5 mm	.3346	54522
	.3350	54523
	.3360	54524
	.3365	54762
	.3370	54525
	.3380	54526
R	.3390	54527
	.3400	54528
	.3410	54529
	.3420	54530
	.3430	54531
11/32	.3438	54532
	.3440	54533
	.3450	54534
	.3460	54535
	.3465	54763
	.3470	54536
S	.3480	54537
	.3490	54538
	.3500	54539
	.3510	54540
	.3520	54541
	.3530	54542
	.3540	54543
9.0 mm	.3543	54544
	.3550	54545
	.3560	54546
	.3570	54547
T	.3580	54548
	.3590	54549
23/64	.3594	54550
	.3600	54551
	.3610	54552
	.3620	54553
	.3630	54554
	.3640	54555

(continued)

SIZE RANGE	FLUTE LENGTH	OAL
.0280"-.0415"	1/4	1-1/2
.0420"-.0650"	3/8	1-1/2
.0655"-.0810"	1/2	1-3/4

SIZE RANGE	FLUTE LENGTH	OAL
.0815"-.0965"	1/2	2
.0970"-.1300"	5/8	2-1/4
.1305"-.1605"	3/4	2-1/2

SIZE RANGE	FLUTE LENGTH	OAL
.1610"-.1915"	7/8	2-3/4
.1920"-.2555"	1	3
.2559"-.3165"	1-1/8	3-1/4

SIZE RANGE	FLUTE LENGTH	OAL
.3170"-.4160"	1-1/4	3-1/2
.4170"-.4780"	1-3/8	4
.4790"-.5625"	1-1/2	4
.5905"-.7510"	1-3/4	4

Solid Carbide Straight Shank Chucking Reamers

(continued)

List No. 5661
STANDARD PACKAGE All sizes — 1 each

SIZE	DEC. SIZE	EDP NO.
	.3650	54556
	.3660	54557
	.3670	54558
	.3675	54764
U	.3680	54559
	.3690	54560
	.3700	54561
	.3710	54562
	.3720	54563
.3730 D/P	.3730	54564
	.3735	54765
9.5 mm	.3740	54565
.3745 D/P	.3745	54566
3/8	.3750	54567
	.3755	54568
.3760 O/S	.3760	54569
	.3765	54570
V	.3770	54571
	.3780	54572
	.3790	54573
	.3795	54766
	.3800	54574
	.3810	54575
	.3820	54576
	.3830	54577
	.3840	54578
	.3850	54579
W	.3860	54580
	.3870	54581
	.3880	54582
	.3890	54583
	.3900	54584
25/64	.3906	54585
	.3910	54586
	.3920	54587
	.3930	54588
10.0 mm	.3937	54589
	.3940	54590
	.3950	54591
	.3960	54592
X	.3970	54593
	.3980	54594
	.3990	54595
	.4000	54596
	.4010	54597
	.4020	54598
	.4030	54599
Y	.4040	54600
	.4050	54601
	.4060	54602
13/32	.4062	54603
	.4070	54604
	.4080	54605
	.4090	54606
	.4100	54607
	.4110	54608
	.4120	54609
Z	.4130	54610
10.5 mm	.4134	54611
	.4140	54612
	.4150	54613
	.4160	54614
	.4170	54615
	.4180	54616
	.4190	54617
	.4200	54618
	.4210	54619
27/64	.4219	54620
	.4230	54621
	.4240	54622
	.4250	54623
	.4260	54624
	.4270	54625
	.4280	54626
	.4290	54627
	.4300	54628
	.4310	54629
	.4320	54630
	.4330	54631
11.0 mm	.4331	54632
	.4340	54633
	.4350	54634
.4355 D/P	.4355	54635
	.4360	54636
.4365 U/S	.4365	54637
.4370 D/P	.4370	54638
7/16	.4375	54639
	.4380	54640
.4385 O/S	.4385	54641
	.4390	54642
	.4400	54643
	.4410	54644
	.4420	54645
	.4430	54646
	.4440	54647
	.4450	54648
	.4460	54649
	.4470	54650
	.4480	54651
	.4490	54652
	.4500	54653
	.4510	54654
	.4520	54655
11.5 mm	.4528	54656
	.4530	54657
29/64	.4531	54658
	.4540	54659
	.4550	54660
	.4560	54661
	.4570	54662
	.4580	54663
	.4590	54664
	.4600	54665
	.4610	54666
	.4620	54667
	.4630	54668
	.4640	54669
	.4650	54670
	.4660	54671
	.4670	54672
	.4680	54673
15/32	.4688	54674
	.4690	54675
	.4700	54676
	.4710	54677
	.4720	54678
12.0 mm	.4724	54679
	.4730	54680
	.4740	54681
	.4750	54682
	.4760	54683
	.4770	54684
	.4780	54685
	.4790	54686
	.4800	54687
	.4805	54688
	.4810	54689
	.4820	54690
	.4830	54691
	.4840	54692
31/64	.4844	54693
	.4850	54694
	.4860	54695
	.4870	54696
	.4880	54697
	.4890	54698
	.4900	54699
	.4910	54700
12.5 mm	.4921	54701
	.4930	54702
	.4940	54703
	.4950	54704
	.4960	54705
	.4970	54706
.4980 D/P	.4980	54707
.4990 U/S	.4990	54708
.4995 D/P	.4995	54709
1/2	.5000	54710
	.5005	54711
.5010 O/S	.5010	54712
	.5015	54713
	.5020	54714
	.5030	54715
	.5040	54716
	.5050	54717
13.0 mm	.5118	54718
14.0 mm	.5512	54719
9/16	.5625	54720
15.0 mm	.5905	54721
	.6235	54722
	.6240	54723
	.6245	54724
5/8	.6250	54725
	.6255	54726
	.6260	54727
	.6270	54728
16.0 mm	.6299	54729
	.6310	54730
	.7490	54731
	.7495	54732
3/4	.7500	54733
	.7505	54734
	.7510	54735

SIZE RANGE	FLUTE LENGTH	OAL
.0280"-.0415"	1/4	1-1/2
.0420"-.0650"	3/8	1-1/2
.0655"-.0810"	1/2	1-3/4

SIZE RANGE	FLUTE LENGTH	OAL
.0815"-.0965"	1/2	2
.0970"-.1300"	5/8	2-1/4
.1305"-.1605"	3/4	2-1/2

SIZE RANGE	FLUTE LENGTH	OAL
.1610"-.1915"	7/8	2-3/4
.1920"-.2555"	1	3
.2559"-.3165"	1-1/8	3-1/4

SIZE RANGE	FLUTE LENGTH	OAL
.3170"-.4160"	1-1/4	3-1/2
.4170"-.4780"	1-3/8	4
.4790"-.5625"	1-1/2	4
.5905"-.7510"	1-3/4	4

Carbide Tipped Straight Shank Chucking Reamers

Straight Flute — Right Hand Cut

Carbide Tipped offers excellent wear resistance for general reaming of steel, cast iron, plastics, and other abrasive non-ferrous materials. Longer tool life in production applications.

List No. 5655

STANDARD PACKAGE All sizes — 1 each

Diameter Tolerance +.0003 / -.0000

SIZE	DEC. EQUIV.	SHANK DIA.	FLUTE LENGTH	OAL	NO. OF FLUTES	EDP NO.
3/16	.1875	11/64	1 1/8	4 1/2	4	55212
7/32	.2187	13/64	1 1/4	5	4	55214
1/4	.2500	15/64	1 1/2	6	4	55216
9/32	.2812	15/64	1 1/2	6	4	55218
19/64	.2969	9/32	1 1/2	6	4	55219
5/16	.3125	9/32	1 1/2	6	4	55220
21/64	.3281	9/32	1 1/2	6	4	55221
11/32	.3437	9/32	1 1/2	6	4	55222
3/8	.3750	5/16	1 3/4	7	4	55224
13/32	.4062	5/16	1 3/4	7	4	55226
27/64	.4219	3/8	1 3/4	7	4	55227*
7/16	.4375	3/8	1 3/4	7	4	55228
29/64	.4531	3/8	1 3/4	7	4	55229*
15/32	.4688	3/8	1 3/4	7	4	55230
1/2	.5000	7/16	2	8	6	55232
17/32	.5312	7/16	2	8	6	55234
9/16	.5625	7/16	2	8	6	55236
5/8	.6250	9/16	2 1/4	9	6	55240
11/16	.6875	9/16	2 1/4	9	6	55244
3/4	.7500	5/8	2 1/2	9 1/2	6	55248
7/8	.8750	3/4	2 5/8	10	6	55256
1	1.0000	7/8	2 3/4	10 1/2	8	55264
1 1/2	1.5000	1 1/4	3 1/2	12 1/2	8	55332*

* Available While Supplies Last

Carbide Tipped Expansion Straight Shank Chucking Reamers

Straight Flute — Right Hand Cut

Expansion Reamers are expandable to permit many regrinds to the original reamer size. **Carbide Tipped** offers excellent wear resistance for general reaming of steel, cast iron, plastics, and other abrasive non-ferrous materials. Longer tool life in production applications.

List No. 5733

NOTE: Expansion feature is for expansion and regrind to the original reamer size only. Not to be used as an adjustable reamer for producing different hole sizes. Expansion screw should never be loosened to achieve a smaller reamer size.

STANDARD PACKAGE All sizes — 1 each

SIZE	DEC. EQUIV.	SHANK DIA.	FLUTE LENGTH	OAL	NO. OF FLUTES	EDP NO.
3/8	.3750	5/16	1	7	4	56003
7/16	.4375	3/8	1	7	4	56004
1/2	.5000	7/16	1	8	6	56005
9/16	.5625	7/16	1 1/8	8	6	56007
5/8	.6250	9/16	1 1/4	9	6	56009
11/16	.6875	9/16	1 1/4	9	6	56011
3/4	.7500	5/8	1 3/8	9 1/2	6	56013
13/16	.8125	5/8	1 3/8	9 1/2	6	56015
7/8	.8750	3/4	1 1/2	10	6	56017
15/16	.9375	3/4	1 1/2	10	8	56019
1	1.000	7/8	1 5/8	10 1/2	8	56021
1 1/8	1.1250	7/8	1 3/4	11	8	56025
1 1/4	1.2500	1	1 7/8	11 1/2	8	56027
1 3/8	1.3750	1	2	12	8	56029
1 1/2	1.5000	1 1/4	2 1/8	12 1/2	8	56031
1 15/16	1.9375	1 1/4	2 1/8	12 1/2	8	56042*

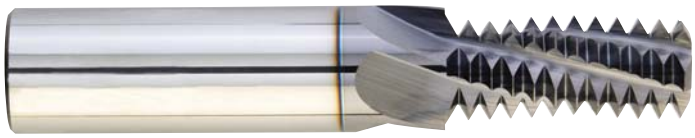
* Available While Supplies Last

Solid Carbide Thread Mills

ALTiN Coated
10% Micrograin Carbide
20° Helix Angle

Shank Diameter Tolerance: h6 for Shrink Fit Holders

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life.



List No. 5900 Fractional & Machine Screw

ALTiN - Aluminum Titanium Nitride is an excellent all-around coating that is especially recommended for high thermal stress applications including dry machining, abrasive materials and difficult-to-machine materials. Benefits include higher cutting speeds and longer tool life.

THREAD MILLING FEATURES & BENEFITS

- **Reduced Tool Inventory. One Thread Mill Can Produce** internal & external threads, left hand & right hand threads, different thread diameters of the same pitch and through hole & blind hole threads.
- **Requires Less Power.** Produce coarse pitches and large diameters on lower H.P. machines.
- **Tough Threading Applications.** Thread harder, difficult-to-machine & gummy materials that cause problems for taps.
- **Helical Flutes** for reduced cutting forces, improved thread quality & increased tool life.
- **Precision Threading.** Control pitch diameter precisely via programming. Precise thread depth control & positional accuracy. Produce 100% thread heights. Produce full threads to within one pitch of a shoulder or blind hole bottom.
- **Easily Removed if Broken.** No need for EDM burn-out.

Fractional & Machine Screw

SIZE	SHANK DIA.	CUTTING DIA.	LENGTH OF CUT	OAL	NO. OF FLUTES	EDP NO.
6-32	1/8	.100	.218	2	3	98600
8-36	1/8	.115	.250	2	3	98601
8-32	1/8	.115	.250	2	3	98602
10-24	3/16	.120	.312	2	3	98603
10-32	3/16	.120	.312	2	3	98604
1/4-20	3/16	.180	.500	2-1/2	3	98605
1/4-28	3/16	.180	.500	2-1/2	3	98606
5/16-18	1/4	.240	.625	2-1/2	3	98607
5/16-24	1/4	.240	.625	2-1/2	3	98608
3/8-16	5/16	.290	.750	3	4	98609
3/8-24	5/16	.290	.750	3	4	98610
7/16-14	3/8	.340	.875	3	4	98611
7/16-20	3/8	.340	.875	3	4	98612
1/2-13	3/8	.350	.875	3-1/2	4	98613
1/2-20	3/8	.350	.875	3-1/2	4	98614
9/16-12	1/2	.370	.875	3-1/2	4	98615
9/16-18	1/2	.370	.875	3-1/2	4	98616
5/8-11	1/2	.470	1.250	3-1/2	5	98617
5/8-18	1/2	.470	1.250	3-1/2	5	98618
3/4-10	1/2	.495	1.250	3-1/2	5	98619
3/4-16	1/2	.495	1.250	3-1/2	5	98620
7/8-9	5/8	.620	1.250	3-1/2	5	98621
7/8-14	5/8	.620	1.250	3-1/2	5	98622
1-8	3/4	.620	1.375	4	5	98623
1-12	3/4	.620	1.375	4	5	98624

Solid Carbide Thread Mills

ALTiN Coated
10% Micrograin Carbide
20° Helix Angle

List No. 5902 Pipe Thread

Shank Diameter Tolerance: h6 for Shrink Fit Holders

Pipe Thread

SIZE	SHANK DIA.	CUTTING DIA.	LENGTH OF CUT	OAL	NO. OF FLUTES	EDP NO.
			NPT			
1/16-27	1/4	.245	.437	2-1/2	3	**98641**
1/8-27	5/16	.310	.437	2-1/2	4	**98642**
1/4-18	3/8	.370	.625	3	4	**98656**
3/8-18	3/8	.370	.625	3	4	**98657**
1/2-14	1/2	.495	.875	3-1/2	4	**98645**
3/4-14	1/2	.495	.875	3-1/2	4	**98646**
1-11½	3/4	.620	1.125	4	5	**98647**
			NPTF			
1/16-27	1/4	.245	.437	2-1/2	3	**98648**
1/8-27	5/16	.310	.437	2-1/2	4	**98649**
1/4-18	3/8	.370	.625	3	4	**98658**
3/8-18	3/8	.370	.625	3	4	**98659**
1/2-14	1/2	.495	.875	3-1/2	4	**98652**
3/4-14	1/2	.495	.875	3-1/2	4	**98653**
1-11½	3/4	.620	1.125	4	5	**98654**

Solid Carbide Thread Mills

ALTiN Coated
10% Micrograin Carbide

Speeds & Feeds: Page 30

6 PIECE SET
Fractional & Machine Screw

With just 6 thread mills you can produce 13 different thread sizes: 6-32, 8-32, 10-32, 10-24, 5/16"-24, 3/8"-24, 1/4"-20, 1/2"-20, 5/16"-18, 9/16"-18, 3/8"-16, 3/4"-16, 1/2"-13

With the same thread mill you can produce:

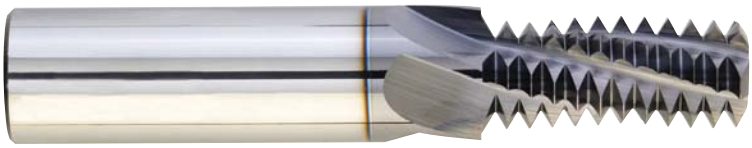
- both left hand & right hand threads
- both internal & external threads

List No. 5900
Sizes: 6-32, 10-24, 1/4"-20, 5/16"-18, 3/8"-16, 1/2"-13 in Plastic Case

EDP No. 98655

Solid Carbide Thread Mills

ALTiN Coated
10% Micrograin Carbide
20° Helix Angle



List No. 5901 Metric

Metric

SIZE	SHANK DIA.	CUTTING DIA.	LENGTH OF CUT	OAL	NO. OF FLUTES	EDP NO.
M4 x 0.7	1/8	.120	.250	2	3	**98625**
M4.5 x 0.75	1/8	.120	.250	2	3	**98626**
M5 x 0.8	3/16	.120	.312	2	3	**98627**
M6 x 1	3/16	.170	.500	2-1/2	3	**98628**
M8 x 0.75	1/4	.235	.625	2-1/2	3	**98629**
M8 x 1	1/4	.235	.625	2-1/2	3	**98630**
M8 x 1.25	1/4	.235	.625	2-1/2	3	**98631**
M10 x 1.25	5/16	.300	.750	3	4	**98632**
M10 x 1.5	5/16	.300	.750	3	4	**98633**
M12 x 1	3/8	.360	.875	3-1/2	4	**98634**
M12 x 1.25	3/8	.360	.875	3-1/2	4	**98635**
M12 x 1.75	3/8	.360	.875	3-1/2	4	**98636**
M14 x 1.5	3/8	.360	.875	3-1/2	4	**98637**
M16 x 2	1/2	.470	1.250	3-1/2	5	**98638**
M18 x 2.5	1/2	.470	1.250	3-1/2	5	**98639**
M20 x 3	5/8	.470	1.250	3-1/2	5	**98640**

Shank Diameter Tolerance: h6 for Shrink Fit Holders

Thread Milling Feed & Speeds

Material	Speed SFM	Feed Rate (inches/tooth)						
		Tool Diameter						
		1/8	3/16	1/4	5/16	3/8	1/2	5/8
Aluminum	800-1400	.0005-.001	.001-.0015	.0015-.0025	.002-.003	.003-.0045	.0035-.0055	.005-.007
Magnesium	800-1400	.0005-.001	.001-.0015	.0015-.0025	.002-.003	.003-.0045	.0035-.0055	.005-.007
Brass	600-800	.0005-.001	.001-.0015	.0015-.0025	.002-.003	.003-.0045	.0035-.0045	.005-.006
Bronze	500-600	.0005-.001	.001-.0015	.0015-.0025	.002-.003	.003-.0045	.0035-.0045	.005-.006
Hard Bronze	200-300	.0004-.0008	.0007-.0012	.001-.002	.001-.002	.0015-.0025	.002-.003	.003-.004
Low Alloy Steels < 25 Rc	350-500	.0005-.001	.001-.0015	.0015-.0025	.002-.003	.0025-.0035	.003-.004	.004-.005
High Alloy Steels > 25 Rc	250-400	.0003-.0006	.0005-.001	.0008-.0015	.001-.002	.0015-.0025	.002-.003	.003-.004
Stainless Steel	150-250	.0004-.0008	.0006-.001	.001-.0015	.0015.-002	.0015-.003	.002-.0035	.003-.004
Cast Iron - Soft	250-350	.0004-.0008	.0007-.0013	.0007-.0013	.0015.-002	.002-.003	.002-.004	.003-.005
Cast Iron - Hard	200-300	.0003-.0006	.0005-.001	.0008-.0015	.001-.002	.0015-.0025	.002-.003	.003-.004
Titanium	80-150	.0003-.0006	.0005-.001	.0008-.0015	.001-.002	.0015-.0025	.0015-.0025	.0025-.0035
Inconel	60-100	.0003-.0006	.0005-.001	.0008-.0015	.001-.002	.0015-.0025	.0015-.0025	.002-.003

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

variFLUTE®
Variable Flute ALTiN Coated HPE Ultra-High Performance Solid Carbide Single End Mills

Center Cutting - 38° Helix Angle
10% Cobalt Micrograin Carbide

HIGH PERFORMANCE MILLING: Carbon Steels, Alloy Steels, Stainless Steels, Mold & Die Steels, High Temperature Alloys, Titanium Alloys, Cast Iron and many other materials.

Variable Flute design reduces chatter, harmonics and cutting forces for increased feed rates, greater depths of cut, improved surface finish and accuracy, minimal tool deflection, reduced machine vibration and increased tool life.

TOLERANCES
Diameter +.000/ - .002
Shank Dia. h6 Tolerance

ALTiN – Aluminum Titanium Nitride Coating is an excellent all-around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

Fraise à queue à rainurer à haut rendement au carbure

Cortador vertical de carburo de alto rendimiento

List No. 5985 3-Flute – Corner Radius

List No. 5988 3-Flute – Ball Nose

List No. 5994 4-Flute – Corner Radius
List No. 5995 4-Flute – Square End

List No. 5996 4-Flute – Ball Nose

List No. 5986 5-Flute – Corner Radius
List No. 5987 5-Flute – Square End

List No. 5985 – 3-Flute – Corner Radius

ALTiN COATED

3-Flute variFLUTE end mills feature tool geometry for high chip evacuation in slotting and roughing applications.

Corner Radius strengthens the end mill to minimize chipping and reduce corner wear. Also used when the finished part requires a radius.

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	CORNER RADIUS	EDP NO.
		STUB LENGTH			
1/4	1/4	3/8	2	.015-.020	56270
3/8	3/8	1/2	2	.015-.020	56271
1/2	1/2	5/8	2 1/2	.025-.030	56272
5/8	5/8	3/4	3	.030-.035	56273
3/4	3/4	7/8	3	.030-.035	56274
		REGULAR LENGTH			
1/8	1/8	3/8	1 1/2	.010-.015	56275
5/32	3/16	7/16	2	.010-.015	56276
3/16	3/16	7/16	2	.010-.015	56277
7/32	1/4	7/16	2 1/2	.015-.020	56278
1/4	1/4	5/8	2 1/2	.015-.020	56279
9/32	5/16	5/8	2 1/2	.015-.020	56280
5/16	5/16	3/4	2 1/2	.015-.020	56281
3/8	3/8	7/8	2 1/2	.015-.020	56282
7/16	7/16	1	2 3/4	.015-.020	56283
1/2	1/2	1	3	.025-.030	56284
5/8	5/8	1 1/4	3 1/2	.030-.035	56285
3/4	3/4	1 1/2	4	.030-.035	56286
1	1	1 1/2	4	.030-.035	56287

Shank Diameter Tolerance: h6

Speeds & Feeds: Page 35

variFLUTE® Solid Carbide Single End Mills

ALTiN COATED

3-Flute variFLUTE end mills feature tool geometry for high chip evacuation in slotting and roughing applications.

Ball Nose for surfacing applications, fillets, radius bottom slots and die cavities.

List No. 5988 – 3-Flute – Ball Nose

Speeds & Feeds: Page 35

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	EDP NO.
		REGULAR LENGTH		
1/8	1/8	3/8	1 1/2	56320
5/32	3/16	7/16	2	56321
3/16	3/16	7/16	2	56322
7/32	1/4	7/16	2 1/2	56323
1/4	1/4	5/8	2 1/2	56324
9/32	5/16	5/8	2 1/2	56325
5/16	5/16	3/4	2 1/2	56326
3/8	3/8	7/8	2 1/2	56327
7/16	7/16	1	2 3/4	56328
1/2	1/2	1	3	56329

ALTiN COATED

4-Flute variFLUTE end mills feature versatile tool geometry for high chip evacuation in slotting applications while providing high surface finish and rapid feed rates in profiling applications.

Ball Nose for surfacing applications, fillets, radius bottom slots and die cavities.

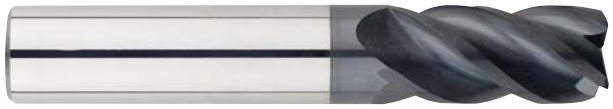
List No. 5996 – 4-Flute – Ball Nose

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	EDP NO.
		REGULAR LENGTH		
1/8	1/8	3/8	1 1/2	56373
5/32	3/16	7/16	2	56374
3/16	3/16	7/16	2	56375
7/32	1/4	7/16	2 1/2	56376
1/4	1/4	5/8	2 1/2	56377
9/32	5/16	5/8	2 1/2	56378
5/16	5/16	3/4	2 1/2	56379
3/8	3/8	7/8	2 1/2	56380
7/16	7/16	1	2 3/4	56381
1/2	1/2	1	3	56382
5/8	5/8	1 1/4	3 1/2	56383
3/4	3/4	1 1/2	4	56384
1	1	1 1/2	4	56385

Shank Diameter Tolerance: h6 for Shrink Fit Holders

variFLUTE® Solid Carbide Single End Mills

Shank Diameter Tolerance: h6



List No. 5994 – 4-Flute – Corner Radius

ALTiN COATED

4-Flute variFLUTE end mills feature versatile tool geometry for high chip evacuation in slotting applications while providing high surface finish and rapid feed rates in profiling applications.

Corner Radius strengthens the end mill to minimize chipping and reduce corner wear. Also used when the finished part requires a radius.

Speeds & Feeds: Page 35

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	CORNER RADIUS	EDP NO.
STUB LENGTH					
1/4	1/4	3/8	2	.015 - .020	56335
5/16	5/16	3/8	2	.015 - .020	56336
3/8	3/8	1/2	2	.015 - .020	56337
1/2	1/2	5/8	2 1/2	.025 - .030	56338
5/8	5/8	3/4	3	.030 - .035	56339
3/4	3/4	7/8	3	.030 - .035	56340
1	1	1	4	.030 - .035	56341
REGULAR LENGTH					
1/8	1/8	3/8	1 1/2	.010 - .015	56342
5/32	3/16	7/16	2	.010 - .015	56343
3/16	3/16	7/16	2	.010 - .015	56344
7/32	1/4	7/16	2 1/2	.015 - .020	56345
1/4	1/4	5/8	2 1/2	.015 - .020	56346
9/32	5/16	5/8	2 1/2	.015 - .020	56347
5/16	5/16	3/4	2 1/2	.015 - .020	56348
3/8	3/8	7/8	2 1/2	.015 - .020	56349
7/16	7/16	1	2 3/4	.015 - .020	56350
1/2	1/2	1	3	.025 - .030	56351
5/8	5/8	1 1/4	3 1/2	.030 - .035	56352
3/4	3/4	1 1/2	4	.030 - .035	56353
1	1	1 1/2	4	.030 - .035	56354
LONG LENGTH					
1/4	1/4	1 1/4	3	.015 - .020	56355
3/8	3/8	1 1/4	3	.015 - .020	56356
1/2	1/2	2	4	.025 - .030	56357
5/8	5/8	2 1/4	5	.030 - .035	56358
3/4	3/4	2 1/4	5	.030 - .035	56359
EXTENDED LENGTH					
1/4	1/4	5/8	4	.015 - .020	56360
3/8	3/8	7/8	4	.015 - .020	56361
1/2	1/2	1	6	.025 - .030	56362
5/8	5/8	1 1/4	6	.030 - .035	56363
3/4	3/4	1 1/2	6	.030 - .035	56364

ALTiN – Aluminum Titanium Nitride Coating is an excellent all-around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

variFLUTE® Solid Carbide Single End Mills

List No. 5995 – 4-Flute – Square End

ALTiN COATED

4-Flute variFLUTE end mills feature versatile tool geometry for high chip evacuation in slotting applications while providing high surface finish and rapid feed rates in profiling applications.

Square End for peripheral milling and finishing applications requiring machining to a sharp corner.

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	EDP NO.
REGULAR LENGTH				
1/4	1/4	5/8	2 1/2	56365
5/16	5/16	3/4	2 1/2	56366
3/8	3/8	7/8	2 1/2	56367
7/16	7/16	1	2 3/4	56368
1/2	1/2	1	3	56369
5/8	5/8	1 1/4	3 1/2	56370
3/4	3/4	1 1/2	4	56371
1	1	1 1/2	4	56372

List No. 5986 – 5-Flute – Corner Radius

ALTiN COATED

5-Flute variFLUTE end mills with increased core thickness and five flutes provide higher feed rates in profiling and finishing applications and enhanced surface finish.

Corner Radius strengthens the end mill to minimize chipping and reduce corner wear. Also used when the finished part requires a radius.

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	CORNER RADIUS	EDP NO.
STUB LENGTH					
1/4	1/4	3/8	2	.015-.020	56290
3/8	3/8	1/2	2	.015-.020	56291
1/2	1/2	5/8	2 1/2	.025-.030	56292
5/8	5/8	3/4	3	.030-.035	56293
3/4	3/4	7/8	3	.030-.035	56294
REGULAR LENGTH					
1/4	1/4	5/8	2 1/2	.015-.020	56295
5/16	5/16	3/4	2 1/2	.015-.020	56296
3/8	3/8	7/8	2 1/2	.015-.020	56297
7/16	7/16	1	2 3/4	.015-.020	56298
1/2	1/2	1	3	.025-.030	56299
5/8	5/8	1 1/4	3 1/2	.030-.035	56300
3/4	3/4	1 1/2	4	.030-.035	56301
1	1	1 1/2	4	.030-.035	56302
LONG LENGTH					
1/4	1/4	1 1/4	3	.015-.020	56330
3/8	3/8	1 1/4	3	.015-.020	56331
1/2	1/2	2	4	.025-.030	56332
5/8	5/8	2 1/4	5	.030-.035	56333
3/4	3/4	2 1/4	5	.030-.035	56334
EXTENDED LENGTH					
1/4	1/4	5/8	4	.015-.020	56303
3/8	3/8	7/8	4	.015-.020	56304
1/2	1/2	1	6	.025-.030	56305
5/8	5/8	1 1/4	6	.030-.035	56306
3/4	3/4	1 1/2	6	.030-.035	56307

Shank Diameter Tolerance: h6

Speeds & Feeds: Page 35

variFLUTE® Solid Carbide Single End Mills

List No. 5987 – 5-Flute – Square End

ALTiN COATED

5-Flute variFLUTE end mills with increased core thickness and five flutes provide higher feed rates in profiling and finishing applications and enhanced surface finish.

Square End for peripheral milling and finishing applications requiring machining to a sharp corner.

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	EDP NO.
		REGULAR LENGTH		
1/4	1/4	5/8	2 1/2	56310
5/16	5/16	3/4	2 1/2	56311
3/8	3/8	7/8	2 1/2	56312
7/16	7/16	1	2 3/4	56313
1/2	1/2	1	3	56314
5/8	5/8	1 1/4	3 1/2	56315
3/4	3/4	1 1/2	4	56316
1	1	1 1/2	4	56317

variFLUTE® SPEEDS & FEEDS

Shank Diameter Tolerance: h6 for Shrink Fit Holders

Workpiece Material	Hardness BHN	Type of Cut	Surface Speed (SFM)	FEED PER TOOTH BY END MILL DIAMETER 1/8"	1/4"	1/2"	3/4"	1"
Plain Steels -Low & Medium Carbon 1008, 1010, 1020	175	Profile	625	0.0005	0.0016	0.0036	0.0046	0.0050
		Slot	500	0.0004	0.0012	0.0029	0.0036	0.0041
Plain Steels -Low & Medium Carbon 1008, 1010, 1020	275	Profile	500	0.0005	0.0016	0.0036	0.0046	0.0050
		Slot	400	0.0004	0.0012	0.0029	0.0036	0.0041
Alloy Steels - Medium Carbon 4140, 4150, 4340	275	Profile	500	0.0004	0.0012	0.0030	0.0042	0.0048
		Slot	400	0.0002	0.0010	0.0024	0.0034	0.0038
Alloy Steels - Medium Carbon 4140, 4150, 4340	375	Profile	375	0.0004	0.0012	0.0030	0.0042	0.0048
		Slot	300	0.0002	0.0010	0.0024	0.0034	0.0038
Mold & Die Steels O1, A2, D2, H13, P20	275	Profile	225	0.0002	0.0012	0.0030	0.0042	0.0048
		Slot	180	0.0002	0.0010	0.0024	0.0034	0.0038
Stainless Steels 300 Series 304, 310, 316	275	Profile	360	0.0004	0.0012	0.0030	0.0042	0.0050
		Slot	290	0.0002	0.0010	0.0024	0.0034	0.0041
Stainless Steels 400 Series 409, 430, 436	325	Profile	300	0.0004	0.0012	0.0030	0.0042	0.0050
		Slot	240	0.0002	0.0010	0.0024	0.0034	0.0041
Stainless Steels Precipitation Hardened 15-5PH, 17-4PH	325	Profile	300	0.0002	0.0012	0.0026	0.0036	0.0048
		Slot	240	0.0002	0.0010	0.0022	0.0029	0.0038
High Temperature Alloys Inconel, Hastelloy, Waspaloy	300	Profile	80	0.0002	0.0008	0.0024	0.0030	0.0038
		Slot	65	0.0002	0.0007	0.0019	0.0024	0.0031
Titanium Alloys Ti-6Al-4V, ASTM B367 Grades C-3, C-4	300	Profile	315	0.0004	0.0012	0.0030	0.0032	0.0042
		Slot	250	0.0002	0.0010	0.0024	0.0026	0.0034
Cast Iron Grey	200	Profile	605	0.0005	0.0014	0.0036	0.0046	0.0050
		Slot	485	0.0004	0.0012	0.0029	0.0036	0.0041
Cast Iron Ductile	300	Profile	275	0.0004	0.0012	0.0036	0.0040	0.0050
		Slot	220	0.0002	0.0010	0.0029	0.0031	0.0041

SPEEDS and FEEDS are suggested starting points and may be increased or decreased depending on actual material and machining conditions. In pocketing operations ramping and spiral plunging are the preferred methods of entry. A 5° ramp angle at about 50% feed are suggested.

RECOMMENDED MAXIMUM DEPTHS OF CUT	PROFILING	SLOTTING
	Radial Depth = .5XD Axial Depth = 1.5XD	Axial Depth = 1XD

May be increased or decreased depending on actual material and machining conditions.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

variFLUTE®
7-Flute Variable Flute HPE Ultra-High Performance Solid Carbide Single End Mills

List No. 5998 7-Flute nACo Coated

Center Cutting - 45° Helix Angle
10% Cobalt Micrograin Carbide

TOLERANCES
Diameter +.000/-.002
Shank Dia. h6 Tolerance

nACo Coated

nACo - Aluminum Titanium Nitride + Silicon Nitride coating for high heat and wear resistance.

Variable Flute reduces chatter and harmonics for increased feed rates, improved finish and minimal tool deflection.

7-Flute mills are recommended for light to medium finishing profiling cuts in steels, stainless steels, high temp alloys, titanium alloys and cast irons up to 52Rc hardness.

Corner Radius to minimize chipping and reduce corner wear.

Total Reach combines the flute length with a necked shank to provide clearance for milling in deeper cavities.

List No. 5998 7-Flute Inch Sizes

Speeds & Feeds: Page 40

DIA.	SHANK DIA.	LOC	TOTAL REACH	OAL	CORNER RADIUS	EDP NO.
1/8	1/8	3/16	—	1-1/2	—	97750
1/8	1/8	3/16	—	1-1/2	.010	97751
1/8	1/8	3/8	—	1-1/2	—	97752
1/8	1/8	3/8	—	1-1/2	.010	97753
3/16	3/16	9/32	—	1-1/2	—	97754
3/16	3/16	9/32	—	1-1/2	.010	97755
3/16	3/16	9/16	—	2	—	97756
3/16	3/16	9/16	—	2	.010	97757
1/4	1/4	3/8	—	2	—	97758
1/4	1/4	3/8	—	2	.015	97759
1/4	1/4	3/8	2-1/8	4	.015	97760
1/4	1/4	3/8	—	4	.015	97761
1/4	1/4	3/4	1	2-1/2	—	97762
1/4	1/4	3/4	1	2-1/2	.015	97763
3/8	3/8	1/2	—	2	—	97764
3/8	3/8	1/2	—	2	.015	97765
3/8	3/8	1/2	1-1/8	3	.015	97766
3/8	3/8	1/2	2-1/8	4	.015	97767
3/8	3/8	1	—	2-1/2	—	97768
3/8	3/8	1	—	2-1/2	.015	97769
1/2	1/2	5/8	—	2-1/2	—	97770
1/2	1/2	5/8	—	2-1/2	.015	97771
1/2	1/2	5/8	1-1/2	4	.015	97772
1/2	1/2	5/8	2-1/4	4	.015	97773
1/2	1/2	1	1-1/4	3	—	97774
1/2	1/2	1	1-1/4	3	.015	97775
1/2	1/2	1	1-1/4	3	.030	97776
1/2	1/2	1-1/4	—	3	—	97777
1/2	1/2	1-1/4	—	3	.015	97778
1/2	1/2	1-1/4	—	3	.030	97779
5/8	5/8	3/4	—	3	—	97780
5/8	5/8	3/4	—	3	.030	97781
5/8	5/8	3/4	1-5/8	5	.030	97782
5/8	5/8	1-1/4	1-1/2	3-1/2	—	97783
5/8	5/8	1-1/4	1-1/2	3-1/2	.030	97784
3/4	3/4	7/8	—	3	—	97785
3/4	3/4	7/8	—	3	.030	97786
3/4	3/4	7/8	2	5	.030	97787
3/4	3/4	1-1/2	1-3/4	4	—	97788
3/4	3/4	1-1/2	1-3/4	4	.030	97789
1	1	1-1/2	1-3/4	4	—	97790
1	1	1-1/2	1-3/4	4	.030	97791

Shank Diameter Tolerance: h6 for Shrink Fit Holders

variFLUTE® Metric 7-Flute Variable Flute HPE Ultra-High Performance Solid Carbide Single End Mills

List No. 5998M 7-Flute nACo Coated

Center Cutting - 45° Helix Angle
10% Cobalt Micrograin Carbide

TOLERANCES
Diameter +.000/-.050 mm
Shank Dia. h6 Tolerance

nACo Coated

nACo - Aluminum Titanium Nitride + Silicon Nitride coating for high heat and wear resistance.

Variable Flute reduces chatter and harmonics for increased feed rates, improved finish and minimal tool deflection.

7-Flute mills are recommended for light to medium finishing profiling cuts in steels, stainless steels, high temp alloys, titanium alloys and cast irons up to 52Rc hardness.

Corner Radius to minimize chipping and reduce corner wear.

Total Reach combines the flute length with a necked shank to provide clearance for milling in deeper cavities.

List No. 5998M 7-Flute Metric Sizes

Speeds & Feeds: Page 40

DIA.	SHANK DIA.	LOC	TOTAL REACH	OAL	CORNER RADIUS	EDP NO.
3 mm	3 mm	6 mm	—	38 mm	—	97795
3 mm	3 mm	6 mm	—	38 mm	.25 mm	97796
3 mm	3 mm	12 mm	—	38 mm	—	97797
3 mm	3 mm	12 mm	—	38 mm	.25 mm	97798
4 mm	4 mm	12 mm	—	51 mm	—	97799
4 mm	4 mm	12 mm	—	51 mm	.25 mm	97800
6 mm	6 mm	20 mm	26 mm	63 mm	—	97801
6 mm	6 mm	20 mm	26 mm	63 mm	.50 mm	97802
6 mm	6 mm	20 mm	—	100 mm	.50 mm	97803
8 mm	8 mm	20 mm	26 mm	63 mm	—	97804
8 mm	8 mm	20 mm	26 mm	63 mm	.50 mm	97805
8 mm	8 mm	20 mm	26 mm	63 mm	1 mm	97806
8 mm	8 mm	20 mm	—	100 mm	.50 mm	97807
10 mm	10 mm	24 mm	30 mm	70 mm	—	97808
10 mm	10 mm	24 mm	30 mm	70 mm	.50 mm	97809
10 mm	10 mm	24 mm	30 mm	70 mm	1 mm	97810
10 mm	10 mm	24 mm	—	100 mm	.50 mm	97811
12 mm	12 mm	25 mm	31 mm	76 mm	—	97812
12 mm	12 mm	25 mm	31 mm	76 mm	.50 mm	97813
12 mm	12 mm	25 mm	31 mm	76 mm	1 mm	97814
12 mm	12 mm	25 mm	31 mm	76 mm	2 mm	97815
12 mm	12 mm	25 mm	—	100 mm	.50 mm	97816
14 mm	14 mm	32 mm	38 mm	89 mm	—	97817
14 mm	14 mm	32 mm	38 mm	89 mm	.50 mm	97818
14 mm	14 mm	32 mm	38 mm	89 mm	1 mm	97819
16 mm	16 mm	32 mm	38 mm	89 mm	—	97820
16 mm	16 mm	32 mm	38 mm	89 mm	.50 mm	97821
16 mm	16 mm	32 mm	38 mm	89 mm	1 mm	97822
16 mm	16 mm	32 mm	38 mm	89 mm	2 mm	97823
16 mm	16 mm	32 mm	—	100 mm	.50 mm	97824
18 mm	18 mm	36 mm	42 mm	100 mm	—	97825
18 mm	18 mm	36 mm	42 mm	100 mm	.50 mm	97826
18 mm	18 mm	36 mm	42 mm	100 mm	1 mm	97827
20 mm	20 mm	36 mm	42 mm	100 mm	—	97828
20 mm	20 mm	36 mm	42 mm	100 mm	.50 mm	97829
20 mm	20 mm	36 mm	42 mm	100 mm	1 mm	97830
20 mm	20 mm	36 mm	42 mm	100 mm	2 mm	97831
20 mm	20 mm	36 mm	42 mm	100 mm	3 mm	97832
25 mm	25 mm	36 mm	42 mm	100 mm	—	97833
25 mm	25 mm	36 mm	42 mm	100 mm	.50 mm	97834
25 mm	25 mm	36 mm	42 mm	100 mm	1 mm	97835
25 mm	25 mm	36 mm	42 mm	100 mm	3 mm	97836

variFLUTE®
9-Flute Variable Flute
HPE Ultra-High Performance
Solid Carbide Single End Mills

List No. 5999 9-Flute nACo Coated

Center Cutting - 45° Helix Angle
10% Cobalt Micrograin Carbide

TOLERANCES
Diameter +.000/-.002
Shank Dia. h6 Tolerance

nACo Coated

nACo - Aluminum Titanium Nitride + Silicon Nitride coating for high heat and wear resistance.

Variable Flute reduces chatter and harmonics for increased feed rates, improved finish and minimal tool deflection.

9-Flute mills are recommended for fine finishing profiling cuts in steels, stainless steels, high temp alloys, titanium alloys and cast irons up to 52Rc hardness.

Corner Radius to minimize chipping and reduce corner wear.

Total Reach combines the flute length with a necked shank to provide clearance for milling in deeper cavities.

List No. 5999 9-Flute Inch Sizes

Speeds & Feeds: Page 41

DIA.	SHANK DIA.	LOC	TOTAL REACH	OAL	CORNER RADIUS	EDP NO.
3/16	3/16	9/32	—	1-1/2	—	97840
3/16	3/16	9/32	—	1-1/2	.010	97841
3/16	3/16	9/16	—	2	—	97842
3/16	3/16	9/16	—	2	.010	97843
1/4	1/4	3/8	—	2	—	97844
1/4	1/4	3/8	—	2	.015	97845
1/4	1/4	3/8	2-1/8	4	.015	97846
1/4	1/4	3/8	—	4	.015	97847
1/4	1/4	3/4	1	2-1/2	—	97848
1/4	1/4	3/4	1	2-1/2	.015	97849
3/8	3/8	1/2	—	2	—	97850
3/8	3/8	1/2	—	2	.015	97851
3/8	3/8	1/2	1-1/8	3	.015	97852
3/8	3/8	1/2	2-1/8	4	.015	97853
3/8	3/8	1	—	2-1/2	—	97854
3/8	3/8	1	—	2-1/2	.015	97855
1/2	1/2	5/8	—	2-1/2	—	97856
1/2	1/2	5/8	—	2-1/2	.015	97857
1/2	1/2	5/8	1-1/2	4	.015	97858
1/2	1/2	5/8	2-1/4	4	.015	97859
1/2	1/2	1	1-1/4	3	—	97860
1/2	1/2	1	1-1/4	3	.015	97861
1/2	1/2	1	1-1/4	3	.030	97862
1/2	1/2	1-1/4	—	3	—	97863
1/2	1/2	1-1/4	—	3	.015	97864
1/2	1/2	1-1/4	—	3	.030	97865
5/8	5/8	3/4	—	3	—	97866
5/8	5/8	3/4	—	3	.030	97867
5/8	5/8	3/4	1-5/8	5	.030	97868
5/8	5/8	1-1/4	1-1/2	3-1/2	—	97869
5/8	5/8	1-1/4	1-1/2	3-1/2	.030	97870
3/4	3/4	7/8	—	3	—	97871
3/4	3/4	7/8	—	3	.030	97872
3/4	3/4	7/8	2	5	.030	97873
3/4	3/4	1-1/2	1-3/4	4	—	97874
3/4	3/4	1-1/2	1-3/4	4	.030	97875
1	1	1-1/2	1-3/4	4	—	97876
1	1	1-1/2	1-3/4	4	.030	97877

Shank Diameter Tolerance: h6 for Shrink Fit Holders

variFLUTE® Metric 9-Flute Variable Flute HPE Ultra-High Performance Solid Carbide Single End Mills

List No. 5999M 9-Flute nACo Coated

Center Cutting - 45° Helix Angle
10% Cobalt Micrograin Carbide

TOLERANCES
Diameter +.000/-.050 mm
Shank Dia. h6 Tolerance

nACo Coated

nACo - Aluminum Titanium Nitride + Silicon Nitride coating for high heat and wear resistance.

Variable Flute reduces chatter and harmonics for increased feed rates, improved finish and minimal tool deflection.

9-Flute mills are recommended for fine finishing profiling cuts in steels, stainless steels, high temp alloys, titanium alloys and cast irons up to 52Rc hardness.

Corner Radius to minimize chipping and reduce corner wear.

Total Reach combines the flute length with a necked shank to provide clearance for milling in deeper cavities.

List No. 5999M 9-Flute Metric Sizes

Speeds & Feeds: Page 41

DIA.	SHANK DIA.	LOC	TOTAL REACH	OAL	CORNER RADIUS	EDP NO.
4 mm	4 mm	12 mm	—	51 mm	—	97880
4 mm	4 mm	12 mm	—	51 mm	.25 mm	97881
6 mm	6 mm	20 mm	26 mm	63 mm	—	97882
6 mm	6 mm	20 mm	26 mm	63 mm	.50 mm	97883
6 mm	6 mm	20 mm	—	100 mm	.50 mm	97884
8 mm	8 mm	20 mm	26 mm	63 mm	—	97885
8 mm	8 mm	20 mm	26 mm	63 mm	.50 mm	97886
8 mm	8 mm	20 mm	26 mm	63 mm	1 mm	97887
8 mm	8 mm	20 mm	—	100 mm	.50 mm	97888
10 mm	10 mm	24 mm	30 mm	70 mm	—	97889
10 mm	10 mm	24 mm	30 mm	70 mm	.50 mm	97890
10 mm	10 mm	24 mm	30 mm	70 mm	1 mm	97891
10 mm	10 mm	24 mm	—	100 mm	.50 mm	97892
12 mm	12 mm	25 mm	31 mm	76 mm	—	97893
12 mm	12 mm	25 mm	31 mm	76 mm	.50 mm	97894
12 mm	12 mm	25 mm	31 mm	76 mm	1 mm	97895
12 mm	12 mm	25 mm	31 mm	76 mm	2 mm	97896
12 mm	12 mm	25 mm	—	100 mm	.50 mm	97897
14 mm	14 mm	32 mm	38 mm	89 mm	—	97898
14 mm	14 mm	32 mm	38 mm	89 mm	.50 mm	97899
14 mm	14 mm	32 mm	38 mm	89 mm	1 mm	97900
16 mm	16 mm	32 mm	38 mm	89 mm	—	97901
16 mm	16 mm	32 mm	38 mm	89 mm	.50 mm	97902
16 mm	16 mm	32 mm	38 mm	89 mm	1 mm	97903
16 mm	16 mm	32 mm	38 mm	89 mm	2 mm	97904
16 mm	16 mm	32 mm	—	100 mm	.50 mm	97905
18 mm	18 mm	36 mm	42 mm	100 mm	—	97906
18 mm	18 mm	36 mm	42 mm	100 mm	.50 mm	97907
18 mm	18 mm	36 mm	42 mm	100 mm	1 mm	97908
20 mm	20 mm	36 mm	42 mm	100 mm	—	97909
20 mm	20 mm	36 mm	42 mm	100 mm	.50 mm	97910
20 mm	20 mm	36 mm	42 mm	100 mm	1 mm	97911
20 mm	20 mm	36 mm	42 mm	100 mm	2 mm	97912
20 mm	20 mm	36 mm	42 mm	100 mm	3 mm	97913
25 mm	25 mm	36 mm	42 mm	100 mm	—	97914
25 mm	25 mm	36 mm	42 mm	100 mm	.50 mm	97915
25 mm	25 mm	36 mm	42 mm	100 mm	1 mm	97916
25 mm	25 mm	36 mm	42 mm	100 mm	3 mm	97917

7-Flute variFLUTE®
Speed and Feed Recommendations

	WORKPIECE MATERIAL	TYPE OF CUT	AXIAL DOC	RADIAL DOC	SURFACE SPEED (SFM)	FEED PER TOOTH BY END MILL DIAMETER							
						1/8" 3 MM	3/16" 4.5 MM	1/4" 6 MM	3/8" 10 MM	1/2" 12 MM	5/8" 16 MM	3/4" 20 MM	1" 25 MM
Steels – ISO P	**Low Alloy Steels** 10XX, 11XX, 13XX	High Speed Profiling	Full LOC	< .1 D	525	.0014	.0023	.0028	.0041	.0055	.0069	.0083	.0111
		Profiling	Full LOC	< .08 D	400	.0016	.0024	.0032	.0057	.0063	.0079	.0095	.0127
	Medium Alloy Steels 200, 250, 300	High Speed Profiling	Full LOC	< .1 D	425	.0013	.0019	.0025	.0038	.0050	.0063	.0076	.0101
		Profiling	Full LOC	< .08 D	375	.0014	.0023	.0029	.0043	.0058	.0072	.0086	.0116
	High Alloy Steels Mold & Die A2, P20, 01, 02, D2, H13	High Speed Profiling	Full LOC	< .1 D	475	.0011	.0016	.0022	.0032	.0042	.0053	.0064	.0086
		Profiling	Full LOC	< .08 D	350	.0013	.0018	.0024	.0037	.0049	.0061	.0073	.0098
	High Strength Steels 4140, 4340, 52100	High Speed Profiling	Full LOC	< .1 D	500	.0013	.0019	.0025	.0038	.0050	.0063	.0076	.0101
		Profiling	Full LOC	< .08 D	375	.0014	.0023	.0029	.0043	.0058	.0072	.0086	.0116
Stainless Steels – ISO M	**Martensitic Stainless Steels** 403, 410, 416	High Speed Profiling	Full LOC	< .1 D	500	.0013	.0019	.0025	.0038	.0050	.0063	.0076	.0101
		Profiling	Full LOC	< .08 D	375	.0014	.0022	.0029	.0043	.0058	.0072	.0086	.0116
	Austenitic Stainless Steels 302, 303, 304L, 316L	High Speed Profiling	Full LOC	< .1 D	475	.0014	.0019	.0028	.0042	.0057	.0070	.0085	.0113
		Profiling	Full LOC	< .08 D	325	.0014	.0020	.0027	.0041	.0054	.0068	.0081	.0109
	Precipitation Hardened Stainless Steels 13-8, 15-5, 17-4PH	High Speed Profiling	Full LOC	< .1 D	450	.0012	.0017	.0023	.0035	.0047	.0059	.0070	.0094
		Profiling	Full LOC	< .08 D	325	.0012	.0016	.0023	.0034	.0045	.0057	.0068	.0091
High Temp Alloys – ISO S	**Iron Base High Temp Alloys** Incoloy 800-802, Multimet N155	High Speed Profiling	Full LOC	< .1 D	155	.0004	.0005	.0008	.0013	.0017	.0021	.0025	.0033
		Profiling	Full LOC	< .08 D	130	.0004	.0006	.0009	.0014	.0019	.0023	.0028	.0038
	Nickel Base High Temp Alloys Inconel 600, 625, 718, Nickel 200, Monel 400, 405, K-Monel, Incoloy 600	High Speed Profiling	Full LOC	< .1 D	160	.0004	.0005	.0007	.0010	.0017	.0016	.0026	.0026
		Profiling	Full LOC	< .08 D	145	.0004	.0005	.0007	.0011	.0018	.0018	.0022	.0022
	Cobalt Base High Temp Alloys Stellite, Haynes 25, 188, X40	High Speed Profiling	Full LOC	< .1 D	175	.0003	.0004	.0005	.0008	.0011	.0014	.0016	.0022
		Profiling	Full LOC	< .08 D	150	.0003	.0005	.0007	.0007	.0013	.0016	.0020	.0026
	Titanium Alloys 6AL-4V, ASTM 1, 2, 3, 6AL-2S	High Speed Profiling	Full LOC	< .1 D	425	.0011	.0016	.0022	.0032	.0043	.0054	.0065	.0086
		Profiling	Full LOC	< .08 D	300	.0011	.0016	.0021	.0032	.0041	.0052	.0062	.0083
Cast Irons – ISO K	**Cast Iron** Gray	High Speed Profiling	Full LOC	< .1 D	500	.0012	.0018	.0023	.0035	.0048	.0059	.0071	.0095
		Profiling	Full LOC	< .08 D	375	.0014	.0022	.0027	.0041	.0054	.0068	.0081	.0109
	Cast Iron Ductile	High Speed Profiling	Full LOC	< .1 D	475	.0010	.0014	.0020	.0030	.0040	.0050	.0059	.0079
		Profiling	Full LOC	< .08 D	350	.0012	.0015	.0023	.0034	.0045	.0057	.0068	.0091

Speeds and Feeds are suggested starting points and may be increased or decreased depending on actual material and machining conditions.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

9-Flute variFLUTE®
Speed and Feed Recommendations

	WORKPIECE MATERIAL	TYPE OF CUT	AXIAL DOC	RADIAL DOC	SURFACE SPEED (SFM)	3/16" 4.5 MM	1/4" 6 MM	3/8" 10 MM	1/2" 12 MM	5/8" 16 MM	3/4" 20 MM	1" 25 MM
Steels – ISO P	**Low Alloy Steels** 10XX, 11XX, 13XX	High Speed Profiling	Full LOC	< .025 D	525	.0023	.0028	.0041	.0055	.0069	.0083	.0111
		Profiling	Full LOC	< .015 D	400	.0024	.0032	.0057	.0063	.0079	.0095	.0127
	Medium Alloy Steels 200, 250, 300	High Speed Profiling	Full LOC	< .025 D	425	.0019	.0025	.0038	.0050	.0063	.0076	.0101
		Profiling	Full LOC	< .015 D	375	.0023	.0029	.0043	.0058	.0072	.0086	.0116
	High Alloy Steels Mold & Die A2, P20, 01, 02, D2, H13	High Speed Profiling	1 x D	< .025 D	475	.0016	.0022	.0032	.0042	.0053	.0064	.0086
		Profiling	Full LOC	< .015 D	350	.0018	.0024	.0037	.0049	.0061	.0073	.0098
	High Strength Steels 4140, 4340, 52100	High Speed Profiling	1 x D	< .025 D	500	.0019	.0025	.0038	.0050	.0063	.0076	.0101
		Profiling	Full LOC	< .015 D	375	.0023	.0029	.0043	.0058	.0072	.0086	.0116
Stainless Steels – ISO M	**Martensitic Stainless Steels** 403, 410, 416	High Speed Profiling	1.5 x D	< .025 D	500	.0019	.0025	.0038	.0050	.0063	.0076	.0101
		Profiling	Full LOC	< .015 D	375	.0022	.0029	.0043	.0058	.0072	.0086	.0116
	Austenitic Stainless Steels 302, 303, 304L, 316L	High Speed Profiling	1.5 x D	< .025 D	475	.0019	.0028	.0042	.0057	.0070	.0085	.0113
		Profiling	Full LOC	< .015 D	350	.0020	.0027	.0041	.0054	.0068	.0081	.0109
	Precipitation Hardened Stainless Steels 13-8, 15-5, 17-4PH	High Speed Profiling	1.5 x D	< .025 D	450	.0017	.0023	.0035	.0047	.0059	.0070	.0094
		Profiling	Full LOC	< .015 D	325	.0016	.0023	.0034	.0045	.0057	.0068	.0091
High Temp Alloys – ISO S	**Iron Base High Temp Alloys** Incoloy 800-802, Multimet N155	High Speed Profiling	.5 x D	< .02 D	155	.0005	.0008	.0013	.0017	.0021	.0025	.0033
		Profiling	Full LOC	< .01 D	130	.0006	.0009	.0014	.0019	.0023	.0028	.0038
	Nickel Base High Temp Alloys Inconel 600, 625, 718, Nickel 200, Monel 400, 405, K-Monel, Incoloy 600	High Speed Profiling	.5 x D	< .02 D	160	.0005	.0007	.0010	.0017	.0016	.0026	.0026
		Profiling	Full LOC	< .01 D	145	.0005	.0007	.0011	.0018	.0018	.0022	.0022
	Cobalt Base High Temp Alloys Stellite, Haynes 25, 188, X40	High Speed Profiling	.5 x D	< .02 D	175	.0004	.0005	.0008	.0011	.0014	.0016	.0022
		Profiling	Full LOC	< .01 D	150	.0005	.0007	.0007	.0013	.0016	.0020	.0026
	Titanium Alloys 6AL-4V, ASTM 1, 2, 3, 6AL-2S	High Speed Profiling	1.5 x D	< .025 D	425	.0016	.0022	.0032	.0043	.0054	.0065	.0086
		Profiling	Full LOC	< .015 D	300	.0016	.0021	.0032	.0041	.0052	.0062	.0083
Cast Irons – ISO K	**Cast Iron** Gray	High Speed Profiling	Full LOC	< .025 D	500	.0018	.0023	.0035	.0048	.0059	.0071	.0095
		Profiling	Full LOC	< .015 D	375	.0022	.0027	.0041	.0054	.0068	.0081	.0109
	Cast Iron Ductile	High Speed Profiling	Full LOC	< .025 D	475	.0014	.0020	.0030	.0040	.0050	.0059	.0079
		Profiling	Full LOC	< .015 D	350	.0015	.0023	.0034	.0045	.0057	.0068	.0091

Speeds and Feeds are suggested starting points and may be increased or decreased depending on actual material and machining conditions.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

variFLUTE® NF
Solid Carbide Variable Flute HPE Ultra-High Performance Single End Mills For Aluminum and Non-Ferrous Materials

Center Cutting – 45° Helix Angle
Premium Micrograin Carbide
10% Cobalt Content

High Performance Milling in Aluminum and Non-Ferrous Materials, Copper Alloys, Bronze/Brass

The Variable Flute Design reduces chatter and improves tool life. The high shear flute designed for rapid chip removal combined with an ultra high polish enable extremely high cutting rates and long tool life.

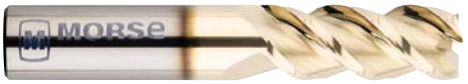
ZrN - Zirconium Nitride coating is a pale gold hard thin high-lubricity coating particularly well suited to machining non-ferrous materials including aluminum, copper alloys and brass.

DLC, CrN, and other high performance coatings also available.

TOLERANCES:
Diameter -.0001 / -.0003
Shank Dia. h6 Tolerance

List No. 5990 & 5990Z 2-Flute — Standard Corner Radius

List No. 5991 & 5991Z 2-Flute — Square End



List No. 5992 & 5992Z 3-Flute — Standard Corner Radius

List No. 5993 & 5993Z 2-Flute — Ball End

2-Flute mills have greater chip capacity and are recommended for slotting and roughing operations.

3-Flute mills offer greater feed rates than two flute mills while still offering high chip capacity, recommended for profile applications.

Corner Radius strengthens the endmill and improves wear characteristics. Small .003- .007 radius enables use in most applications.

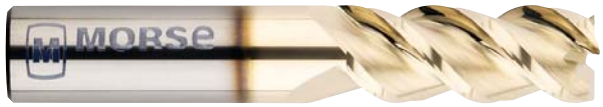
List No. 5990 & 5990Z 2-Flute Standard Corner Radius

Dia.	Shank Dia.	Length Of Cut	OAL	Corner Radius	List No. 5990 Bright Finish EDP NO.	List No. 5990Z ZrN Coated EDP NO.
			STANDARD LENGTH			
1/4	1/4	3/4	2-1/2	.003 - .005	52900	92600
5/16	5/16	3/4	2-1/2	.003 - .005	52901	92601
3/8	3/8	1	2-1/2	.003 - .005	52902	92602
1/2	1/2	1-1/4	3	.005 - .007	52903	92603
5/8	5/8	1-5/8	3-1/2	.005 - .007	52904	92604
3/4	3/4	1-3/4	4	.005 - .007	52905	92605
1	1	1-3/4	4	.005 - .007	52906	92606
			LONG LENGTH			
1/4	1/4	1-1/4	3	.003 - .005	52910	92610
5/16	5/16	1-3/8	3	.003 - .005	52911	92611
3/8	3/8	1-1/2	3-1/2	.003 - .005	52912	92612
1/2	1/2	2	4	.005 - .007	52913	92613
5/8	5/8	2-3/8	5	.005 - .007	52914	92614
3/4	3/4	2-1/2	5	.005 - .007	52915	92615
1	1	3	6	.005 - .007	52916	92616

Shank Diameter Tolerance: h6 for Shrink Fit Holders

variFLUTE® NF
Solid Carbide Ultra-High Performance End Mills for Aluminum and Non Ferrous Materials

Shank Diameter Tolerance: h6



Corner Radius strengthens the end mill and improves wear characteristics. Small .003- .007 radius enables use in most applications.

ZrN - Zirconium Nitride coating is a pale gold hard thin high-lubricity coating particularly well suited to machining non-ferrous materials including aluminum, copper alloys and brass.

DLC, CrN, and other high performance coatings also available.

List No. 5992 & 5992Z 3-Flute Standard Corner Radius

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	CORNER RADIUS	LIST NO. 5992 BRIGHT FINISH EDP NO.	LIST NO. 5992Z ZrN COATED EDP NO.
			STANDARD LENGTH			
1/4	1/4	3/4	2-1/2	.003 - .005	52930	92630
5/16	5/16	3/4	2-1/2	.003 - .005	52931	92631
3/8	3/8	1	2-1/2	.003 - .005	52932	92632
1/2	1/2	1-1/4	3	.005 - .007	52933	92633
5/8	5/8	1-5/8	3-1/2	.005 - .007	52934	92634
3/4	3/4	1-3/4	4	.005 - .007	52935	92635
1	1	1-3/4	4	.005 - .007	52936	92636
			LONG LENGTH			
1/4	1/4	1-1/4	3	.003 - .005	52940	92940
5/16	5/16	1-3/8	3	.003 - .005	52941	92941
3/8	3/8	1-1/2	3-1/2	.003 - .005	52942	92942
1/2	1/2	2	4	.005 - .007	52943	92943
5/8	5/8	2-3/8	5	.005 - .007	52944	92944
3/4	3/4	2-1/2	5	.005 - .007	52945	92945
1	1	3	6	.005 - .007	52946	92946

Speeds & Feeds: Page 44

Square End for milling and finishing where a sharp corner is required

ZrN - Zirconium Nitride coating is a pale gold hard thin high-lubricity coating particularly well suited to machining non-ferrous materials including aluminum, copper alloys and brass.

DLC, CrN, and other high performance coatings also available.

List No. 5991 & 5991Z 2-Flute Square End

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	LIST NO. 5991 BRIGHT FINISH EDP NO.	LIST NO. 5991Z ZRN COATED EDP NO.
			STANDARD LENGTH		
1/4	1/4	3/4	2-1/2	52920	92920
5/16	5/16	3/4	2-1/2	52921	92921
3/8	3/8	1	2-1/2	52922	92922
1/2	1/2	1-1/4	3	52923	92923
5/8	5/8	1-5/8	3-1/2	52924	92924
3/4	3/4	1-3/4	4	52925	92925
1	1	1-3/4	4	52926	92926

variFLUTE® NF
Solid Carbide Ultra-High Performance End Mills for Aluminum and Non Ferrous Materials

Shank Diameter Tolerance: h6 for Shrink Fit Holders

Ball End for use in contour milling, radius bottom slots, fillets, and cavity milling.

ZrN - Zirconium Nitride coating is a pale gold hard thin high-lubricity coating particularly well suited to machining non-ferrous materials including aluminum, copper alloys and brass.

DLC, CrN, and other high performance coatings also available.

List No. 5993 & 5993Z 2-Flute Ball End

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	LIST NO. 5993 BRIGHT FINISH EDP NO.	LIST NO. 5993Z ZrN COATED EDP NO.
		STANDARD LENGTH			
1/4	1/4	3/4	2-1/2	52950	92650
5/16	5/16	3/4	2-1/2	52951	92651
3/8	3/8	1	2-1/2	52952	92652
1/2	1/2	1-1/4	3	52953	92653
5/8	5/8	1-5/8	3-1/2	52954	92654
3/4	3/4	1-3/4	4	52955	92655
1	1	1-3/4	4	52956	92656

variFLUTE® NF SPEEDS & FEEDS

MATERIAL	CUTTING SPEED SFM M/MIN	CHIP LOAD PER TOOTH IN / MM						
		1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
Aluminum	1600" - 2000" 490mm - 610mm	0.003" 0.08mm	0.004" 0.10mm	0.005" 0.13mm	0.006" 0.15mm	0.007" 0.18mm	0.008" 0.20mm	0.010" 0.25mm
Copper Alloys	800" - 1200" 240mm - 365mm	0.003" 0.08mm	0.004" 0.10mm	0.005" 0.13mm	0.006" 0.15mm	0.007" 0.18mm	0.008" 0.20mm	0.010" 0.25mm
Brass/Bronze	800" - 1500" 240mm - 460mm	0.003" 0.08mm	0.004" 0.10mm	0.005" 0.13mm	0.006" 0.15mm	0.007" 0.18mm	0.008" 0.20mm	0.010" 0.25mm
Plastics	1200" - 1600" 365mm - 490mm	0.006" 0.16mm	0.008" 0.20mm	0.010" 0.26mm	0.012" 0.30mm	0.014" 0.36mm	0.016" 0.40mm	0.020" 0.50mm

Morse variFLUTE NF mills are capable of very high removal rates.
- Proper coolant under sufficient volume and pressure is important for optimal performance.
- High quality balanced tool holding is recommended.
- Increase chip load based on available machine capability.

RECOMMENDED MAXIMUM DEPTHS OF CUT	PROFILING Radial Depth = .5XD Axial Depth = 1.5XD	SLOTTING Axial Depth = 1XD

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

SPEEDS and FEEDS are suggested starting points and may be increased or decreased depending on actual material and machining conditions.

VP2-End Mill
High Performance Variable Flute veri4 Coated Solid Carbide Single End Mills

Center Cutting – Honed Cutting Edge
10% Cobalt Submicron Carbide
veri4 – Aluminum Chromium Titanium Nitride Coating

List No. 5980 4-Flute – Square End

VP2-End Mill excels at **High Performance Milling** in a **Wide Range of Materials.**

Honed Cutting Edge for enhanced edge strength and tool life.

veri4 Coating for maximum toughness, wear resistance and lubricity.

Honed Cutting Edge

Shank Diameter Tolerance: h6

List No. 5980 - 4-Flute - Square End

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	EDP NO.
		STUB LENGTH		
1/8	1/8	1/4	1-1/2	95820
3/16	3/16	3/8	2	95821
1/4	1/4	7/16	2	95822
5/16	5/16	1/2	2	95823
3/8	3/8	5/8	2	95824
1/2	1/2	5/8	2-1/2	95825
5/8	5/8	3/4	3	95826
3/4	3/4	1	3	95827
		REGULAR LENGTH		
1/8	1/8	1/2	1-1/2	95830
3/16	3/16	5/8	2	95831
1/4	1/4	3/4	2-1/2	95832
5/16	5/16	13/16	2-1/2	95833
3/8	3/8	1	2-1/2	95834
7/16	7/16	1	2-3/4	95835
1/2	1/2	1	3	95836
1/2	1/2	1-1/4	3	95837
5/8	5/8	1-1/4	3-1/2	95838
3/4	3/4	1-1/2	4	95839
1	1	1-1/2	4	95840
		LONG LENGTH		
1/8	1/8	3/4	2-1/4	95845
3/16	3/16	3/4	2-1/2	95846
1/4	1/4	1-1/8	3	95847
5/16	5/16	1-1/8	3	95848
3/8	3/8	1-1/8	3	95849
7/16	7/16	2	4	95850
1/2	1/2	1-1/2	4	95851
1/2	1/2	2	4	95852
5/8	5/8	2-1/4	5	95853
3/4	3/4	2-1/4	5	95854
1	1	2-1/4	5	95855
		EXTRA LONG LENGTH		
1/8	1/8	1	3	95860
3/16	3/16	1-1/8	3	95861
1/4	1/4	1-1/2	4	95862
5/16	5/16	1-5/8	4	95863
3/8	3/8	1-3/4	4	95864
7/16	7/16	3	6	95865
1/2	1/2	3	6	95866
5/8	5/8	3	6	95867
3/4	3/4	3	6	95868
3/4	3/4	4	7	95869
1	1	3	6	95870
1	1	4	7	95871

Tolerances and Speeds & Feeds: Pages 46-48

VP2-End Mill
High Performance Variable Flute veri4 Coated Solid Carbide Single End Mills

Center Cutting – Honed Cutting Edge
10% Cobalt Submicron Carbide
veri4 – Aluminum Chromium Titanium Nitride Coating

Corner Radius

List No. 5981 4-Flute – Corner Radius

VP2-End Mill excels at **HIgh Performance Milling** in a **Wide Range of Materials.**

Honed Cutting Edge for enhanced edge strength and tool life.

Corner Radius strengthens the end mill to minimize chipping and reduce corner wear. Also used when the finished part requires a radius.

veri4 Coating for maximum toughness, wear resistance and lubricity.

Honed Cutting Edge

List No. 5981 - 4-Flute - Corner Radius

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	CORNER RADIUS	EDP NO.
		STUB LENGTH			
1/8	1/8	1/4	1-1/2	.010	95880
3/16	3/16	3/8	2	.010	95881
1/4	1/4	7/16	2	.015	95882
5/16	5/16	1/2	2	.015	95883
3/8	3/8	5/8	2	.015	95884
1/2	1/2	5/8	2-1/2	.030	95885
5/8	5/8	3/4	3	.030	95886
3/4	3/4	1	3	.030	95887
		REGULAR LENGTH			
1/8	1/8	1/2	1-1/2	.010	95900
1/8	1/8	1/2	1-1/2	.030	95901
3/16	3/16	5/8	2	.010	95902
3/16	3/16	5/8	2	.030	95903
1/4	1/4	3/4	2-1/2	.015	95904
1/4	1/4	3/4	2-1/2	.030	95905
1/4	1/4	3/4	2-1/2	.060	95906
5/16	5/16	13/16	2-1/2	.015	95907
5/16	5/16	13/16	2-1/2	.030	95908
5/16	5/16	13/16	2-1/2	.060	95909
3/8	3/8	1	2-1/2	.015	95910
3/8	3/8	1	2-1/2	.030	95911
3/8	3/8	1	2-1/2	.060	95912
7/16	7/16	1	2-3/4	.030	95913
7/16	7/16	1	2-3/4	.060	95914
1/2	1/2	1	3	.030	95915
1/2	1/2	1	3	.060	95916
1/2	1/2	1	3	.090	95917
1/2	1/2	1	3	.125	95918
5/8	5/8	1-1/4	3-1/2	.030	95919
5/8	5/8	1-1/4	3-1/2	.060	95920
3/4	3/4	1-1/2	4	.030	95921
3/4	3/4	1-1/2	4	.060	95922
3/4	3/4	1-1/2	4	.090	95923
1	1	1-1/2	4	.030	95924
1	1	1-1/2	4	.060	95925
1	1	1-1/2	4	.090	95926
1	1	1-1/2	4	.125	95927

Shank Diameter Tolerance: h6 for Shrink Fit Holders

(continued)

VP2-End Mill
High Performance Variable Flute veri4 Coated Solid Carbide Single End Mills

Center Cutting – Honed Cutting Edge
10% Cobalt Submicron Carbide
veri4 – Aluminum Chromium Titanium Nitride Coating

Corner Radius

List No. 5981 4-Flute – Corner Radius

VP2-End Mill excels at **HIgh Performance Milling** in a **Wide Range of Materials.**

Honed Cutting Edge for enhanced edge strength and tool life.

Corner Radius strengthens the end mill to minimize chipping and reduce corner wear. Also used when the finished part requires a radius.

veri4 Coating for maximum toughness, wear resistance and lubricity.

Honed Cutting Edge

List No. 5981 - 4-Flute - Corner Radius (continued)

DIA.	SHANK DIA.	LENGTH OF CUT	OAL	CORNER RADIUS	EDP NO.
		LONG LENGTH			
1/8	1/8	3/4	2 1/4	.015	95945
3/16	3/16	3/4	2 1/2	.015	95946
1/4	1/4	1-1/8	3	.015	95947
1/4	1/4	1-1/8	3	.030	95948
5/16	5/16	1-1/8	3	.015	95949
5/16	5/16	1-1/8	3	.030	95950
3/8	3/8	1-1/8	3	.015	95951
3/8	3/8	1-1/8	3	.030	95952
3/8	3/8	1-1/8	3	.060	95953
1/2	1/2	1-1/2	4	.030	95954
1/2	1/2	1-1/2	4	.060	95955
1/2	1/2	2	4	.030	95956
1/2	1/2	2	4	.060	95957
5/8	5/8	2-1/4	5	.030	95958
5/8	5/8	2-1/4	5	.060	95959
3/4	3/4	2-1/4	5	.030	95960
3/4	3/4	2-1/4	5	.060	95961
1	1	2-1/4	5	.030	95962
1	1	2-1/4	5	.060	95963
		EXTRA LONG LENGTH			
1/8	1/8	1	3	.015	95975
3/16	3/16	1-1/8	3	.015	95976
1/4	1/4	1-1/2	4	.015	95977
1/4	1/4	1-1/2	4	.030	95978
5/16	5/16	1-5/8	4	.015	95979
5/16	5/16	1-5/8	4	.030	95980
3/8	3/8	1-3/4	4	.015	95981
3/8	3/8	1-3/4	4	.030	95982
1/2	1/2	3	6	.030	95983
1/2	1/2	3	6	.060	95984
5/8	5/8	3	6	.030	95985
5/8	5/8	3	6	.060	95986
3/4	3/4	3	6	.030	95987
3/4	3/4	3	6	.060	95988
3/4	3/4	4	7	.030	95989
3/4	3/4	4	7	.060	95990
1	1	3	6	.030	95991
1	1	4	7	.030	95992
1	1	4	7	.060	95993

Shank Diameter Tolerance: h6

Speeds & Feeds: Page 48

VP2-End Mill

Speed and Feed Recommendations

	WORKPIECE MATERIAL	HARDNESS	TYPE OF CUT	SURFACE SPEED (SFM)	FEED PER TOOTH BY END MILL DIAMETER				
					1/8"	1/4"	1/2"	3/4"	1"
ISO P	**Plain Steels - Low and Medium Carbon** 1018, 12L12, 1108, 1213	175 BRN	Profile	600	0.0004	0.0015	0.0034	0.0043	0.0047
		-	Slot	480	0.0003	0.0011	0.0027	0.0034	0.0038
	Plain Steels - Low and Medium Carbon 1018, 12L12, 1108, 1213	275 BRN	Profile	480	0.0004	0.0015	0.0034	0.0043	0.0047
		28 HRc	Slot	385	0.0003	0.0011	0.0027	0.0034	0.0038
	Alloy Steels - Medium Carbon 4140, 4150, 4340	275 BRN	Profile	480	0.0003	0.0011	0.0028	0.0039	0.0045
		28 HRc	Slot	385	0.0002	0.0009	0.0022	0.0031	0.0036
	Alloy Steels - Medium Carbon 4140, 4150, 4340	375 BRN	Profile	360	0.0003	0.0011	0.0028	0.0039	0.0045
		41 HRC	Slot	290	0.0002	0.0009	0.0022	0.0031	0.0036
	Mold & Die Steels O1, A2, D2, H13, P20	275 BRN	Profile	215	0.0002	0.0011	0.0028	0.0039	0.0045
		28 HRc	Slot	175	0.0002	0.0009	0.0022	0.0031	0.0036
ISO M	**300 Series Stainless Steels** 304,316, 416, 440F	275 BRN	Profile	345	0.0003	0.0011	0.0028	0.0039	0.0047
		28 HRc	Slot	275	0.0002	0.0009	0.0022	0.0031	0.0038
	400 Series Stainless Steels 430, 436	325 BRN	Profile	290	0.0003	0.0011	0.0028	0.0039	0.0047
		35 HRc	Slot	230	0.0002	0.0009	0.0022	0.0031	0.0038
	Precipitation Hardened Stainless Steels 17-4PH, 15-4PH	325 BRN	Profile	290	0.0002	0.0011	0.0025	0.0034	0.0045
		35 HRc	Slot	230	0.0002	0.0009	0.0020	0.0027	0.0036
ISO K	**Cast Iron** Gray	200 BRN	Profile	580	0.0004	0.0013	0.0034	0.0043	0.0047
		-	Slot	460	0.0003	0.0011	0.0027	0.0034	0.0038
	Cast Iron Ductile	300 BRN	Profile	265	0.0003	0.0011	0.0034	0.0037	0.0047
		32 HRc	Slot	210	0.0002	0.0009	0.0027	0.0029	0.0038
ISO S	**Titanium Alloys** Ti-6Al-4V, ASTM B367 Grades C-3, C-4	300 BRN	Profile	300	0.0003	0.0011	0.0028	0.0030	0.0039
		32 HRc	Slot	240	0.0002	0.0009	0.0022	0.0025	0.0031
	High Temperature Alloys Inconel, Hastelloy, Waspaloy	300 BRN	Profile	75	0.0002	0.0008	0.0022	0.0028	0.0036
		32 HRc	Slot	60	0.0002	0.0007	0.0018	0.0022	0.0029

Speeds and Feeds are suggested starting points and may be increased or decreased depending on actual material and machining conditions.

In general, use lower speeds and feeds for hard and difficult-to-machine materials. Use higher speeds and feeds for easy-to-machine materials. Use higher speeds for lighter cuts, smaller tools, and better finishes. Higher feed rates can improve tool life and performance in softer materials and more abrasive materials.

For long and extra long tools reduce feed fates by 50%.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

Successful Machining

Tool Holding – High Quality tool holders should be used to minimize run-out and maximize rigidity.

Machine – A rigid machine with a high quality spindle is required.

Work-Holding – The workpiece should be securely held to prevent movement and vibration while machining.

Coolant – A high quality coolant under adequate pressure should be used to enhance chip control and improve tool life.

Plunging – When Plunging or Ramping the feed rate should be reduced 50%.

Tool Choice – The shortest tool that will do the job is recommended to reduce chatter and deflection.

Speed and Feed – Using correct speed and feed rates will provide a better surface finish and improve tool life.

VP2-MILL Diameter Tolerances		
Mill Diameter: +.000/-.002 (All Sizes)		
Shank Diameter: h6		
Shank Dia. Range		**Tolerance**
< 3mm .1181"	≤ 6mm .2362"	+.000mm/-.008mm +.0000"/-.00031"
> 6mm .2362"	≤ 10mm .3937"	+.000mm/-.009mm +.0000"/-.00035"
> 10mm .3937"	≤ 18mm .7087"	+.000mm/-.011mm +.0000"/-.00043"
> 18mm .7087"	≤ 30mm 1.1811"	+.000mm/-.013mm +.0000"/-.00051"

Solid Carbide DRILL-MILL™

2-Flute & 4-Flute
60° & 90° Point Angle

List No. 5989 – 2-Flute

List No. 5989 – 4-Flute

STANDARD PACKAGE All sizes — 1 each

Micrograin Carbide • 30° Right Hand Helix

DRILL-MILL™ performs drilling, spotting, countersinking, chamfering, slotting, side milling, profile milling, "V" grooving and other drilling & milling operations with the same tool in vertical milling machine applications.

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

TOLERANCE +.000 - .002

Speeds & Feeds: Page 71

2-Flute 90° Point Angle

DIA.	SHANK DIA.	LOC*	OAL*	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
.030	1/8	.090	1 1/2	59055	—	—	95356
.045	1/8	.105	1 1/2	59056	—	—	95357
.060	1/8	.180	1 1/2	59057	—	—	95358
1/16	1/8	3/16	1 1/2	59058	—	—	95359
3/32	1/8	3/8	1 1/2	59059	—	—	95360
1/8	1/8	1/2	1 1/2	59060	95300	95320	95340
1/8**	1/8	1/2	1 1/2	59061	95301	95321	95341
3/16	3/16	5/8	2	59062	95302	95322	95342
3/16**	3/16	5/8	2	59063	95303	95323	95343
1/4	1/4	3/4	2 1/2	59064	95304	95324	95344
1/4**	1/4	3/4	2 1/2	59065	95305	95325	95345
5/16	5/16	13/16	2 1/2	59066	95306	95326	95346
5/16**	5/16	13/16	2 1/2	59067	95307	95327	95347
3/8	3/8	1	2 1/2	59068	95308	95328	95348
3/8**	3/8	1	2 1/2	59069	95309	95329	95349
7/16	7/16	1	2 3/4	59070	95310	95330	95350
1/2	1/2	1	3	59071	95311	95331	95351
1/2**	1/2	1	3	59072	95312	95332	95352
5/8	5/8	1 1/4	3 1/2	59073	95313	95333	95353
5/8**	5/8	1 1/4	3 1/2	59074	95314	95334	95354
3/4	3/4	1 1/2	4	59075	95315	95335	95355

* Lengths include the conical cutting point

** Features sharper point with a .005"/.008" tip diameter for "V" grooving where a sharper point is required. (Standard carbide Drill-Mills supplied with tip diameter of .030" or larger to provide strength.)

				2-Flute 60° Point Angle		4-Flute 60° Point Angle		4-Flute 90° Point Angle	
DIA.	SHANK DIA.	LOC*	OAL*	UNCOATED EDP NO.	ALTiN COATED EDP NO.	UNCOATED EDP NO.	ALTiN COATED EDP NO.	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/16	1/8	3/16	1-1/2	59076	95361	59202	95575	59085	95370
3/32	1/8	3/8	1-1/2	59077	95362	59203	95576	59086	95371
1/8	1/8	1/2	1-1/2	59078	95363	59142	95515	59087	95372
3/16	3/16	5/8	2	59079	95364	59143	95516	59088	95373
1/4	1/4	3/4	2-1/2	59080	95365	59144	95517	59089	95374
5/16	5/16	13/16	2-1/2	59138	95511	59145	95518	59140	95513
3/8	3/8	1	2-1/2	59081	95366	59146	95519	59090	95375
7/16	7/16	1	2-3/4	59139	95512	59147	95520	59141	95514
1/2	1/2	1	3	59082	95367	59148	95521	59091	95376
5/8	5/8	1-1/4	3-1/2	59083	95368	59149	95522	59092	95377
3/4	3/4	1-1/2	4	59084	95369	59150	95523	59093	95378

* Lengths include the conical cutting point

Solid Carbide
2-Flute Single End Mills

Micrograin Carbide – Center Cutting
30° Helix Angle

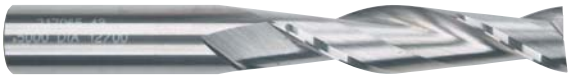
2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron. Ideal for plunge cutting and slotting. **Center Cutting** end allows for plunge cutting like a drill into solid material.

TOLERANCES

Size to 1/4"	+.000 - .002
9/32" to 1"	+.000 - .003
Shank Dia.	+.0000 - .0005

Speeds & Feeds: Page 71

List No. 5944 Regular Length



List No. 5954 Medium Length & Long Length

List No. 5950 Extra Long Length & Extension Length

(See Next Page)

List No. 5944 Regular Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/64	1/8	3/64	1-1/2	58001	89999	—	89996
1/32	1/8	1/8	1-1/2	58002	90000	—	89997
3/64	1/8	1/8	1-1/2	58003	90001	—	89998
1/16	1/8	3/16	1-1/2	58004	90002	90039	90076
5/64	1/8	3/16	1-1/2	58005	90003	90040	90077
3/32	1/8	3/8	1-1/2	58006	90004	90041	90078
7/64	1/8	3/8	1-1/2	58007	90005	90042	90079
1/8	1/8	1/2	1-1/2	58008	90006	90043	90080
9/64	3/16	9/16	2	58009	90007	90044	90081
5/32	3/16	9/16	2	58010	90008	90045	90082
11/64	3/16	5/8	2	58011	90009	90046	90083
3/16	3/16	5/8	2	58012	90010	90047	90084
13/64	1/4	5/8	2-1/2	58013	90011	90048	90085
7/32	1/4	5/8	2-1/2	58014	90012	90049	90086
15/64	1/4	3/4	2-1/2	58065	92875	92890	92905
1/4	1/4	3/4	2-1/2	58016	90014	90051	90088
17/64	5/16	3/4	2-1/2	58066	92876	92891	92906
9/32	5/16	3/4	2-1/2	58018	90016	90053	90090
19/64	5/16	13/16	2-1/2	58067	92877	92892	92907
5/16	5/16	13/16	2-1/2	58020	90018	90055	90092
21/64	3/8	1	2-1/2	58068	92878	92893	92908
11/32	3/8	1	2-1/2	58069	92879	92894	92909
23/64	3/8	1	2-1/2	58070	92880	92895	92910
3/8	3/8	1	2-1/2	58024	90022	90059	90096
25/64	7/16	1	2-3/4	58071	92881	92896	92911
13/32	7/16	1	2-3/4	58072	92882	92897	92912
27/64	7/16	1	2-3/4	58073	92883	92898	92913
7/16	7/16	1	2-3/4	58028	90026	90063	90100
29/64	1/2	1	3	58074	92884	92899	92914
15/32	1/2	1	3	58075	92885	92900	92915
31/64	1/2	1	3	58076	92886	92901	92916
1/2	1/2	1	3	58032	90030	90067	90104
1/2	1/2	1-1/4	3	58077	92887	92902	92917
33/64	9/16	1-1/4	3-1/2	58078	92888	92903	92918
17/32	9/16	1-1/4	3-1/2	58079	92889	92904	92919
9/16	9/16	1-1/4	3-1/2	58036	90031	90068	90105
5/8	5/8	1-1/4	3-1/2	58040	90032	90069	90106
11/16	3/4	1-1/2	4	58044	90033	90070	90107
3/4	3/4	1-1/2	4	58048	90034	90071	90108
7/8	7/8	1-1/2	4	58056	90035	90072	90109
1	1	1-1/2	4	58064	90036	90073	90110

List No. 5954 Medium Length & Long Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	3/4	2-1/4	58238	90120	90130	90140
5/32	3/16	3/4	2-1/2	58295	90118	90116	90114
3/16	3/16	3/4	2-1/2	58239	90121	90131	90141
1/4	1/4	1-1/8	3	58241	90122	90132	90142
5/16	5/16	1-1/8	3	58250	90123	90133	90143
3/8	3/8	1-1/8	3	58254	90124	90134	90144
7/16	7/16	2	4	58258	90125	90135	90145
1/2	1/2	1-1/2	4	58296	90119	90117	90115
1/2	1/2	2	4	58262	90126	90136	90146
5/8	5/8	2-1/4	5	58270	90127	90137	90147
3/4	3/4	2-1/4	5	58278	90128	90138	90148
1	1	2-1/4	5	58294	90129	90139	90149

(continued)

Solid Carbide 2-Flute Single End Mills

(continued)

List No. 5950 Extra Long Length & Extension Length

List No. 5950 Extra Long Length & Extension Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	1	3	58408	90160	90170	90180
5/32	3/16	1-1/8	3	58465	90150	90190	92538
3/16	3/16	1-1/8	3	58412	90161	90171	90181
1/4	1/4	1-1/2	4	58416	90162	90172	90182
1/4	1/4	1-1/2	6	58466	90151	90191	92539
5/16	5/16	1-5/8	4	58420	90163	90173	90183
5/16	5/16	1-1/2	6	58467	90152	90192	92540
3/8	3/8	1-3/4	4	58424	90164	90174	90184
3/8	3/8	1-1/2	6	58468	90153	90193	92541
7/16	7/16	3	6	58428	90165	90175	90185
1/2	1/2	1-1/2	6	58469	90154	90194	92542
1/2	1/2	3	6	58432	90166	90176	90186
5/8	5/8	1-1/2	6	58470	90155	90195	92543
5/8	5/8	3	6	58440	90167	90177	90187
3/4	3/4	1-1/2	6	58471	90156	90196	92544
3/4	3/4	3	6	58448	90168	90178	90188
3/4	3/4	4	7	58472	90157	90197	92545
1	1	1-1/2	6	58473	90158	90198	92546
1	1	3	6	58464	90169	90179	90189
1	1	4	7	58474	90159	90199	92547

Solid Carbide Stub Length 2-Flute Single End Mills

List No. 5973 Stub Length

Micrograin Carbide — Center Cutting 30° Helix Angle

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron. Ideal for plunge cutting and slotting. **Center Cutting** end allows for plunge cutting like a drill into solid material.

TOLERANCES

Size to 1/4"	+.000 - .002
5/16" to 3/4"	+.000 - .003
Shank Dia.	+.0000 - .0005

STANDARD PACKAGE
All sizes – 1 each

Stub Length for high rigidity & minimal tool deflection.

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/32	1/8	1/16	1-1/2	57085	92860
3/64	1/8	3/32	1-1/2	57086	92861
1/16	1/8	1/8	1-1/2	57025	92800
5/64	1/8	5/32	1-1/2	56582	92868
3/32	1/8	3/16	1-1/2	57026	92801
7/64	1/8	7/32	1-1/2	56583	92869
1/8	1/8	1/4	1-1/2	57027	92802
9/64	3/16	9/32	2	56584	92870
5/32	3/16	5/16	2	57028	92803
11/64	3/16	5/16	2	56585	92871
3/16	3/16	3/8	2	57029	92804
13/64	1/4	3/8	2	56586	92872
7/32	1/4	7/16	2	57030	92805
15/64	1/4	7/16	2	56587	92873
1/4	1/4	1/2	2	57031	92806
9/32	5/16	1/2	2	56588	92874
5/16	5/16	1/2	2	57032	92807
3/8	3/8	5/8	2	57033	92808
7/16	7/16	5/8	2-1/2	57034	92809
1/2	1/2	5/8	2-1/2	57035	92810
5/8	5/8	3/4	3	57036	92811
3/4	3/4	1	3	57037	92812

Solid Carbide Metric 2-Flute Single End Mills

Micrograin Carbide – Center Cutting
30° Helix Angle

TOLERANCES
All Sizes +.000mm/-.051mm
Shank Dia. +000mm/-.013mm

STANDARD PACKAGE
All sizes – 1 each

List No. 5959

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron. Ideal for plunge cutting and slotting. **Center Cutting** end allows for plunge cutting like a drill into solid material.

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1 mm	3 mm	3 mm	39 mm	59280	90200	90220	90240
1.5 mm	3 mm	5 mm	39 mm	59281	90201	90221	90241
2 mm	3 mm	7 mm	39 mm	59282	90202	90222	90242
2.5 mm	3 mm	7 mm	39 mm	59283	90203	90223	90243
3 mm	3 mm	9 mm	39 mm	59284	90204	90224	90244
3.5 mm	4 mm	12 mm	51 mm	59285	90205	90225	90245
4 mm	4 mm	14 mm	51 mm	59286	90206	90226	90246
4.5 mm	5 mm	14 mm	51 mm	59287	90207	90227	90247
5 mm	5 mm	16 mm	51 mm	59288	90208	90228	90248
6 mm	6 mm	19 mm	64 mm	59289	90209	90229	90249
7 mm	8 mm	19 mm	64 mm	59290	90210	90230	90250
8 mm	8 mm	21 mm	64 mm	59291	90211	90231	90251
9 mm	10 mm	22 mm	70 mm	59292	90212	90232	90252
10 mm	10 mm	22 mm	70 mm	59293	90213	90233	90253
11 mm	11 mm	25 mm	70 mm	59294	90214	90234	90254
12 mm	12 mm	25 mm	76 mm	59295	90215	90235	90255
14 mm	14 mm	31 mm	89 mm	59297	90216	90236	90256
16 mm	16 mm	32 mm	89 mm	59298	90217	90237	90257
18 mm	18 mm	35 mm	102 mm	59299	90218	90238	90258
20 mm	20 mm	38 mm	102 mm	59300	90219	90239	90259

Solid Carbide 2-Flute Double End Mills

Speeds & Feeds: Page 71

Micrograin Carbide – Center Cutting
30° Helix Angle

List No. 5947 Stub Length

List No. 5896 Regular Length

List No. 5947 Stub Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/16	1/8	1/8	1½	57250	90300	90311	90322
3/32	1/8	3/16	1½	57251	90301	90312	90323
1/8	1/8	1/4	1½	57252	90302	90313	90324
5/32	3/16	5/16	2	57253	90303	90314	90325
3/16	3/16	3/8	2	57254	90304	90315	90326
7/32	1/4	1/2	2½	57255	90305	90316	90327
1/4	1/4	1/2	2½	57256	90306	90317	90328
5/16	5/16	1/2	2½	57257	90307	90318	90329
3/8	3/8	9/16	3	57258	90308	90319	90330
7/16	7/16	9/16	3	57259	90309	90320	90331
1/2	1/2	5/8	3	57260	90310	90321	90332

List No. 5896 Regular Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	3/8	3/8	3 1/8	57158	90350	90360	90370
5/32	3/8	7/16	3 1/8	57160	90351	90361	90371
3/16	3/8	1/2	3 1/4	57162	90352	90362	90372
7/32	3/8	9/16	3 3/8	57164	90353	90363	90373
1/4	3/8	5/8	3 3/8	57166	90354	90364	90374
9/32	3/8	11/16	3 3/8	57168	90355	90365	90375
5/16	3/8	3/4	3½	57170	90356	90366	90376
3/8	3/8	3/4	3½	57174	90357	90367	90377
7/16	1/2	7/8	4	57178	90358	90368	90378
1/2	1/2	1	4	57182	90359	90369	90379

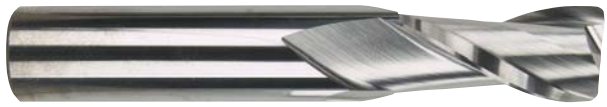
Solid Carbide 2-Flute Corner Radius Single End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

Corner Radius strengthens the end mill corners to minimize chipping especially in tougher milling applications. **Corner Radius** also used when the finished part requires a radius.

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron.

Corner Radius



List No. 5967 2-Flute

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance, and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

TOLERANCES

Size to 1/4"	+.000 - .002
5/16" to 1"	+.000 - .003
Shank Dia.	+.0000 - .0005

STANDARD PACKAGE
All sizes – 1 each

DIA	SHANK DIA.	LOC	OAL	CORNER RADIUS	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	1/2	1-1/2	.015	59094	95379	95401	95423
1/8	1/8	1/2	1-1/2	.020	58910	94830	94875	94920
1/8	1/8	1/2	1-1/2	.030	59095	95380	95402	95424
3/16	3/16	5/8	2	.015	59096	95381	95403	95425
3/16	3/16	5/8	2	.020	58913	94833	94878	94923
3/16	3/16	5/8	2	.030	58914	94834	94879	94924
1/4	1/4	3/4	2-1/2	.015	59097	95382	95404	95426
1/4	1/4	3/4	2-1/2	.020	58916	94836	94881	94926
1/4	1/4	3/4	2-1/2	.030	58917	94837	94882	94927
1/4	1/4	3/4	2-1/2	.045	59098	95383	95405	95427
1/4	1/4	3/4	2-1/2	.060	59099	95384	95406	95428
5/16	5/16	13/16	2-1/2	.015	59100	95385	95407	95429
5/16	5/16	13/16	2-1/2	.020	58920	94840	94885	94930
5/16	5/16	13/16	2-1/2	.030	58921	94841	94886	94931
5/16	5/16	13/16	2-1/2	.045	59101	95386	95408	95430
5/16	5/16	13/16	2-1/2	.060	59102	95387	95409	95431
3/8	3/8	1	2-1/2	.015	59103	95388	95410	95432
3/8	3/8	1	2-1/2	.020	58924	94844	94889	94934
3/8	3/8	1	2-1/2	.030	58925	94845	94890	94935
3/8	3/8	1	2-1/2	.045	59104	95389	95411	95433
3/8	3/8	1	2-1/2	.060	59105	95390	95412	95434
1/2	1/2	1	3	.015	59106	95391	95413	95435
1/2	1/2	1	3	.020	58929	94849	94894	94939
1/2	1/2	1	3	.030	58930	94850	94895	94940
1/2	1/2	1	3	.045	59107	95392	95414	95436
1/2	1/2	1	3	.060	58932	94852	94897	94942
1/2	1/2	1	3	.090	59108	95393	95415	95437
1/2	1/2	1	3	.125	59109	95394	95416	95438
5/8	5/8	1-1/4	3-1/2	.015	59110	95395	95417	95439
5/8	5/8	1-1/4	3-1/2	.020	58936	94856	94901	94946
5/8	5/8	1-1/4	3-1/2	.030	58937	94857	94902	94947
5/8	5/8	1-1/4	3-1/2	.045	59111	95396	95418	95440
5/8	5/8	1-1/4	3-1/2	.060	58939	94859	94904	94949
5/8	5/8	1-1/4	3-1/2	.090	58940	94860	94905	94950
3/4	3/4	1-1/2	4	.015	59112	95397	95419	95441
3/4	3/4	1-1/2	4	.020	58942	94862	94907	94952
3/4	3/4	1-1/2	4	.030	58943	94863	94908	94953
3/4	3/4	1-1/2	4	.045	59113	95398	95420	95442
3/4	3/4	1-1/2	4	.060	58945	94865	94910	94955
3/4	3/4	1-1/2	4	.090	58946	94866	94911	94956
3/4	3/4	1-1/2	4	.125	58947	94867	94912	94957
1	1	1-1/2	4	.015	59114	95399	95421	95443
1	1	1-1/2	4	.020	58949	94869	94914	94959
1	1	1-1/2	4	.030	58950	94870	94915	94960
1	1	1-1/2	4	.045	59115	95400	95422	95444
1	1	1-1/2	4	.060	58952	94872	94917	94962
1	1	1-1/2	4	.090	58953	94873	94918	94963
1	1	1-1/2	4	.125	58954	94874	94919	94964

Solid Carbide 2-Flute Ball Nose Single End Mills

Micrograin Carbide – Center Cutting
30° Helix Angle

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

List No. 5940 Regular Length

List No. 5956 Medium Length & Long Length

List No. 5952 Extra Long Length & Extension Length

(See Next Page)

List No. 5940 Regular Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/64	1/8	3/64	1-1/2	58101	90397	—	90394
1/32	1/8	1/8	1-1/2	58102	90398	—	90395
3/64	1/8	1/8	1-1/2	58103	90399	—	90396
1/16	1/8	3/16	1-1/2	58104	90400	90423	90446
5/64	1/8	3/16	1-1/2	58105	90401	90424	90447
3/32	1/8	3/8	1-1/2	58106	90402	90425	90448
7/64	1/8	3/8	1-1/2	58107	90403	90426	90449
1/8	1/8	1/2	1-1/2	58108	90404	90427	90450
9/64	3/16	9/16	2	58109	90405	90428	90451
5/32	3/16	9/16	2	58110	90406	90429	90452
11/64	3/16	5/8	2	58111	90407	90430	90453
3/16	3/16	5/8	2	58112	90408	90431	90454
13/64	1/4	5/8	2-1/2	58113	90409	90432	90455
7/32	1/4	5/8	2-1/2	58114	90410	90433	90456
15/64	1/4	3/4	2-1/2	57105	92382	92394	92554
1/4	1/4	3/4	2-1/2	58116	90411	90434	90457
17/64	5/16	3/4	2-1/2	57106	92383	92395	92555
9/32	5/16	3/4	2-1/2	58118	90412	90435	90458
19/64	5/16	13/16	2-1/2	57107	92384	92396	92556
5/16	5/16	13/16	2-1/2	58120	90413	90436	90459
21/64	3/8	1	2-1/2	57133	92385	92397	92557
11/32	3/8	1	2-1/2	57134	92386	92398	92558
23/64	3/8	1	2-1/2	57135	92387	92399	92559
3/8	3/8	1	2-1/2	58124	90414	90437	90460
25/64	7/16	1	2-3/4	57136	92388	92548	92560
13/32	7/16	1	2-3/4	57137	92389	92549	92561
27/64	7/16	1	2-3/4	57138	92390	92550	92562
7/16	7/16	1	2-3/4	58128	90415	90438	90461
29/64	1/2	1	3	57139	92391	92551	92563
15/32	1/2	1	3	57140	92392	92552	92564
31/64	1/2	1	3	57141	92393	92553	92565
1/2	1/2	1	3	58132	90416	90439	90462
9/16	9/16	1-1/4	3-1/2	58136	90417	90440	90463
5/8	5/8	1-1/4	3-1/2	58140	90418	90441	90464
11/16	3/4	1-1/2	4	58144	90419	90442	90465
3/4	3/4	1-1/2	4	58148	90420	90443	90466
7/8	7/8	1-1/2	4	58156	90421	90444	90467
1	1	1-1/2	4	58164	90422	90445	90468

List No. 5956 Medium Length & Long Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	3/4	2-1/4	57575	90470	90480	90490
5/32	3/16	3/4	2-1/2	57142	92566	92568	92570
3/16	3/16	3/4	2-1/2	57577	90471	90481	90491
1/4	1/4	1-1/8	3	57581	90472	90482	90492
5/16	5/16	1-1/8	3	57583	90473	90483	90493
3/8	3/8	1-1/8	3	57585	90474	90484	90494
7/16	7/16	2	4	57587	90475	90485	90495
1/2	1/2	1-1/2	4	57143	92567	92569	92571
1/2	1/2	2	4	57589	90476	90486	90496
5/8	5/8	2-1/4	5	57591	90477	90487	90497
3/4	3/4	2-1/4	5	57593	90478	90488	90498
1	1	2-1/4	5	57595	90479	90489	90499

(continued)

Solid Carbide 2-Flute Ball Nose Single End Mills

(continued)

List No. 5952 Extra Long Length & Extension Length

List No. 5952 Extra Long Length & Extension Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	1	3	58608	90500	90510	90520
5/32	3/16	1-1/8	3	57144	92572	92580	92588
3/16	3/16	1-1/8	3	58612	90501	90511	90521
1/4	1/4	1-1/2	4	58616	90502	90512	90522
1/4	1/4	1-1/2	6	57145	92573	92581	92589
5/16	5/16	1-5/8	4	58620	90503	90513	90523
5/16	5/16	1-1/2	6	57146	92574	92582	92590
3/8	3/8	1-3/4	4	58624	90504	90514	90524
3/8	3/8	1-1/2	6	57147	92575	92583	92591
7/16	7/16	3	6	58628	90505	90515	90525
1/2	1/2	1-1/2	6	57148	92576	92584	92592
1/2	1/2	3	6	58632	90506	90516	90526
5/8	5/8	1-1/2	6	57149	92577	92585	92593
5/8	5/8	3	6	58640	90507	90517	90527
3/4	3/4	1-1/2	6	57150	92578	92586	92594
3/4	3/4	3	6	58648	90508	90518	90528
1	1	1-1/2	6	57151	92579	92587	92595
1	1	3	6	58664	90509	90519	90529

Solid Carbide 2-Flute Stub Length Ball Nose Single End Mills

Micrograin Carbide — Center Cutting 30° Helix Angle

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

TOLERANCES

Size to 1/4"	+.000 - .002
5/16" to 3/4"	+.000 - .003
Shank Dia.	+.0000 - .0005

STANDARD PACKAGE

All sizes – 1 each

List No. 5974 Stub Length

Speeds & Feeds: Page 71

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

Stub Length for high rigidity & minimal tool deflection.

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/32	1/8	1/16	1-1/2	57089	92864
3/64	1/8	3/32	1-1/2	57090	92865
1/16	1/8	1/8	1-1/2	57055	92830
5/64	1/8	5/32	1-1/2	57093	92370
3/32	1/8	3/16	1-1/2	57056	92831
7/64	1/8	7/32	1-1/2	57094	92371
1/8	1/8	1/4	1-1/2	57057	92832
9/64	3/16	9/32	2	57095	92372
5/32	3/16	5/16	2	57058	92833
11/64	3/16	5/16	2	57096	92373
3/16	3/16	3/8	2	57059	92834
13/64	1/4	3/8	2	57097	92374
7/32	1/4	7/16	2	57060	92835
15/64	1/4	7/16	2	57098	92375
1/4	1/4	1/2	2	57061	92836
5/16	5/16	1/2	2	57062	92837
3/8	3/8	5/8	2	57063	92838
7/16	7/16	5/8	2-1/2	57064	92839
1/2	1/2	5/8	2-1/2	57065	92840
5/8	5/8	3/4	3	57066	92841
3/4	3/4	1	3	57067	92842

Solid Carbide Metric 2-Flute Ball Nose Single End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

List No. 5963

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

TOLERANCES
All Sizes +.000mm/-.051mm
Shank Dia. +000mm/-.013mm

STANDARD PACKAGE
All sizes – 1 each

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1 mm	3 mm	3 mm	39 mm	59400	90540	90560	90580
1.5 mm	3 mm	5 mm	39 mm	59401	90541	90561	90581
2 mm	3 mm	7 mm	39 mm	59402	90542	90562	90582
2.5 mm	3 mm	7 mm	39 mm	59403	90543	90563	90583
3 mm	3 mm	9 mm	39 mm	59404	90544	90564	90584
3.5 mm	4 mm	12 mm	51 mm	59405	90545	90565	90585
4 mm	4 mm	14 mm	51 mm	59406	90546	90566	90586
4.5 mm	5 mm	14 mm	51 mm	59407	90547	90567	90587
5 mm	5 mm	16 mm	51 mm	59408	90548	90568	90588
6 mm	6 mm	19 mm	64 mm	59409	90549	90569	90589
7 mm	8 mm	19 mm	64 mm	59410	90550	90570	90590
8 mm	8 mm	21 mm	64 mm	59411	90551	90571	90591
9 mm	10 mm	22 mm	70 mm	59412	90552	90572	90592
10 mm	10 mm	22 mm	70 mm	59413	90553	90573	90593
11 mm	11 mm	25 mm	70 mm	59414	90554	90574	90594
12 mm	12 mm	25 mm	76 mm	59415	90555	90575	90595
14 mm	14 mm	31 mm	89 mm	59417	90556	90576	90596
16 mm	16 mm	32 mm	89 mm	59418	90557	90577	90597
18 mm	18 mm	35 mm	102 mm	59419	90558	90578	90598
20 mm	20 mm	38 mm	102 mm	59420	90559	90579	90599
22 mm	22 mm	38 mm	102 mm	59421*	—	—	—
25 mm	25 mm	38 mm	102 mm	59422*	—	—	—

*Available While Supplies Last

Speeds & Feeds: Page 71

Solid Carbide 2-Flute Stub Length Ball Nose Double End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

TOLERANCES

Size to 1/4"	+.000 - .002
9/32" to 1"	+.000 - .003
Shank Dia.	+.0000 - .0005

STANDARD PACKAGE
All sizes – 1 each

List No. 5948

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/16	1/8	1/8	1 1/2	58304	90600	90611	90622
3/32	1/8	3/16	1 1/2	58306	90601	90612	90623
1/8	1/8	1/4	1 1/2	58308	90602	90613	90624
5/32	3/16	5/16	2	58310	90603	90614	90625
3/16	3/16	3/8	2	58312	90604	90615	90626
7/32	1/4	1/2	2 1/2	58314	90605	90616	90627
1/4	1/4	1/2	2 1/2	58316	90606	90617	90628
5/16	5/16	1/2	2 1/2	58320	90607	90618	90629
3/8	3/8	9/16	2 1/2	58324	90608	90619	90630
7/16	7/16	9/16	3	58328	90609	90620	90631
1/2	1/2	5/8	3	58332	90610	90621	90632

Solid Carbide
3-Flute Single End Mills

Micrograin Carbide — Center Cutting
30° Helix Angle

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life.

Tool Coatings further enhance milling performance in a wide range of applications.

3-Flute mills provide a compromise between the chip capacity of 2-flute mills and the tool strength, higher feed rate and improved surface finish of 4-flute mills. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron.

Center Cutting end allows for plunge cutting like a drill into solid material

TOLERANCES

Size to 1/4"	+.000 - .002
9/32" to 1"	+.000 - .003
Shank Dia.	+.0000 - .0005

Tool Coatings Also Available

List No. 5941 Square End

List No. 5969 Ball Nose

Ball Nose end mills are designed for milling die cavities, fillets, round bottomed holes and radius bottom slots.

				SQUARE END		BALL NOSE	
DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	ALTiN COATED EDP NO.	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/32	1/8	1/8	1-1/2	54785	92965	54805	92985
3/64	1/8	1/8	1-1/2	54786	92966	54806	92986
1/16	1/8	1/4	1-1/2	54787	92967	54807	92987
5/64	1/8	1/4	1-1/2	54788	92968	54808	92988
3/32	1/8	3/8	1-1/2	54789	92969	54809	92989
7/64	1/8	3/8	1-1/2	54790	92970	54810	92990
1/8	1/8	1/2	1-1/2	54791	92971	54811	92991
5/32	3/16	9/16	2	54792	92972	54812	92992
3/16	3/16	5/8	2	54793	92973	54813	92993
7/32	1/4	5/8	2-1/2	54794	92974	54814	92994
1/4	1/4	3/4	2-1/2	54795	92975	54815	92995
9/32	5/16	3/4	2-1/2	54796	92976	54816	92996
5/16	5/16	13/16	2-1/2	54797	92977	54817	92997
3/8	3/8	1	2-1/2	54798	92978	54818	92998
7/16	7/16	1	2-3/4	54799	92979	54819	92999
1/2	1/2	1	3	54800	92980	54820	93000
9/16	9/16	1-1/4	3-1/2	54801	92981	54821	93001
5/8	5/8	1-1/4	3-1/2	54802	92982	54822	93002
3/4	3/4	1-1/2	4	54803	92983	54823	93003
1	1	1-1/2	4	54804	92984	54824	93004

TOOL COATING SERVICE

Tool Coatings enhance cutting tool performance for increased productivity and lower overall tooling cost.

TiN — Titanium Nitride	**TiCN —** Titanium Carbonitride
TiALN — Titanium Aluminum Nitride	**ALTiN —** Aluminum Titanium Nitride
CrN — Chromium Nitride	**CrC —** Chromium Carbide

Solid Carbide Single End Mills With Weldon Flat On Shank

Micrograin Carbide – Center Cutting 30° Helix Angle

2-Flute end mills provide increased chip capacity for higher feed rates. Recommended for easy-to-machine materials including low alloy steels, non-ferrous materials and cast iron.

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish.

Center Cutting end allows for plunge cutting like a drill into solid material.

List No. 5979 2-Flute

List No. 5978 4-Flute

Solid Carbide offers excellent hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life.

ALTiN – Aluminum Titanium Nitride Coating is an excellent all-around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

Weldon Flat on Shank

TOLERANCES

Size to 1/4"	+.000 - .002
3/8" to 1"	+.000 - .003
Shank Dia.	+.0000 - .0005

Speeds & Feeds: Page 71

List No. 5979 2-Flute Weldon Flat

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/4	1/4	1/2	2	59218	95591
1/4	1/4	3/4	2-1/2	59219	95592
3/8	3/8	5/8	2	59220	95593
3/8	3/8	1	2-1/2	59221	95594
1/2	1/2	5/8	2-1/2	59222	95595
1/2	1/2	1	3	59223	95596
5/8	5/8	3/4	3	59224	95597
5/8	5/8	1-1/4	3-1/2	59225	95598
3/4	3/4	1	3	59226	95599
3/4	3/4	1-1/2	4	59227	95600
7/8	7/8	1-1/2	4	59229	95602
1	1	1-1/2	4	59231	95604

List No. 5978 4-Flute Weldon Flat

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/4	1/4	1/2	2	59204	95577
1/4	1/4	3/4	2-1/2	59205	95578
3/8	3/8	5/8	2	59206	95579
3/8	3/8	1	2-1/2	59207	95580
1/2	1/2	5/8	2-1/2	59208	95581
1/2	1/2	1	3	59209	95582
5/8	5/8	3/4	3	59210	95583
5/8	5/8	1-1/4	3-1/2	59211	95584
3/4	3/4	1	3	59212	95585
3/4	3/4	1-1/2	4	59213	95586
7/8	7/8	1-1/2	4	59215	95588
1	1	1-1/2	4	59217	95590

Solid Carbide Stub Length 4-Flute Single End Mills

Micrograin Carbide — Center Cutting 30° Helix Angle

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

TOLERANCES

Size to 1/4"	+.000 - .002
5/16" to 3/4"	+.000 - .003
Shank Dia.	+.0000 - .0005

STANDARD PACKAGE
All sizes – 1 each

List No. 5975 Stub Length

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Center Cutting** end allows for plunge cutting like a drill into solid material.

Stub Length for high rigidity & minimal tool deflection.

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/32	1/8	1/16	1-1/2	57087	92862
3/64	1/8	3/32	1-1/2	57088	92863
1/16	1/8	1/8	1-1/2	57040	92815
5/64	1/8	5/32	1-1/2	56589	91045
3/32	1/8	3/16	1-1/2	57041	92816
7/64	1/8	7/32	1-1/2	56590	91046
1/8	1/8	1/4	1-1/2	57042	92817
9/64	3/16	9/32	2	56591	91047
5/32	3/16	5/16	2	57043	92818
11/64	3/16	5/16	2	56592	91048
3/16	3/16	3/8	2	57044	92819
13/64	1/4	3/8	2	56593	91049
7/32	1/4	7/16	2	57045	92820
15/64	1/4	7/16	2	56594	91080
1/4	1/4	1/2	2	57046	92821
9/32	5/16	1/2	2	56595	91081
5/16	5/16	1/2	2	57047	92822
3/8	3/8	5/8	2	57048	92823
7/16	7/16	5/8	2-1/2	57049	92824
1/2	1/2	5/8	2-1/2	57050	92825
5/8	5/8	3/4	3	57051	92826
3/4	3/4	1	3	57052	92827
1	1	1	3	56596	91082

TOOL COATING SERVICE

Tool Coatings enhance cutting tool performance for increased productivity and lower overall tooling cost. Benefits include increased surface hardness, lubricity & heat resistance and decreased chemical reactivity. Results include reduced friction & torque, higher speeds & feeds, increased tool life, decreased galling & chip welding and improved surface finish. **PLEASE INQUIRE.**

TiN — Titanium Nitride

TiCN — Titanium Carbonitride

TiALN — Titanium Aluminum Nitride

ALTiN — Aluminum Titanium Nitride

CrN — Chromium Nitride

CrC — Chromium Carbide

DLC — Amorphous Diamond-Like Carbon

Solid Carbide 4-Flute Single End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Center Cutting** end allows for plunge cutting like a drill into solid material.

*** Extended LOC for milling the edges of steel sheet and plate in one pass.**

List No. 5943 Regular Length

List No. 5955 Medium Length & Long Length

(See Next Page)

List No. 5951 Extra Long Length & Extension Length

(See Next Page)

List No. 5943 Regular Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/64	1/8	3/64	1-1/2	57901	90699	—	90696
1/32	1/8	1/8	1-1/2	57902	90700	—	90697
3/64	1/8	1/8	1-1/2	57903	90701	—	90698
1/16	1/8	3/16	1-1/2	57904	90702	90739	90776
5/64	1/8	3/16	1-1/2	57905	90703	90740	90777
3/32	1/8	3/8	1-1/2	57906	90704	90741	90778
7/64	1/8	3/8	1-1/2	57907	90705	90742	90779
1/8	1/8	1/2	1-1/2	57908	90706	90743	90780
9/64	3/16	9/16	2	57909	90707	90744	90781
5/32	3/16	9/16	2	57910	90708	90745	90782
11/64	3/16	5/8	2	57911	90709	90746	90783
3/16	3/16	5/8	2	57912	90710	90747	90784
13/64	1/4	5/8	2-1/2	57913	90711	90748	90785
7/32	1/4	5/8	2-1/2	57914	90712	90749	90786
15/64	1/4	3/4	2-1/2	57915	90713	90762	90815
1/4	1/4	3/4	2-1/2	57916	90714	90751	90788
1/4	1/4	7/8*	2-1/2	57961*	—	—	90633*
17/64	5/16	3/4	2-1/2	57917	90715	90764	90816
9/32	5/16	3/4	2-1/2	57918	90716	90753	90790
19/64	5/16	13/16	2-1/2	57919	90717	90765	90817
5/16	5/16	13/16	2-1/2	57920	90718	90755	90792
5/16	5/16	1*	2-1/2	57962*	—	—	90634*
21/64	3/8	1	2-1/2	57921	90719	90766	90818
11/32	3/8	1	2-1/2	57922	90720	90774	90819
23/64	3/8	1	2-1/2	57923	90721	90775	90850
3/8	3/8	1	2-1/2	57924	90722	90759	90796
3/8	3/8	1-1/8*	2-1/2	57963*	—	—	90635*
25/64	7/16	1	2-3/4	57925	90723	90787	90851
13/32	7/16	1	2-3/4	57926	90724	90789	90852
27/64	7/16	1	2-3/4	57927	90725	90791	90853
7/16	7/16	1	2-3/4	57928	90726	90763	90800
29/64	1/2	1	3	57929	90727	90793	90854
15/32	1/2	1	3	57930	90728	90794	90855
31/64	1/2	1	3	57931	90729	90795	90856
1/2	1/2	1	3	57932	90730	90767	90804
1/2	1/2	1-1/4*	3	57933*	90737*	90797*	90857*
33/64	9/16	1-1/4	3-1/2	57934	90738	90798	90858
17/32	9/16	1-1/4	3-1/2	57935	90750	90799	90859
9/16	9/16	1-1/4	3-1/2	57936	90731	90768	90805
19/32	5/8	1-1/4	3-1/2	57937	90752	90801	90890
5/8	5/8	1-1/4	3-1/2	57940	90732	90769	90806
5/8	5/8	1-3/8*	3-1/2	57965*	—	—	90636*
41/64	3/4	1-1/2	4	57938	90754	90802	90891
21/32	3/4	1-1/2	4	57939	90756	90803	90892
11/16	3/4	1-1/2	4	57944	90733	90770	90807
47/64	3/4	1-1/2	4	57941	90757	90811	90893
3/4	3/4	1-1/2	4	57948	90734	90771	90808
3/4	3/4	1-5/8*	4	57966*	—	—	90637*
13/16	7/8	1-1/2	4	57942	90758	90812	90894
7/8	7/8	1-1/2	4	57956	90735	90772	90809
15/16	1	1-1/2	4	57943	90760	90813	90895
1	1	1-1/2	4	57964	90736	90773	90810
1	1	1-3/4*	4	57967*	—	—	90638*
1-1/4	1-1/4	2	4-1/2	57945	90761	90814	90896

(continued)

Solid Carbide 4-Flute Single End Mills

List No. 5955 Medium Length & Long Length

Micrograin Carbide – Center Cutting
30° Helix Angle

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Center Cutting** end allows for plunge cutting like a drill into solid material.

TOLERANCES

Size to 1/4"	+.000 - .002
9/32" to 1"	+.000 - .003
Shank Dia.	+.0000 - .0005

Speeds & Feeds: Page 71

List No. 5955 Medium Length & Long Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	3/4	2-1/4	58138	90820	90830	90840
5/32	3/16	3/4	2-1/2	58142	90897	90960	90963
3/16	3/16	3/4	2-1/2	58139	90821	90831	90841
1/4	1/4	1-1/8	3	58141	90822	90832	90842
5/16	5/16	1-1/8	3	58150	90823	90833	90843
3/8	3/8	1-1/8	3	58154	90824	90834	90844
7/16	7/16	2	4	58158	90825	90835	90845
1/2	1/2	1	4	58143	90898	90961	90964
1/2	1/2	1-1/2	4	58145	90899	90962	90965
1/2	1/2	2	4	58162	90826	90836	90846
5/8	5/8	2-1/4	5	58170	90827	90837	90847
3/4	3/4	2-1/4	5	58178	90828	90838	90848
1	1	2-1/4	5	58194	90829	90839	90849

Solid Carbide 4-Flute Single End Mills

List No. 5951 Extra Long Length & Extension Length

List No. 5951 Extra Long Length & Extension Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	1	3	58508	90860	90870	90880
5/32	3/16	1-1/8	3	57946	90966	90980	90993
3/16	3/16	1-1/8	3	58512	90861	90871	90881
3/16	3/16	1	4	57947	90967	90981	90994
1/4	1/4	1	4	57949	90968	90982	90995
1/4	1/4	1-1/2	4	58516	90862	90872	90882
1/4	1/4	1-1/2	6	57950	90969	90983	90996
5/16	5/16	1-5/8	4	58520	90863	90873	90883
5/16	5/16	1-1/2	6	57951	90970	90984	90997
3/8	3/8	1	4	57952	90971	90985	90998
3/8	3/8	1-3/4	4	58524	90864	90874	90884
3/8	3/8	1-1/2	6	57953	90972	90986	90999
7/16	7/16	3	6	58528	90865	90875	90885
1/2	1/2	1-1/2	6	57954	90973	90987	91033
1/2	1/2	3	6	58532	90866	90876	90886
5/8	5/8	1-1/2	6	57955	90974	90988	91034
5/8	5/8	3	6	58540	90867	90877	90887
3/4	3/4	1-1/2	6	57957	90975	90989	91035
3/4	3/4	3	6	58548	90868	90878	90888
3/4	3/4	4	7	57958	90976	90990	91036
1	1	1-1/2	6	57959	90977	90991	91037
1	1	3	6	58564	90869	90879	90889
1	1	4	7	57960	90979	90992	91038

Solid Carbide Metric 4-Flute Single End Mills

List No. 5961

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Center Cutting** end allows for plunge cutting like a drill into solid material.

Micrograin Carbide
Center Cutting
30° Helix Angle

TOLERANCE
All Sizes +.000mm/-.051mm
Shank Dia. +.000mm/-.013mm

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1 mm	3 mm	3 mm	39 mm	59310	90900	90920	90940
1.5 mm	3 mm	5 mm	39 mm	59311	90901	90921	90941
2 mm	3 mm	7 mm	39 mm	59312	90902	90922	90942
2.5 mm	3 mm	7 mm	39 mm	59313	90903	90923	90943
3 mm	3 mm	9 mm	39 mm	59314	90904	90924	90944
3.5 mm	4 mm	12 mm	51 mm	59315	90905	90925	90945
4 mm	4 mm	14 mm	51 mm	59316	90906	90926	90946
4.5 mm	5 mm	14 mm	51 mm	59317	90907	90927	90947
5 mm	5 mm	16 mm	51 mm	59318	90908	90928	90948
6 mm	6 mm	19 mm	64 mm	59319	90909	90929	90949
7 mm	8 mm	19 mm	64 mm	59320	90910	90930	90950
8 mm	8 mm	21 mm	64 mm	59321	90911	90931	90951
9 mm	10 mm	22 mm	70 mm	59322	90912	90932	90952
10 mm	10 mm	22 mm	70 mm	59323	90913	90933	90953
11 mm	11 mm	25 mm	70 mm	59324	90914	90934	90954
12 mm	12 mm	25 mm	76 mm	59325	90915	90935	90955
14 mm	14 mm	31 mm	89 mm	59327	90916	90936	90956
16 mm	16 mm	32 mm	89 mm	59328	90917	90937	90957
18 mm	18 mm	35 mm	102 mm	59329	90918	90938	90958
20 mm	20 mm	38 mm	102 mm	59330	90919	90939	90959
22 mm	22 mm	38 mm	102 mm	59331	91039	91041	91043
25 mm	25 mm	38 mm	102 mm	59332	91040	91042	91044

Solid Carbide 4-Flute Double End Mills

Speeds & Feeds: Page 71

List No. 5946 Stub Length

List No. 5895 Regular Length

Micrograin Carbide – Center Cutting
30° Helix Angle

STANDARD PACKAGE
All sizes – 1 each

List No. 5946 Stub Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/16	1/8	1/8	1 1/2	57270	91000	91011	91022
3/32	1/8	3/16	1 1/2	57271	91001	91012	91023
1/8	1/8	1/4	1 1/2	57272	91002	91013	91024
5/32	3/16	5/16	2	57273	91003	91014	91025
3/16	3/16	3/8	2	57274	91004	91015	91026
7/32	1/4	1/2	2 1/2	57275	91005	91016	91027
1/4	1/4	1/2	2 1/2	57276	91006	91017	91028
5/16	5/16	1/2	2 1/2	57277	91007	91018	91029
3/8	3/8	9/16	3	57278	91008	91019	91030
7/16	7/16	9/16	3	57279	91009	91020	91031
1/2	1/2	5/8	3	57280	91010	91021	91032

List No. 5895 Regular Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	3/8	3/8	3 1/8	57108	91050	91060	91070
5/32	3/8	7/16	3 1/8	57110	91051	91061	91071
3/16	3/8	1/2	3 1/4	57112	91052	91062	91072
7/32	3/8	9/16	3 3/8	57114	91053	91063	91073
1/4	3/8	5/8	3 3/8	57116	91054	91064	91074
9/32	3/8	11/16	3 3/8	57118	91055	91065	91075
5/16	3/8	3/4	3 1/2	57120	91056	91066	91076
3/8	3/8	3/4	3 1/2	57124	91057	91067	91077
7/16	1/2	7/8	4	57128	91058	91068	91078
1/2	1/2	1	4	57132	91059	91069	91079

Solid Carbide 4-Flute Corner Radius Single End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

Corner Radius strengthens the end mill corners to minimize chipping especially in tougher milling applications. **Corner Radius** also used when the finished part requires a radius.

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish.

List No. 5968 4-Flute

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance, and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

TOLERANCES

Size to 1/4"	+.000 - .002
5/16" to 1"	+.000 - .003
Shank Dia.	+.0000 - .0005

STANDARD PACKAGE
All sizes – 1 each

Corner Radius

DIA	SHANK DIA.	LOC	OAL	CORNER RADIUS	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	1/2	1-1/2	.015	59116	95445	95467	95489
1/8	1/8	1/2	1-1/2	.020	59000	94965	95010	95055
1/8	1/8	1/2	1-1/2	.030	59117	95446	95468	95490
3/16	3/16	5/8	2	.015	59118	95447	95469	95491
3/16	3/16	5/8	2	.020	59003	94968	95013	95058
3/16	3/16	5/8	2	.030	59004	94969	95014	95059
1/4	1/4	3/4	2-1/2	.015	59119	95448	95470	95492
1/4	1/4	3/4	2-1/2	.020	59006	94971	95016	95061
1/4	1/4	3/4	2-1/2	.030	59007	94972	95017	95062
1/4	1/4	3/4	2-1/2	.045	59120	95449	95471	95493
1/4	1/4	3/4	2-1/2	.060	59121	95450	95472	95494
5/16	5/16	13/16	2-1/2	.015	59122	95451	95473	95495
5/16	5/16	13/16	2-1/2	.020	59010	94975	95020	95065
5/16	5/16	13/16	2-1/2	.030	59011	94976	95021	95066
5/16	5/16	13/16	2-1/2	.045	59123	95452	95474	95496
5/16	5/16	13/16	2-1/2	.060	59124	95453	95475	95497
3/8	3/8	1	2-1/2	.015	59125	95454	95476	95498
3/8	3/8	1	2-1/2	.020	59014	94979	95024	95069
3/8	3/8	1	2-1/2	.030	59015	94980	95025	95070
3/8	3/8	1	2-1/2	.045	59126	95455	95477	95499
3/8	3/8	1	2-1/2	.060	59127	95456	95478	95500
1/2	1/2	1	3	.015	59128	95457	95479	95501
1/2	1/2	1	3	.020	59019	94984	95029	95074
1/2	1/2	1	3	.030	59020	94985	95030	95075
1/2	1/2	1	3	.045	59129	95458	95480	95502
1/2	1/2	1	3	.060	59022	94987	95032	95077
1/2	1/2	1	3	.090	59130	95459	95481	95503
1/2	1/2	1	3	.125	59131	95460	95482	95504
5/8	5/8	1-1/4	3-1/2	.015	59132	95461	95483	95505
5/8	5/8	1-1/4	3-1/2	.020	59026	94991	95036	95081
5/8	5/8	1-1/4	3-1/2	.030	59027	94992	95037	95082
5/8	5/8	1-1/4	3-1/2	.045	59133	95462	95484	95506
5/8	5/8	1-1/4	3-1/2	.060	59029	94994	95039	95084
5/8	5/8	1-1/4	3-1/2	.090	59030	94995	95040	95085
3/4	3/4	1-1/2	4	.015	59134	95463	95485	95507
3/4	3/4	1-1/2	4	.020	59032	94997	95042	95087
3/4	3/4	1-1/2	4	.030	59033	94998	95043	95088
3/4	3/4	1-1/2	4	.045	59135	95464	95486	95508
3/4	3/4	1-1/2	4	.060	59035	95000	95045	95090
3/4	3/4	1-1/2	4	.090	59036	95001	95046	95091
3/4	3/4	1-1/2	4	.125	59037	95002	95047	95092
1	1	1-1/2	4	.015	59136	95465	95487	95509
1	1	1-1/2	4	.020	59039	95004	95049	95094
1	1	1-1/2	4	.030	59040	95005	95050	95095
1	1	1-1/2	4	.045	59137	95466	95488	95510
1	1	1-1/2	4	.060	59042	95007	95052	95097
1	1	1-1/2	4	.090	59043	95008	95053	95098
1	1	1-1/2	4	.125	59044	95009	95054	95099

Solid Carbide 4-Flute Ball Nose Single End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

List No. 5942 Regular Length

List No. 5957 Medium Length & Long Length

List No. 5953 Extra Long Length & Extension Length

(See Next Page)

List No. 5942 Regular Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/64	1/8	3/64	1-1/2	58201	91097	—	91094
1/32	1/8	1/8	1-1/2	58202	91098	—	91095
3/64	1/8	1/8	1-1/2	58203	91099	—	91096
1/16	1/8	3/16	1-1/2	58204	91100	91123	91146
5/64	1/8	3/16	1-1/2	58205	91101	91124	91147
3/32	1/8	3/8	1-1/2	58206	91102	91125	91148
7/64	1/8	3/8	1-1/2	58207	91103	91126	91149
1/8	1/8	1/2	1-1/2	58208	91104	91127	91150
9/64	3/16	9/16	2	58209	91105	91128	91151
5/32	3/16	9/16	2	58210	91106	91129	91152
11/64	3/16	5/8	2	58211	91107	91130	91153
3/16	3/16	5/8	2	58212	91108	91131	91154
13/64	1/4	5/8	2-1/2	58213	91109	91132	91155
7/32	1/4	5/8	2-1/2	58214	91110	91133	91156
15/64	1/4	3/4	2-1/2	57152	92596	92625	92644
1/4	1/4	3/4	2-1/2	58216	91111	91134	91157
17/64	5/16	3/4	2-1/2	57153	92597	92626	92645
9/32	5/16	3/4	2-1/2	58218	91112	91135	91158
19/64	5/16	13/16	2-1/2	57154	92598	92627	92646
5/16	5/16	13/16	2-1/2	58220	91113	91136	91159
21/64	3/8	1	2-1/2	57155	92599	92628	92647
11/32	3/8	1	2-1/2	57156	92617	92629	92648
23/64	3/8	1	2-1/2	57157	92618	92637	92649
3/8	3/8	1	2-1/2	58224	91114	91137	91160
25/64	7/16	1	2-3/4	57183	92619	92638	92657
13/32	7/16	1	2-3/4	57184	92620	92639	92658
27/64	7/16	1	2-3/4	57185	92621	92640	92659
7/16	7/16	1	2-3/4	58228	91115	91138	91161
29/64	1/2	1	3	57186	92622	92641	93110
15/32	1/2	1	3	57187	92623	92642	93111
31/64	1/2	1	3	57188	92624	92643	93112
1/2	1/2	1	3	58232	91116	91139	91162
9/16	9/16	1-1/4	3-1/2	58236	91117	91140	91163
5/8	5/8	1-1/4	3-1/2	58240	91118	91141	91164
11/16	3/4	1-1/2	4	58244	91119	91142	91165
3/4	3/4	1-1/2	4	58248	91120	91143	91166
7/8	7/8	1-1/2	4	58256	91121	91144	91167
1	1	1-1/2	4	58264	91122	91145	91168

List No. 5957 Medium Length & Long Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	3/4	2-1/4	58838	91170	91180	91190
5/32	3/16	3/4	2-1/2	57189	93113	93115	93117
3/16	3/16	3/4	2-1/2	58840	91171	91181	91191
1/4	1/4	1-1/8	3	58844	91172	91182	91192
5/16	5/16	1-1/8	3	58850	91173	91183	91193
3/8	3/8	1-1/8	3	58854	91174	91184	91194
7/16	7/16	2	4	58858	91175	91185	91195
1/2	1/2	1-1/2	4	57190	93114	93116	93118
1/2	1/2	2	4	58862	91176	91186	91196
5/8	5/8	2-1/4	5	58870	91177	91187	91197
3/4	3/4	2-1/4	5	58878	91178	91188	91198
1	1	2-1/4	5	58894	91179	91189	91199

(continued)

Solid Carbide 4-Flute Ball Nose Single End Mills

(continued)

List No. 5953 Extra Long Length & Extension Length

List No. 5953 Extra Long Length & Extension Length

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/8	1/8	1	3	58708	91200	91210	91220
5/32	3/16	1-1/8	3	57191	93119	93129	93139
3/16	3/16	1-1/8	3	58712	91201	91211	91221
3/16	3/16	1	4	57192	93120	93130	93140
1/4	1/4	1	4	57193	93121	93131	93141
1/4	1/4	1-1/2	4	58716	91202	91212	91222
1/4	1/4	1-1/2	6	57194	93122	93132	93142
5/16	5/16	1-5/8	4	58720	91203	91213	91223
5/16	5/16	1-1/2	6	57195	93123	93133	93143
3/8	3/8	1-3/4	4	58724	91204	91214	91224
3/8	3/8	1-1/2	6	57196	93124	93134	93144
7/16	7/16	3	6	58728	91205	91215	91225
1/2	1/2	1-1/2	6	57197	93125	93135	93145
1/2	1/2	3	6	58732	91206	91216	91226
5/8	5/8	1-1/2	6	57198	93126	93136	93146
5/8	5/8	3	6	58740	91207	91217	91227
3/4	3/4	1-1/2	6	57199	93127	93137	93147
3/4	3/4	3	6	58748	91208	91218	91228
1	1	1-1/2	6	57200	93128	93138	93148
1	1	3	6	58764	91209	91219	91229

Solid Carbide 4-Flute Stub Length Ball Nose Single End Mills

Micrograin Carbide — Center Cutting
30° Helix Angle

List No. 5976 Stub Length

Speeds & Feeds: Page 71

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool defection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

TOLERANCES

Size to 1/4"	+.000 - .002
5/16" to 3/4"	+.000 - .003
Shank Dia.	+.0000 - .0005

STANDARD PACKAGE
All sizes – 1 each

Stub Length for high rigidity & minimal tool deflection.

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	ALTiN COATED EDP NO.
1/32	1/8	1/16	1-1/2	57091	92866
3/64	1/8	3/32	1-1/2	57092	92867
1/16	1/8	1/8	1-1/2	57070	92845
5/64	1/8	5/32	1-1/2	57099	92376
3/32	1/8	3/16	1-1/2	57071	92846
7/64	1/8	7/32	1-1/2	57100	92377
1/8	1/8	1/4	1-1/2	57072	92847
9/64	3/16	9/32	2	57101	92378
5/32	3/16	5/16	2	57073	92848
11/64	3/16	5/16	2	57102	92379
3/16	3/16	3/8	2	57074	92849
13/64	1/4	3/8	2	57103	92380
7/32	1/4	7/16	2	57075	92850
15/64	1/4	7/16	2	57104	92381
1/4	1/4	1/2	2	57076	92851
5/16	5/16	1/2	2	57077	92852
3/8	3/8	5/8	2	57078	92853
7/16	7/16	5/8	2-1/2	57079	92854
1/2	1/2	5/8	2-1/2	57080	92855
5/8	5/8	3/4	3	57081	92856
3/4	3/4	1	3	57082	92857

Solid Carbide Metric 4-Flute Ball Nose Single End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool deflection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

List No. 5965

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

TOLERANCE
All Sizes +.000mm/-.051mm
Shank Dia. +.000mm/-.013mm

STANDARD PACKAGE
All sizes – 1 each

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1 mm	3 mm	3 mm	39 mm	59440	91240	91260	91280
1.5 mm	3 mm	5 mm	39 mm	59441	91241	91261	91281
2 mm	3 mm	7 mm	39 mm	59442	91242	91262	91282
2.5 mm	3 mm	7 mm	39 mm	59443	91243	91263	91283
3 mm	3 mm	9 mm	39 mm	59444	91244	91264	91284
3.5 mm	4 mm	12 mm	51 mm	59445	91245	91265	91285
4 mm	4 mm	14 mm	51 mm	59446	91246	91266	91286
4.5 mm	5 mm	14 mm	51 mm	59447	91247	91267	91287
5 mm	5 mm	16 mm	51 mm	59448	91248	91268	91288
6 mm	6 mm	19 mm	64 mm	59449	91249	91269	91289
7 mm	8 mm	19 mm	64 mm	59450	91250	91270	91290
8 mm	8 mm	21 mm	64 mm	59451	91251	91271	91291
9 mm	10 mm	22 mm	70 mm	59452	91252	91272	91292
10 mm	10 mm	22 mm	70 mm	59453	91253	91273	91293
11 mm	11 mm	25 mm	70 mm	59454	91254	91274	91294
12 mm	12 mm	25 mm	76 mm	59455	91255	91275	91295
14 mm	14 mm	31 mm	89 mm	59457	91256	91276	91296
16 mm	16 mm	32 mm	89 mm	59458	91257	91277	91297
18 mm	18 mm	35 mm	102 mm	59459	91258	91278	91298
20 mm	20 mm	38 mm	102 mm	59460	91259	91279	91299

Solid Carbide 4-Flute Stub Length Ball Nose Double End Mills

Micrograin Carbide – Center Cutting 30° Helix Angle

TOLERANCES
Size to 1/4" +.000 - .002
9/32" to 1" +.000 - .003
Shank Dia. +.0000 - .0005

STANDARD PACKAGE
All sizes – 1 each

List No. 5949

4-Flute end mills with a greater core thickness offer increased tool strength and reduced tool deflection. 4-Flutes also reduce chip load per tooth for the milling of tougher materials, greater wear resistance and improved surface finish. **Ball Nose** mills are recommended for milling die cavities, fillets, radius bottom slots and special contours. **Center Cutting** end allows for plunge cutting like a drill into solid material.

DIA.	SHANK DIA.	LOC	OAL	UNCOATED EDP NO.	TiN COATED EDP NO.	TiCN COATED EDP NO.	ALTiN COATED EDP NO.
1/16	1/8	1/8	1½	58354	91300	91311	91322
3/32	1/8	3/16	1½	58356	91301	91312	91323
1/8	1/8	1/4	1½	58358	91302	91313	91324
5/32	3/16	5/16	2	58360	91303	91314	91325
3/16	3/16	3/8	2	58362	91304	91315	91326
7/32	1/4	1/2	2½	58364	91305	91316	91327
1/4	1/4	1/2	2½	58366	91306	91317	91328
5/16	5/16	1/2	2½	58370	91307	91318	91329
3/8	3/8	9/16	2½	58374	91308	91319	91330
7/16	7/16	9/16	3	58378	91309	91320	91331
1/2	1/2	5/8	3	58382	91310	91321	91332

Solid Carbide Roughing / Finishing Single End Mills

Micrograin Carbide – Center Cutting
3-Flute & 4-Flute – Corner Radius

Chipbreaker geometry permits high feed rates in roughing operations while producing a finish near that produced by standard end mills. Benefits include smaller more manageable chips and reduced cutting forces, chatter, deflection & horsepower required. Increased productivity with longer tool life. Recommended for aggressive milling in stainless steels, difficult-to-machine materials and wide range of other materials.

Corner Radius strengthens the end mill corners to minimize chipping especially in tougher milling applications. **Corner Radius** also used when the finished part requires a radius.

Aluminum Titanium Nitride (ALTiN) Coating is an excellent all around coating that increases surface hardness, wear resistance, heat resistance, chip flow and resist chip welding. Especially recommended for abrasive and hard-to-machine materials that generate higher cutting temperatures.

Fewer flutes provide increased chip capacity. Especially recommended for slotting & pocket milling applications.

List No. 5928 3-Flute Corner Radius

List No. 5929 4-Flute Corner Radius

TOLERANCES

Dia.	+.000 - .002
Shank Dia.	+.0000 - .0005

Also Available in Ball Nose
Please inquire

3-Flute

DIA.	SHANK DIA.	LOC	OAL	CORNER RADIUS	LIST 5928 UNCOATED EDP NO.	LIST 5928T ALTiN COATED EDP NO.
1/8	1/8	1/2	1-1/2	.005 - .010	57455	92350
3/16	3/16	5/8	2	.005 - .010	57456	92351
1/4	1/4	3/4	2-1/2	.005 - .010	57457	92352
5/16	5/16	13/16	2-1/2	.005 - .010	57458	92353
3/8	3/8	1	2-1/2	.010 - .015	57459	92354
7/16	7/16	1	2-3/4	.010 - .015	57460	92355
1/2	1/2	1	3	.010 - .015	57461	92356
5/8	5/8	1-1/4	3-1/2	.015 - .020	57462	92357
3/4	3/4	1-1/2	4	.015 - .020	57463	92358
1	1	1-1/2	4	.015 - .020	57464	92359

4-Flute

DIA.	SHANK DIA.	LOC	OAL	CORNER RADIUS	LIST 5929 UNCOATED EDP NO.	LIST 5929T ALTiN COATED EDP NO.
1/8	1/8	1/2	1-1/2	.005 - .010	57465	92360
3/16	3/16	5/8	2	.005 - .010	57466	92361
1/4	1/4	3/4	2-1/2	.005 - .010	57467	92362
5/16	5/16	13/16	2-1/2	.005 - .010	57468	92363
3/8	3/8	1	2-1/2	.010 - .015	57469	92364
7/16	7/16	1	2-3/4	.010 - .015	57470	92365
1/2	1/2	1	3	.010 - .015	57471	92366
5/8	5/8	1-1/4	3-1/2	.015 - .020	57472	92367
3/4	3/4	1-1/2	4	.015 - .020	57473	92368
1	1	1-1/2	4	.015 - .020	57474	92369

Tool Coatings Also Available

Solid Carbide Fine Pitch Roughing End Mills

Micrograin Carbide – Center Cutting
20° Helix Angle – Weldon Flats

List No. 5971 — Bright Finish

List No. 5971T — ALTiN Coated

Roughing end mills feature a chp breaker type cutting edge for heavier cuts and higher speeds and feeds. **Fine Pitch Roughing End Mills** are recommended for tougher applications including harder, higher tensile strength materials up to 50Rc hardness and materials prone to work-hardening. **Recommended for** Alloy Steels, Mold Steels, Nickel Alloys and Work-Hardening Stainless Steels.

Solid Carbide offers excellent rigidity, hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life.

ALTiN - Aluminum Titanium Nitride Coating increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding.

Unequal Flute Spacing reduces chatter for increased feed rates, smoother cutting and improved tool life.

Weldon Flat on Shank

TOLERANCES
Dia. +.000 - .003
Shank Dia. +.000 - .0004

STANDARD PACKAGE
All sizes – 1 each

DIA.	SHANK DIA.	LOC	OAL	CORNER CHAMFER	NO. OF FLUTES	LIST 5971 UNCOATED EDP NO	LIST 5971T ALTiN COATED EDP NO.
1/4	1/4	1/2	2	.020	4	56553	90664
1/4	1/4	3/4	2-1/2	.020	4	56554	90665
5/16	5/16	1/2	2	.020	4	56555	90666
5/16	5/16	13/16	2-1/2	.020	4	56556	90667
3/8	3/8	5/8	2	.020	4	56557	90668
3/8	3/8	1	2-1/2	.020	4	56558	90669
7/16	7/16	1	2-3/4	.020	4	56559	90670
1/2	1/2	5/8	2-1/2	.025	4	56560	90671
1/2	1/2	1-1/4	3	.025	4	56561	90672
1/2	1/2	2	4	.025	4	56562	90673
5/8	5/8	3/4	3	.025	4	56563	90674
5/8	5/8	1-5/8	4	.025	4	56564	90675
3/4	3/4	1	3-1/2	.025	4	56565	90676
3/4	3/4	1-3/4	4	.025	4	56566	90677
3/4	3/4	2-1/4	5	.025	4	56567	90678
3/4	3/4	3	6	.025	4	56568	90679
1	1	2	5	.025	5	56569	90680
1	1	2-5/8	5	.025	5	56570	90681
1	1	3-1/4	6	.025	5	56571	90682
1	1	4-1/8	7	.025	5	56572	90683

CUTTING FLUIDS

Coolants and lubricants offer many benefits including reduced friction and heat, enhanced chip removal, improved accuracy and surface finish, higher speeds and feeds, corrosion protection and increased tool life.

Proper selection and application of cutting fluids is critical to optimizing machining applications. **Please consult your cutting fluids supplier for advice on your specific machining application.**

Solid Carbide Medium Pitch Roughing End Mills

Micrograin Carbide – Center Cutting
37° Helix Angle – Weldon Flats

List No. 5977 — Bright Finish

List No. 5977T — ALTiN Coated

Roughing end mills feature a chp breaker type cutting edge for heavier cuts and higher speeds and feeds. **Medium Pitch Roughing End Mills** are recommended for low to medium hardness materials under 40Rc hardness. **37° Helix Angle** for rapid chip evacuation and higher feed rates. **Recommended for** Carbon Steels, Tool Steels, Free Machining Stainless Steels and other materials.

Solid Carbide offers excellent rigidity, hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life.

ALTiN - Aluminum Titanium Nitride Coating increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding.

Unequal Flute Spacing reduces chatter for increased feed rates, smoother cutting and improved tool life.

Weldon Flat on Shank

TOLERANCES
Dia. +.000 - .003
Shank Dia. +.000 - .0004

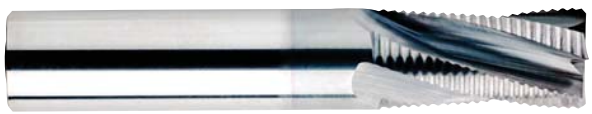
STANDARD PACKAGE
All sizes – 1 each

DIA.	SHANK DIA.	LOC	OAL	CORNER CHAMFER	NO. OF FLUTES	LIST 5977 UNCOATED EDP NO	LIST 5977T ALTiN COATED EDP NO.
3/16	3/16	5/8	2	.020	3	56573	90684
1/4	1/4	3/4	2-1/2	.020	4	56574	90685
5/16	5/16	3/4	2-1/2	.020	4	56575	90686
3/8	3/8	7/8	2-1/2	.020	4	56576	90687
7/16	7/16	1	2-3/4	.025	4	56577	90688
1/2	1/2	1-1/4	3	.025	4	56578	90689
5/8	5/8	1-5/8	3-1/2	.025	4	56579	90690
3/4	3/4	1-5/8	4	.025	4	56580	90691
1	1	1-3/4	4	.025	5	56581	90692

Solid Carbide Four-Flute Medium Pitch Roughing End Mills

Micrograin Carbide – Center Cutting
20° Helix Angle

List No. 5972G — TiN Coated



List No. 5972C — TiCN Coated

Roughing end mills feature a chip breaker type cutting edge for heavier cuts, higher speeds and feeds and greatly increased productivity. Recommended for a wide range of materials including mild steel, steel alloys, stainless steel, cast iron and many other applications. **Center Cutting** end allows for plunge cutting like a drill into solid material.

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life. **Tool Coatings** further enhance milling performance in a wide range of applications.

STANDARD PACKAGE
All sizes – 1 each

DIA.	SHANK DIA.	LOC	OAL	NO. OF FLUTES	TiN COATED EDP NO.	TiCN COATED EDP NO.
¼	¼	¾	2½	4	56760	56780
5/16	5/16	13/16	2½	4	56761	56781
⅜	⅜	1	2½	4	56762	56782
½	½	1¼	3	4	56764	56784
⅝	⅝	1¼	3½	4	56765	56785
¾	¾	1½	4	4	56766	56786

Solid Carbide Chamfer Mills

Micrograin Carbide
60°, 82° & 90° Point Angle
Single End & Double End

Recommended for deburring, chamfering and beveling in a wide range of materials. Can also be used for spotting and countersinking.

Solid Carbide offers excellent rigidity, hardness, wear resistance and heat resistance for higher cutting speeds and longer tool life.

ALTiN – Aluminum Titanium Nitride coating increases surface hardness, wear resistance, heat resistance, chip flow and resists chip welding. For a wide range of materials including abrasive and tough materials that generate higher cutting temperatures.

List No. 5997 Single End 2-Flute & 4-Flute

List No. 5997 Double End 2-Flute & 4-Flute

TOLERANCES

Dia.	+.0000 - .0005
Shank Dia.	+.0000 - .0005

2-Flute Single End

DIA.	SHANK DIA.	OAL	60° INCL. ANGLE UNCOATED EDP NO.	60° INCL. ANGLE ALTiN COATED EDP NO.	82° INCL. ANGLE UNCOATED EDP NO.	82° INCL. ANGLE ALTiN COATED EDP NO.	90° INCL. ANGLE UNCOATED EDP NO.	90° INCL. ANGLE ALTiN COATED EDP NO.
1/8	1/8	1-1/2	59151	95524	59157	95530	59163	95536
3/16	3/16	2	59152	95525	59158	95531	59164	95537
1/4	1/4	2-1/2	59153	95526	59159	95532	59165	95538
3/8	3/8	2-1/2	59154	95527	59160	95533	59166	95539
1/2	1/2	3	59155	95528	59161	95534	59167	95540
3/4	3/4	3	59156	95529	59162	95535	59168	95541

2-Flute Double End

DIA.	SHANK DIA.	OAL	60° INCL. ANGLE UNCOATED EDP NO.	60° INCL. ANGLE ALTiN COATED EDP NO.	90° INCL. ANGLE UNCOATED EDP NO.	90° INCL. ANGLE ALTiN COATED EDP NO.
1/8	1/8	1-1/2	59169	95542	59174	95547
3/16	3/16	2	59170	95543	59175	95548
1/4	1/4	2-1/2	59171	95544	59176	95549
3/8	3/8	2-1/2	59172	95545	59177	95550
1/2	1/2	3	59173	95546	59178	95551

4-Flute Single End

DIA.	SHANK DIA.	OAL	60° INCL. ANGLE UNCOATED EDP NO.	60° INCL. ANGLE ALTiN COATED EDP NO.	82° INCL. ANGLE UNCOATED EDP NO.	82° INCL. ANGLE ALTiN COATED EDP NO.	90° INCL. ANGLE UNCOATED EDP NO.	90° INCL. ANGLE ALTiN COATED EDP NO.
1/8	1/8	1-1/2	59179	95552	59185	95558	59191	95564
3/16	3/16	2	59180	95553	59186	95559	59192	95565
1/4	1/4	2-1/2	59181	95554	59187	95560	59193	95566
3/8	3/8	2-1/2	59182	95555	59188	95561	59194	95567
1/2	1/2	3	59183	95556	59189	95562	59195	95568
3/4	3/4	3	59184	95557	59190	95563	59196	95569

4-Flute Double End

DIA.	SHANK DIA.	OAL	90° INCL. ANGLE UNCOATED EDP NO.	90° INCL. ANGLE ALTiN COATED EDP NO.
1/8	1/8	1-1/2	59197	95570
3/16	3/16	2	59198	95571
1/4	1/4	2-1/2	59199	95572
3/8	3/8	2-1/2	59200	95573
1/2	1/2	3	59201	95574

CUTTING FLUIDS provide many benefits including reduced friction and heat, enhanced chip removal, improved accuracy and surface finish, higher speeds and feeds, corrosion protection and increased tool life. **Please consult your cutting fluids supplier for advice on your specifc machining application.**

Standard Solid Carbide End Mill Speed and Feed Recommendations

WORKPIECE MATERIAL	TYPE OF CUT	SURFACE SPEED (SFM)	FEED PER TOOTH BY END MILL DIAMETER				
			1/8"	1/4"	1/2"	3/4"	1"
Low Carbon Steel ≤ 40 RC 1018, 12L12, 1108, 1213	Profile	275	0.0006	0.0012	0.0025	0.0037	0.0050
	Slot	220	0.0005	0.0010	0.0020	0.0030	0.0040
Medium Carbon Steel ≤ 40 Rc 1040, 1140, 4340, 8640	Profile	250	0.0006	0.0012	0.0025	0.0037	0.0050
	Slot	200	0.0005	0.0010	0.0020	0.0030	0.0040
Tool and Die Steels ≤ 40 Rc P20, A2, D2, H12	Profile	250	0.0006	0.0012	0.0025	0.0037	0.0050
	Slot	200	0.0005	0.0010	0.0020	0.0030	0.0040
Tool and Die Steels > 40 & ≤ 50 Rc P20, A2, D2, H12	Profile	200	0.0003	0.0007	0.0015	0.0022	0.0030
	Slot	160	0.0002	0.0006	0.0012	0.0018	0.0024
Free Machining Stainless Steels 303, 410, 416, 440F	Profile	250	0.0005	0.0010	0.0020	0.0030	0.0040
	Slot	200	0.0004	0.0008	0.0016	0.0024	0.0032
Moderate Machining Stainless Steels 304, 316	Profile	225	0.0003	0.0007	0.0015	0.0022	0.0030
	Slot	180	0.0002	0.0006	0.0012	0.0018	0.0024
Difficult Machining Stainless Steels 17-4PH, 316L, AM350	Profile	150	0.0002	0.0006	0.0012	0.0018	0.0024
	Slot	120	0.0002	0.0004	0.0010	0.0014	0.0019
Cast Iron Gray	Profile	300	0.0005	0.0010	0.0020	0.0030	0.0040
	Slot	240	0.0004	0.0008	0.0016	0.0024	0.0032
Cast Iron Ductile	Profile	250	0.0005	0.0010	0.0020	0.0030	0.0040
	Slot	200	0.0004	0.0008	0.0016	0.0024	0.0032
Cast Iron Malleable	Profile	200	0.0005	0.0011	0.0022	0.0033	0.0044
	Slot	160	0.0004	0.0009	0.0018	0.0026	0.0035
Titanium Alloys Ti-6Al-4V, ASTM B367 Grades C-3, C-4	Profile	125	0.0005	0.0010	0.0020	0.0040	0.0060
	Slot	100	0.0004	0.0008	0.0016	0.0032	0.0048
High Temperature Alloys Inconel, Hastelloy, Waspaloy	Profile	90	0.0005	0.0011	0.0022	0.0033	0.0044
	Slot	70	0.0004	0.0009	0.0018	0.0026	0.0035
Aluminum Alloys 2025, 6061, A140, 514.0	Profile	650	0.0010	0.0020	0.0040	0.0060	0.0080
	Slot	520	0.0008	0.0016	0.0032	0.0048	0.0064
Copper Alloys Brass and Bronze	Profile	300	0.0008	0.0015	0.0030	0.0047	0.0060
	Slot	240	0.0006	0.0012	0.0024	0.0038	0.0048
Composites & Plastics	Profile	375	0.0009	0.0018	0.0035	0.0055	0.0070
	Slot	300	0.0007	0.0014	0.0028	0.0044	0.0056
Magnesium Alloys AZ80A, HM12A, AM60A, ZE41A	Profile	450	0.0010	0.0020	0.0040	0.0060	0.0080
	Slot	360	0.0008	0.0016	0.0032	0.0048	0.0064
Graphite	Profile	450	0.0009	0.0018	0.0035	0.0055	0.0070
	Slot	360	0.0007	0.0014	0.0028	0.0044	0.0056

SPEEDS and FEEDS are suggested starting points and may be increased or decreased depending on actual material and machining conditions.

In general, use lower speeds and feeds for hard and difficult-to-machine materials. Use higher speeds and feeds for easy-to-machine materials. Use higher surface speed for lighter cuts, smaller tools, and better finishes. Higher feed rates can improve tool life and performance in softer materials and more abrasive materials.

For long and extra long tools reduce feed rates by 50%.

For TiN and TiCN coated tools, increase speed by up to 20% with the feed rate unchanged. For ALTiN coated tools, speeds may be increased by up to 50% with the feed rate unchanged.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

Solid Carbide 2-Flute Miniature Square End Single End Mills

Micrograin Carbide – Center Cutting – 30° Helix Angle
Stub Length & Regular Length
For materials less than 48Rc hardness
Dia. Tolerance +.0005" / -.0005"

List No. 5914 2-Flute Square End

ALTiN – Aluminum Titanium Nitride Coating for abrasive and hard-to-machine materials

DLC - Amorphous Diamond-Like Carbon for graphite and some non-ferrous materials.

Speeds & Feeds: Page 88

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.005	1/8	.008	1.5x	1-1/2	Stub	45465	—	—
.005	1/8	.015	3x	1-1/2	Regular	45466	96534	—
.006	1/8	.009	1.5x	1-1/2	Stub	45467	—	—
.006	1/8	.018	3x	1-1/2	Regular	45468	—	—
.007	1/8	.011	1.5x	1-1/2	Stub	45469	—	—
.007	1/8	.021	3x	1-1/2	Regular	45470	—	—
.008	1/8	.012	1.5x	1-1/2	Stub	45471	—	—
.008	1/8	.024	3x	1-1/2	Regular	45472	—	—
.009	1/8	.014	1.5x	1-1/2	Stub	45473	—	—
.009	1/8	.027	3x	1-1/2	Regular	45474	—	—
.010	1/8	.015	1.5x	1-1/2	Stub	45475	96535	—
.010	1/8	.030	3x	1-1/2	Regular	45476	96536	96625
.011	1/8	.017	1.5x	1-1/2	Stub	45477	—	—
.011	1/8	.033	3x	1-1/2	Regular	45478	—	—
.012	1/8	.018	1.5x	1-1/2	Stub	45479	—	—
.012	1/8	.036	3x	1-1/2	Regular	45480	96537	—
.013	1/8	.020	1.5x	1-1/2	Stub	45481	—	—
.013	1/8	.039	3x	1-1/2	Regular	45482	—	—
.014	1/8	.021	1.5x	1-1/2	Stub	45483	—	—
.014	1/8	.042	3x	1-1/2	Regular	45484	—	—
.015 (1/64)	1/8	.023	1.5x	1-1/2	Stub	45485	96538	—
.015 (1/64)	1/8	.045	3x	1-1/2	Regular	45486	96539	96626
.016	1/8	.024	1.5x	1-1/2	Stub	45487	—	—
.016	1/8	.048	3x	1-1/2	Regular	45488	—	—
.017	1/8	.026	1.5x	1-1/2	Stub	45489	—	—
.017	1/8	.051	3x	1-1/2	Regular	45490	—	—
.018	1/8	.027	1.5x	1-1/2	Stub	45491	—	—
.018	1/8	.054	3x	1-1/2	Regular	45492	96540	—
.019	1/8	.029	1.5x	1-1/2	Stub	45493	—	—
.019	1/8	.057	3x	1-1/2	Regular	45494	—	—
.020	1/8	.030	1.5x	1-1/2	Stub	45495	96541	—
.020	1/8	.060	3x	1-1/2	Regular	45496	96542	96627
.021	1/8	.032	1.5x	1-1/2	Stub	45497	—	—
.021	1/8	.063	3x	1-1/2	Regular	45498	—	—
.022	1/8	.033	1.5x	1-1/2	Stub	45499	—	—
.022	1/8	.066	3x	1-1/2	Regular	45500	—	—
.023	1/8	.035	1.5x	1-1/2	Stub	45501	—	—
.023	1/8	.069	3x	1-1/2	Regular	45502	—	—
.024	1/8	.036	1.5x	1-1/2	Stub	45503	—	—
.024	1/8	.072	3x	1-1/2	Regular	45504	—	—
.025	1/8	.038	1.5x	1-1/2	Stub	45505	96543	—
.025	1/8	.075	3x	1-1/2	Regular	45506	96544	96628
.026	1/8	.039	1.5x	1-1/2	Stub	45507	—	—
.026	1/8	.078	3x	1-1/2	Regular	45508	—	—
.027	1/8	.041	1.5x	1-1/2	Stub	45509	—	—
.027	1/8	.081	3x	1-1/2	Regular	45510	—	—
.028	1/8	.042	1.5x	1-1/2	Stub	45511	—	—
.028	1/8	.084	3x	1-1/2	Regular	45512	—	—
.029	1/8	.044	1.5x	1-1/2	Stub	45513	—	—
.029	1/8	.087	3x	1-1/2	Regular	45514	—	—
.030	1/8	.045	1.5x	1-1/2	Stub	45515	96545	—
.030	1/8	.090	3x	1-1/2	Regular	45516	96546	96629
.031 (1/32)	1/8	.047	1.5x	1-1/2	Stub	45517	96547	—
.031 (1/32)	1/8	.093	3x	1-1/2	Regular	45518	96548	96630
.032	1/8	.048	1.5x	1-1/2	Stub	45519	—	—
.032	1/8	.096	3x	1-1/2	Regular	45520	—	—
.033	1/8	.050	1.5x	1-1/2	Stub	45521	—	—
.033	1/8	.099	3x	1-1/2	Regular	45522	—	—
.034	1/8	.051	1.5x	1-1/2	Stub	45523	—	—
.034	1/8	.102	3x	1-1/2	Regular	45524	—	—

(continued)

Solid Carbide 2-Flute Miniature Square End Single End Mills

List No. 5914 2-Flute Square End

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.035	1/8	.053	1.5x	1-1/2	Stub	45525	96549	—
.035	1/8	.105	3x	1-1/2	Regular	45526	96550	96631
.036	1/8	.054	1.5x	1-1/2	Stub	45527	—	—
.036	1/8	.108	3x	1-1/2	Regular	45528	—	—
.037	1/8	.056	1.5x	1-1/2	Stub	45529	—	—
.037	1/8	.111	3x	1-1/2	Regular	45530	—	—
.038	1/8	.057	1.5x	1-1/2	Stub	45531	—	—
.038	1/8	.114	3x	1-1/2	Regular	45532	—	—
.039	1/8	.059	1.5x	1-1/2	Stub	45533	—	—
.039	1/8	.117	3x	1-1/2	Regular	45534	96551	—
.040	1/8	.060	1.5x	1-1/2	Stub	45535	96552	—
.040	1/8	.120	3x	1-1/2	Regular	45536	96553	96632
.041	1/8	.123	3x	1-1/2	Regular	45537	—	—
.042	1/8	.126	3x	1-1/2	Regular	45538	—	—
.043	1/8	.129	3x	1-1/2	Regular	45539	—	—
.044	1/8	.132	3x	1-1/2	Regular	45540	—	—
.045	1/8	.068	1.5x	1-1/2	Stub	45541	96554	—
.045	1/8	.135	3x	1-1/2	Regular	45542	96555	96633
.046	1/8	.138	3x	1-1/2	Regular	45543	—	—
.047 (3/64)	1/8	.071	1.5x	1-1/2	Stub	45544	96556	—
.047 (3/64)	1/8	.141	3x	1-1/2	Regular	45545	96557	96634
.048	1/8	.144	3x	1-1/2	Regular	45546	—	—
.049	1/8	.147	3x	1-1/2	Regular	45547	—	—
.050	1/8	.074	1.5x	1-1/2	Stub	45548	96558	—
.050	1/8	.150	3x	1-1/2	Regular	45549	96559	96635
.051	1/8	.153	3x	1-1/2	Regular	45550	—	—
.052	1/8	.156	3x	1-1/2	Regular	45551	—	—
.053	1/8	.159	3x	1-1/2	Regular	45552	—	—
.054	1/8	.162	3x	1-1/2	Regular	45553	—	—
.055	1/8	.083	1.5x	1-1/2	Stub	45554	96560	—
.055	1/8	.165	3x	1-1/2	Regular	45555	96561	96636
.056	1/8	.168	3x	1-1/2	Regular	45556	—	—
.057	1/8	.171	3x	1-1/2	Regular	45557	—	—
.058	1/8	.174	3x	1-1/2	Regular	45558	—	—
.059	1/8	.177	3x	1-1/2	Regular	45559	—	—
.060	1/8	.090	1.5x	1-1/2	Stub	45560	96562	—
.060	1/8	.180	3x	1-1/2	Regular	45561	96563	96637
.062 (1/16)	1/8	.093	1.5x	1-1/2	Stub	45562	96564	—
.062 (1/16)	1/8	.186	3x	1-1/2	Regular	45563	96565	96638
.065	1/8	.098	1.5x	1-1/2	Stub	45564	96566	—
.065	1/8	.195	3x	1-1/2	Regular	45565	96567	96639
.070	1/8	.105	1.5x	1-1/2	Stub	45566	96568	—
.070	1/8	.210	3x	1-1/2	Regular	45567	96569	96640
.075	1/8	.113	1.5x	1-1/2	Stub	45568	96570	—
.075	1/8	.225	3x	1-1/2	Regular	45569	96571	—
.078 (5/64)	1/8	.117	1.5x	1-1/2	Stub	45570	96572	—
.078 (5/64)	1/8	.234	3x	1-1/2	Regular	45571	96573	96641
.080	1/8	.120	1.5x	1-1/2	Stub	45572	96574	—
.080	1/8	.240	3x	1-1/2	Regular	45573	96575	96642
.085	1/8	.128	1.5x	1-1/2	Stub	45574	96576	—
.085	1/8	.255	3x	1-1/2	Regular	45575	96577	—
.090	1/8	.135	1.5x	1-1/2	Stub	45576	96578	—
.090	1/8	.270	3x	1-1/2	Regular	45577	96579	96643
.093 (3/32)	1/8	.140	1.5x	1-1/2	Stub	45578	96580	—
.093 (3/32)	1/8	.279	3x	1-1/2	Regular	45579	96581	96644
.095	1/8	.143	1.5x	1-1/2	Stub	45580	96582	—
.095	1/8	.285	3x	1-1/2	Regular	45581	96583	—
.100	1/8	.150	1.5x	1-1/2	Stub	45582	96584	—
.100	1/8	.300	3x	1-1/2	Regular	45583	96585	96645
.105	1/8	.158	1.5x	1-1/2	Stub	45584	96586	—
.105	1/8	.315	3x	1-1/2	Regular	45585	96587	—
.110	1/8	.165	1.5x	1-1/2	Stub	45586	96588	—
.110	1/8	.330	3x	1-1/2	Regular	45587	96589	—
.115	1/8	.173	1.5x	1-1/2	Stub	45588	96590	—
.115	1/8	.345	3x	1-1/2	Regular	45589	96591	—

Solid Carbide 2-Flute Miniature Ball Nose Single End Mills

Micrograin Carbide – Center Cutting – 30° Helix Angle
Stub Length & Regular Length
For materials less than 48Rc hardness
Dia. Tolerance +.0005" / -.0005"

List No. 5915 2-Flute Ball Nose

ALTiN – Aluminum Titanium Nitride Coating for abrasive and hard-to-machine materials

DLC - Amorphous Diamond-Like Carbon for graphite and some non-ferrous materials.

Speeds & Feeds: Page 88

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.005	1/8	.008	1.5x	1-1/2	Stub	45594	—	—
.005	1/8	.015	3x	1-1/2	Regular	45595	—	—
.006	1/8	.009	1.5x	1-1/2	Stub	45596	—	—
.006	1/8	.018	3x	1-1/2	Regular	45597	—	—
.007	1/8	.011	1.5x	1-1/2	Stub	45598	—	—
.007	1/8	.021	3x	1-1/2	Regular	45599	—	—
.008	1/8	.012	1.5x	1-1/2	Stub	45600	—	—
.008	1/8	.024	3x	1-1/2	Regular	45601	—	—
.009	1/8	.014	1.5x	1-1/2	Stub	45602	—	—
.009	1/8	.027	3x	1-1/2	Regular	45603	—	—
.010	1/8	.015	1.5x	1-1/2	Stub	45604	96594	—
.010	1/8	.030	3x	1-1/2	Regular	45605	96595	96649
.011	1/8	.017	1.5x	1-1/2	Stub	45606	—	—
.011	1/8	.033	3x	1-1/2	Regular	45607	—	—
.012	1/8	.018	1.5x	1-1/2	Stub	45608	—	—
.012	1/8	.036	3x	1-1/2	Regular	45609	—	—
.013	1/8	.020	1.5x	1-1/2	Stub	45610	—	—
.013	1/8	.039	3x	1-1/2	Regular	45611	—	—
.014	1/8	.021	1.5x	1-1/2	Stub	45612	—	—
.014	1/8	.042	3x	1-1/2	Regular	45613	—	—
.015 (1/64)	1/8	.023	1.5x	1-1/2	Stub	45614	96596	—
.015 (1/64)	1/8	.045	3x	1-1/2	Regular	45615	96597	96650
.016	1/8	.024	1.5x	1-1/2	Stub	45616	—	—
.016	1/8	.048	3x	1-1/2	Regular	45617	—	—
.017	1/8	.026	1.5x	1-1/2	Stub	45618	—	—
.017	1/8	.051	3x	1-1/2	Regular	45619	—	—
.018	1/8	.027	1.5x	1-1/2	Stub	45620	—	—
.018	1/8	.054	3x	1-1/2	Regular	45621	—	—
.019	1/8	.029	1.5x	1-1/2	Stub	45622	—	—
.019	1/8	.057	3x	1-1/2	Regular	45623	—	—
.020	1/8	.030	1.5x	1-1/2	Stub	45624	96598	—
.020	1/8	.060	3x	1-1/2	Regular	45625	96599	96651
.021	1/8	.032	1.5x	1-1/2	Stub	45626	—	—
.021	1/8	.063	3x	1-1/2	Regular	45627	—	—
.022	1/8	.033	1.5x	1-1/2	Stub	45628	—	—
.022	1/8	.066	3x	1-1/2	Regular	45629	—	—
.023	1/8	.035	1.5x	1-1/2	Stub	45630	—	—
.023	1/8	.069	3x	1-1/2	Regular	45631	—	—
.024	1/8	.036	1.5x	1-1/2	Stub	45632	—	—
.024	1/8	.072	3x	1-1/2	Regular	45633	—	—
.025	1/8	.038	1.5x	1-1/2	Stub	45634	96600	—
.025	1/8	.075	3x	1-1/2	Regular	45635	96601	96652
.026	1/8	.039	1.5x	1-1/2	Stub	45636	—	—
.026	1/8	.078	3x	1-1/2	Regular	45637	—	—
.027	1/8	.041	1.5x	1-1/2	Stub	45638	—	—
.027	1/8	.081	3x	1-1/2	Regular	45639	—	—
.028	1/8	.042	1.5x	1-1/2	Stub	45640	—	—
.028	1/8	.084	3x	1-1/2	Regular	45641	—	—
.029	1/8	.044	1.5x	1-1/2	Stub	45642	—	—
.029	1/8	.087	3x	1-1/2	Regular	45643	—	—
.030	1/8	.045	1.5x	1-1/2	Stub	45644	96602	—
.030	1/8	.090	3x	1-1/2	Regular	45645	96603	96653
.031 (1/32)	1/8	.047	1.5x	1-1/2	Stub	45646	96604	—
.031 (1/32)	1/8	.093	3x	1-1/2	Regular	45647	96605	96654
.032	1/8	.048	1.5x	1-1/2	Stub	45648	—	—
.032	1/8	.096	3x	1-1/2	Regular	45649	—	—

(continued)

Solid Carbide 2-Flute Miniature Ball Nose Single End Mills

List No. 5915 2-Flute Ball Nose

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.033	1/8	.050	1.5x	1-1/2	Stub	45650	—	—
.033	1/8	.099	3x	1-1/2	Regular	45651	—	—
.034	1/8	.051	1.5x	1-1/2	Stub	45652	—	—
.034	1/8	.102	3x	1-1/2	Regular	45653	—	—
.035	1/8	.053	1.5x	1-1/2	Stub	45654	96606	—
.035	1/8	.105	3x	1-1/2	Regular	45655	96607	96655
.036	1/8	.054	1.5x	1-1/2	Stub	45656	—	—
.036	1/8	.108	3x	1-1/2	Regular	45657	—	—
.037	1/8	.056	1.5x	1-1/2	Stub	45658	—	—
.037	1/8	.111	3x	1-1/2	Regular	45659	—	—
.038	1/8	.057	1.5x	1-1/2	Stub	45660	—	—
.038	1/8	.114	3x	1-1/2	Regular	45661	—	—
.039	1/8	.059	1.5x	1-1/2	Stub	45662	—	—
.039	1/8	.117	3x	1-1/2	Regular	45663	—	—
.040	1/8	.060	1.5x	1-1/2	Stub	45664	96608	—
.040	1/8	.120	3x	1-1/2	Regular	45665	96609	96656
.041	1/8	.123	3x	1-1/2	Regular	45666	—	—
.042	1/8	.126	3x	1-1/2	Regular	45667	—	—
.043	1/8	.129	3x	1-1/2	Regular	45668	—	—
.044	1/8	.132	3x	1-1/2	Regular	45669	—	—
.045	1/8	.068	1.5x	1-1/2	Stub	45670	—	—
.045	1/8	.135	3x	1-1/2	Regular	45671	96610	96657
.046	1/8	.138	3x	1-1/2	Regular	45672	—	—
.047 (3/64)	1/8	.071	1.5x	1-1/2	Stub	45673	96611	—
.047 (3/64)	1/8	.141	3x	1-1/2	Regular	45674	96612	96658
.048	1/8	.144	3x	1-1/2	Regular	45675	—	—
.049	1/8	.147	3x	1-1/2	Regular	45676	—	—
.050	1/8	.075	1.5x	1-1/2	Stub	45677	—	—
.050	1/8	.150	3x	1-1/2	Regular	45678	96613	96659
.051	1/8	.153	3x	1-1/2	Regular	45679	—	—
.052	1/8	.156	3x	1-1/2	Regular	45680	—	—
.053	1/8	.159	3x	1-1/2	Regular	45681	—	—
.054	1/8	.162	3x	1-1/2	Regular	45682	—	—
.055	1/8	.083	1.5x	1-1/2	Stub	45683	—	—
.055	1/8	.165	3x	1-1/2	Regular	45684	96614	96660
.056	1/8	.168	3x	1-1/2	Regular	45685	—	—
.057	1/8	.171	3x	1-1/2	Regular	45686	—	—
.058	1/8	.174	3x	1-1/2	Regular	45687	—	—
.059	1/8	.177	3x	1-1/2	Regular	45688	—	—
.060	1/8	.090	1.5x	1-1/2	Stub	45689	—	—
.060	1/8	.180	3x	1-1/2	Regular	45690	96615	96661
.062 (1/16)	1/8	.093	1.5x	1-1/2	Stub	45691	96616	—
.062 (1/16)	1/8	.186	3x	1-1/2	Regular	45692	96617	96662
.065	1/8	.098	1.5x	1-1/2	Stub	45693	—	—
.065	1/8	.195	3x	1-1/2	Regular	45694	—	96663
.070	1/8	.105	1.5x	1-1/2	Stub	45695	—	—
.070	1/8	.210	3x	1-1/2	Regular	45696	—	96664
.075	1/8	.113	1.5x	1-1/2	Stub	45697	—	—
.075	1/8	.225	3x	1-1/2	Regular	45698	—	—
.078 (5/64)	1/8	.117	1.5x	1-1/2	Stub	45699	96618	—
.078 (5/64)	1/8	.234	3x	1-1/2	Regular	45700	96619	96665
.080	1/8	.120	1.5x	1-1/2	Stub	45701	—	—
.080	1/8	.240	3x	1-1/2	Regular	45702	—	96666
.085	1/8	.128	1.5x	1-1/2	Stub	45703	—	—
.085	1/8	.255	3x	1-1/2	Regular	45704	—	—
.090	1/8	.135	1.5x	1-1/2	Stub	45705	—	—
.090	1/8	.270	3x	1-1/2	Regular	45706	—	96667
.093 (3/32)	1/8	.140	1.5x	1-1/2	Stub	45707	96620	—
.093 (3/32)	1/8	.279	3x	1-1/2	Regular	45708	96621	96668
.095	1/8	.143	1.5x	1-1/2	Stub	45709	—	—
.095	1/8	.285	3x	1-1/2	Regular	45710	—	—
.100	1/8	.150	1.5x	1-1/2	Stub	45711	—	—
.100	1/8	.300	3x	1-1/2	Regular	45712	—	96669
.105	1/8	.315	3x	1-1/2	Regular	45713	—	—
.110	1/8	.330	3x	1-1/2	Regular	45714	—	—
.115	1/8	.345	3x	1-1/2	Regular	45715	—	—
.120	1/8	.360	3x	1-1/2	Regular	45716	—	—

Solid Carbide 3-Flute Miniature Square End Single End Mills

Micrograin Carbide – Center Cutting – 30° Helix Angle
For materials less than 48Rc hardness
Dia. Tolerance +.0005" / -.0005"

List No. 5916 3-Flute Square End

ALTiN – Aluminum Titanium Nitride Coating for abrasive and hard-to-machine materials

DLC - Amorphous Diamond-Like Carbon for graphite and some non-ferrous materials.

Speeds & Feeds: Page 88

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.010	1/8	.015	1.5x	.030	3x	2-1/2	45970	97020	—
.010	1/8	.015	1.5x	.050	5x	2-1/2	45971	97021	97480
.010	1/8	.015	1.5x	.080	8x	2-1/2	45972	97022	97481
.010	1/8	.015	1.5x	.125	12x	2-1/2	45973	97023	97482
.010	1/8	.015	1.5x	.150	15x	2-1/2	45974	97024	—
.010	1/8	.050	5x	—	—	2-1/2	45975	97025	97483
.010	1/8	.050	5x	.100	10x	2-1/2	45976	97026	97484
.015 (1/64)	1/8	.022	1.5x	.045	3x	2-1/2	45977	97027	—
.015 (1/64)	1/8	.022	1.5x	.078	5x	2-1/2	45978	97028	97485
.015 (1/64)	1/8	.022	1.5x	.125	8x	2-1/2	45979	97029	97486
.015 (1/64)	1/8	.022	1.5x	.156	10x	2-1/2	45980	97030	—
.015 (1/64)	1/8	.022	1.5x	.225	15x	2-1/2	45981	97031	97487
.015 (1/64)	1/8	.022	1.5x	.270	18x	2-1/2	45982	97032	—
.015 (1/64)	1/8	.022	1.5x	.300	20x	2-1/2	45983	97033	—
.015 (1/64)	1/8	.022	1.5x	.375	25x	2-1/2	45984	97034	—
.015 (1/64)	1/8	.078	5x	—	—	2-1/2	45985	97035	97488
.015 (1/64)	1/8	.078	5x	.150	10x	2-1/2	45986	97036	97489
.015 (1/64)	1/8	.125	8x	—	—	2-1/2	45987	97037	97490
.015 (1/64)	1/8	.187	12x	—	—	2-1/2	45988	97038	—
.020	1/8	.030	1.5x	.100	5x	2-1/2	45989	97039	97491
.020	1/8	.030	1.5x	.160	8x	2-1/2	45990	97040	97492
.020	1/8	.030	1.5x	.200	10x	2-1/2	45991	97041	—
.020	1/8	.030	1.5x	.250	12x	2-1/2	45992	97042	97493
.020	1/8	.030	1.5x	.300	15x	2-1/2	45993	97043	97494
.020	1/8	.030	1.5x	.500	25x	2-1/2	45994	97044	—
.020	1/8	.100	5x	—	—	2-1/2	45995	97045	97495
.020	1/8	.100	5x	.200	10x	2-1/2	45996	97046	97496
.020	1/8	.160	8x	—	—	2-1/2	45997	97047	—
.020	1/8	.250	12x	—	—	2-1/2	45998	97048	—
.025	1/8	.037	1.5x	.075	3x	2-1/2	45999	97049	—
.025	1/8	.037	1.5x	.125	5x	2-1/2	46000	97050	97497
.025	1/8	.037	1.5x	.203	8x	2-1/2	46001	97051	97498
.025	1/8	.037	1.5x	.250	10x	2-1/2	46002	97052	—
.025	1/8	.037	1.5x	.375	15x	2-1/2	46003	97053	97499
.025	1/8	.037	1.5x	.500	20x	2-1/2	46004	97054	—
.025	1/8	.125	5x	—	—	2-1/2	46005	97055	97500
.025	1/8	.125	5x	.250	10x	2-1/2	46006	97056	97501
.025	1/8	.203	8x	—	—	2-1/2	46007	97057	—
.030	1/8	.045	1.5x	.090	3x	2-1/2	46008	97058	—
.030	1/8	.045	1.5x	.156	5x	2-1/2	46009	97059	97502
.030	1/8	.045	1.5x	.250	8x	2-1/2	46010	97060	97503
.030	1/8	.045	1.5x	.312	10x	2-1/2	46011	97061	—
.030	1/8	.045	1.5x	.375	12x	2-1/2	46012	97062	97504
.030	1/8	.150	5x	—	—	2-1/2	46013	97063	97505
.030	1/8	.150	5x	.300	10x	2-1/2	46014	97064	97506
.030	1/8	.250	8x	—	—	2-1/2	46015	97065	—
.031 (1/32)	1/8	.046	1.5x	.093	3x	2-1/2	46016	97066	—
.031 (1/32)	1/8	.046	1.5x	.156	5x	2-1/2	46017	97067	97507
.031 (1/32)	1/8	.046	1.5x	.250	8x	2-1/2	46018	97068	97508
.031 (1/32)	1/8	.046	1.5x	.312	10x	2-1/2	46019	97069	—
.031 (1/32)	1/8	.046	1.5x	.375	12x	2-1/2	46020	97070	97509
.031 (1/32)	1/8	.046	1.5x	.470	15x	2-1/2	46021	97071	97510
.031 (1/32)	1/8	.046	1.5x	.565	18x	2-1/2	46022	97072	—
.031 (1/32)	1/8	.046	1.5x	.625	20x	2-1/2	46023	97073	—
.031 (1/32)	1/8	.046	1.5x	.775	25x	2-1/2	46024	97074	—
.031 (1/32)	1/8	.046	1.5x	.937	30x	2-1/2	46025	—	—
.031 (1/32)	1/8	.156	5x	—	—	2-1/2	46026	97075	97511
.031 (1/32)	1/8	.156	5x	.310	10x	2-1/2	46027	97076	97512

(continued)

Solid Carbide 3-Flute Miniature Square End Single End Mills

List No. 5916 3-Flute Square End

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.031 (1/32)	1/8	.250	8x	—	—	2-1/2	46028	97077	97513
.031 (1/32)	1/8	.312	10x	—	—	2-1/2	46029	97078	—
.031 (1/32)	1/8	.375	12x	—	—	2-1/2	46030	97079	97514
.031 (1/32)	1/8	.470	15x	—	—	2-1/2	46031	97080	—
.035	1/8	.052	1.5x	.105	3x	2-1/2	46032	97081	—
.035	1/8	.052	1.5x	.187	5x	2-1/2	46033	97082	97515
.035	1/8	.052	1.5x	.281	8x	2-1/2	46034	97083	97516
.035	1/8	.052	1.5x	.425	12x	2-1/2	46035	97084	97517
.035	1/8	.052	1.5x	.525	15x	2-1/2	46036	97085	—
.035	1/8	.175	5x	—	—	2-1/2	46037	97086	97518
.035	1/8	.175	5x	.350	10x	2-1/2	46038	97087	97519
.035	1/8	.280	8x	—	—	2-1/2	46039	97088	—
.039	1/8	.059	1.5x	.117	3x	2-1/2	46040	97089	—
.039	1/8	.059	1.5x	.203	5x	2-1/2	46041	97090	—
.039	1/8	.059	1.5x	.325	8x	2-1/2	46042	97091	—
.039	1/8	.059	1.5x	.480	12x	2-1/2	46043	97092	—
.039	1/8	.203	5x	—	—	2-1/2	46044	97093	—
.040	1/8	.060	1.5x	.120	3x	2-1/2	46045	97094	—
.040	1/8	.060	1.5x	.203	5x	2-1/2	46046	97095	97520
.040	1/8	.060	1.5x	.325	8x	2-1/2	46047	97096	97521
.040	1/8	.060	1.5x	.400	10x	2-1/2	46048	97097	—
.040	1/8	.060	1.5x	.480	12x	2-1/2	46049	97098	97522
.040	1/8	.060	1.5x	.600	15x	2-1/2	46050	97099	—
.040	1/8	.060	1.5x	.800	20x	2-1/2	46051	97100	—
.040	1/8	.200	5x	—	—	2-1/2	46052	97101	97523
.040	1/8	.200	5x	.400	10x	2-1/2	46053	97102	97524
.040	1/8	.325	8x	—	—	2-1/2	46054	97103	—
.040	1/8	.480	12x	—	—	2-1/2	46055	97104	—
.045	1/8	.067	1.5x	.450	10x	2-1/2	46056	97105	—
.045	1/8	.067	1.5x	.550	12x	2-1/2	46057	97106	97525
.045	1/8	.067	1.5x	.680	15x	2-1/2	46058	97107	—
.045	1/8	.067	1.5x	.900	20x	2-1/2	46059	97108	—
.045	1/8	.225	5x	—	—	2-1/2	46060	97109	97526
.045	1/8	.375	8x	—	—	2-1/2	46061	97110	—
.045	1/8	.550	12x	—	—	2-1/2	46062	97111	—
.047 (3/64)	1/8	.070	1.5x	.141	3x	2-1/2	46063	97112	—
.047 (3/64)	1/8	.070	1.5x	.250	5x	2-1/2	46064	97113	97527
.047 (3/64)	1/8	.070	1.5x	.375	8x	2-1/2	46065	97114	97528
.047 (3/64)	1/8	.070	1.5x	.480	10x	2-1/2	46066	97115	—
.047 (3/64)	1/8	.070	1.5x	.570	12x	2-1/2	46067	97116	97529
.047 (3/64)	1/8	.070	1.5x	.710	15x	2-1/2	46068	97117	—
.047 (3/64)	1/8	.070	1.5x	.850	18x	2-1/2	46069	97118	—
.047 (3/64)	1/8	.070	1.5x	.950	20x	2-1/2	46070	97119	—
.047 (3/64)	1/8	.250	5x	—	—	2-1/2	46071	97120	97530
.047 (3/64)	1/8	.250	5x	.500	10x	2-1/2	46072	97121	97531
.047 (3/64)	1/8	.375	8x	—	—	2-1/2	46073	97122	97532
.047 (3/64)	1/8	.480	10x	—	—	2-1/2	46074	97123	—
.047 (3/64)	1/8	.570	12x	—	—	2-1/2	46075	97124	97533
.047 (3/64)	1/8	.710	15x	—	—	2-1/2	46076	97125	—
.050	1/8	.075	1.5x	.150	3x	2-1/2	46077	97126	—
.050	1/8	.075	1.5x	.250	5x	2-1/2	46078	97127	97534
.050	1/8	.075	1.5x	.400	8x	2-1/2	46079	97128	97535
.050	1/8	.075	1.5x	.500	10x	2-1/2	46080	97129	—
.050	1/8	.075	1.5x	.600	12x	2-1/2	46081	97130	97536
.050	1/8	.075	1.5x	.750	15x	2-1/2	46082	97131	—
.050	1/8	.300	6x	—	—	2-1/2	46083	97132	97537
.050	1/8	.400	8x	—	—	2-1/2	46084	97133	—
.050	1/8	.600	12x	—	—	2-1/2	46085	97134	—
.055	1/8	.082	1.5x	.165	3x	2-1/2	46086	97135	—
.055	1/8	.082	1.5x	.275	5x	2-1/2	46087	97136	97538
.055	1/8	.082	1.5x	.450	8x	2-1/2	46088	97137	97539
.055	1/8	.082	1.5x	.560	10x	2-1/2	46089	97138	—
.055	1/8	.082	1.5x	.660	12x	2-1/2	46090	97139	97540

(continued)

Solid Carbide 3-Flute Miniature Square End Single End Mills

List No. 5916 3-Flute Square End

Speeds & Feeds: Page 88

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.055	1/8	.082	1.5x	.825	15x	2-1/2	46091	97140	—
.055	1/8	.275	5x	—	—	2-1/2	46092	97141	—
.055	1/8	.385	7x	—	—	2-1/2	46093	97142	97541
.055	1/8	.385	7x	.770	14x	2-1/2	46094	97143	97542
.055	1/8	.660	12x	—	—	2-1/2	46095	97144	—
.060	1/8	.090	1.5x	.180	3x	2-1/2	46096	97145	—
.060	1/8	.090	1.5x	.312	5x	2-1/2	46097	97146	97543
.060	1/8	.090	1.5x	.500	8x	2-1/2	46098	97147	97544
.060	1/8	.090	1.5x	.625	10x	2-1/2	46099	97148	—
.060	1/8	.090	1.5x	.720	12x	2-1/2	46100	97149	97545
.060	1/8	.090	1.5x	.900	15x	2-1/2	46101	97150	—
.060	1/8	.312	5x	—	—	2-1/2	46102	97151	—
.060	1/8	.500	8x	—	—	2-1/2	46103	97152	97546
.062 (1/16)	1/8	.093	1.5x	.186	3x	2-1/2	46104	97153	—
.062 (1/16)	1/8	.093	1.5x	.312	5x	2-1/2	46105	97154	97547
.062 (1/16)	1/8	.093	1.5x	.500	8x	2-1/2	46106	97155	97548
.062 (1/16)	1/8	.093	1.5x	.625	10x	2-1/2	46107	97156	—
.062 (1/16)	1/8	.093	1.5x	.750	12x	2-1/2	46108	97157	97549
.062 (1/16)	1/8	.093	1.5x	.950	15x	2-1/2	46109	97158	97550
.062 (1/16)	1/8	.093	1.5x	1.125	18x	2-1/2	46110	97159	—
.062 (1/16)	1/8	.093	1.5x	1.250	20x	2-1/2	46111	97160	—
.062 (1/16)	1/8	.093	1.5x	1.375	22x	3	46112	97161	—
.062 (1/16)	1/8	.093	1.5x	1.550	25x	3	46113	97162	—
.062 (1/16)	1/8	.312	5x	—	—	2-1/2	46114	97163	97551
.062 (1/16)	1/8	.500	8x	—	—	2-1/2	46115	97164	97552
.062 (1/16)	1/8	.500	8x	1.000	16x	2-1/2	46116	97165	97553
.062 (1/16)	1/8	.625	10x	—	—	2-1/2	46117	97166	—
.062 (1/16)	1/8	.750	12x	—	—	2-1/2	46118	97167	97554
.062 (1/16)	1/8	.950	15x	—	—	2-1/2	46119	97168	97555
.065	1/8	.097	1.5x	.325	5x	2-1/2	46120	97169	—
.065	1/8	.097	1.5x	.530	8x	2-1/2	46121	97170	97556
.065	1/8	.097	1.5x	.800	12x	2-1/2	46122	97171	—
.065	1/8	.325	5x	—	—	2-1/2	46123	97172	—
.065	1/8	.500	8x	—	—	2-1/2	46124	97173	97557
.070	1/8	.105	1.5x	.375	5x	2-1/2	46125	97174	—
.070	1/8	.105	1.5x	.570	8x	2-1/2	46126	97175	97558
.070	1/8	.105	1.5x	.850	12x	2-1/2	46127	97176	—
.070	1/8	.105	1.5x	1.062	15x	2-1/2	46128	97177	—
.070	1/8	.375	5x	—	—	2-1/2	46129	97178	—
.070	1/8	.500	7x	—	—	2-1/2	46130	97179	97559
.070	1/8	.500	7x	1.000	14x	2-1/2	46131	97180	97560
.075	1/8	.112	1.5x	.375	5x	2-1/2	46132	97181	—
.075	1/8	.112	1.5x	.625	8x	2-1/2	46133	97182	97561
.075	1/8	.112	1.5x	.900	12x	2-1/2	46134	97183	—
.075	1/8	.375	5x	—	—	2-1/2	46135	97184	—
.075	1/8	.500	7x	—	—	2-1/2	46136	97185	97562
.078 (5/64)	1/8	.117	1.5x	.234	3x	2-1/2	46137	97186	—
.078 (5/64)	1/8	.117	1.5x	.406	5x	2-1/2	46138	97187	97563
.078 (5/64)	1/8	.117	1.5x	.625	8x	2-1/2	46139	97188	97564
.078 (5/64)	1/8	.117	1.5x	.800	10x	2-1/2	46140	97189	—
.078 (5/64)	1/8	.117	1.5x	.940	12x	2-1/2	46141	97190	97565
.078 (5/64)	1/8	.117	1.5x	1.187	15x	2-1/2	46142	97191	—
.078 (5/64)	1/8	.117	1.5x	1.562	20x	3	46143	97192	—
.078 (5/64)	1/8	.406	5x	—	—	2-1/2	46144	97193	97566
.078 (5/64)	1/8	.500	6x	1.000	12x	2-1/2	46145	97194	97567
.078 (5/64)	1/8	.625	8x	—	—	2-1/2	46146	97195	97568
.078 (5/64)	1/8	.800	10x	—	—	2-1/2	46147	97196	—
.078 (5/64)	1/8	.940	12x	—	—	2-1/2	46148	97197	97569
.078 (5/64)	1/8	1.187	15x	—	—	2-1/2	46149	97198	97570
.080	1/8	.120	1.5x	.406	5x	2-1/2	46150	97199	—
.080	1/8	.120	1.5x	.650	8x	2-1/2	46151	97200	97571
.080	1/8	.120	1.5x	.960	12x	2-1/2	46152	97201	—
.080	1/8	.406	5x	—	—	2-1/2	46153	97202	—

(continued)

Solid Carbide 3-Flute Miniature Square End Single End Mills

List No. 5916 3-Flute Square End

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.080	1/8	.750	9x	—	—	2-1/2	46154	97203	97572
.080	1/8	.750	9x	1.250	15x	2-1/2	46155	97204	97573
.080	1/8	.960	12x	—	—	2-1/2	46156	97205	—
.085	1/8	.127	1.5x	.425	5x	2-1/2	46157	97206	—
.085	1/8	.127	1.5x	.700	8x	2-1/2	46158	97207	97574
.085	1/8	.127	1.5x	1.020	12x	2-1/2	46159	97208	—
.085	1/8	.425	5x	—	—	2-1/2	46160	97209	—
.085	1/8	.750	9x	—	—	2-1/2	46161	97210	97575
.085	1/8	.750	9x	1.250	14x	2-1/2	46162	97211	97576
.090	1/8	.135	1.5x	.450	5x	2-1/2	46163	97212	—
.090	1/8	.135	1.5x	.750	8x	2-1/2	46164	97213	97577
.090	1/8	.135	1.5x	1.080	12x	2-1/2	46165	97214	—
.090	1/8	.450	5x	—	—	2-1/2	46166	97215	—
.090	1/8	.750	8x	—	—	2-1/2	46167	97216	97578
.090	1/8	.750	8x	1.250	13x	2-1/2	46168	97217	97579
.090	1/8	1.080	12x	—	—	2-1/2	46169	97218	—
.093 (3/32)	1/8	.139	1.5x	.279	3x	2-1/2	46170	97219	—
.093 (3/32)	1/8	.139	1.5x	.500	5x	2-1/2	46171	97220	97580
.093 (3/32)	1/8	.139	1.5x	.750	8x	2-1/2	46172	97221	97581
.093 (3/32)	1/8	.139	1.5x	.950	10x	2-1/2	46173	97222	—
.093 (3/32)	1/8	.139	1.5x	1.125	12x	2-1/2	46174	97223	97582
.093 (3/32)	1/8	.139	1.5x	1.400	15x	3	46175	97224	97583
.093 (3/32)	1/8	.139	1.5x	1.675	18x	3	46176	97225	—
.093 (3/32)	1/8	.139	1.5x	1.875	20x	4	46177	97226	—
.093 (3/32)	1/8	.500	5x	—	—	2-1/2	46178	97227	97584
.093 (3/32)	1/8	.750	8x	—	—	2-1/2	46179	97228	97585
.093 (3/32)	1/8	.750	8x	1.250	13x	2-1/2	46180	97229	97586
.093 (3/32)	1/8	.950	10x	—	—	2-1/2	46181	97230	—
.093 (3/32)	1/8	1.125	12x	—	—	2-1/2	46182	97231	97587
.093 (3/32)	1/8	1.400	15x	—	—	3	46183	97232	97588
.095	1/8	.142	1.5x	.500	5x	2-1/2	46184	97233	—
.095	1/8	.142	1.5x	.750	8x	2-1/2	46185	97234	97589
.095	1/8	.142	1.5x	1.150	12x	2-1/2	46186	97235	—
.100	1/8	.150	1.5x	.500	5x	2-1/2	46187	97236	—
.100	1/8	.150	1.5x	.800	8x	2-1/2	46188	97237	97590
.100	1/8	.150	1.5x	1.200	12x	2-1/2	46189	97238	—
.100	1/8	.150	1.5x	1.500	15x	3	46190	97239	—
.100	1/8	.500	5x	—	—	2-1/2	46191	97240	—
.100	1/8	.750	7.5x	—	—	2-1/2	46192	97241	97591
.100	1/8	.750	7.5x	1.250	12x	2-1/2	46193	97242	97592
.100	1/8	1.200	12x	—	—	2-1/2	46194	97243	—
.109 (7/64)	1/8	.163	1.5x	.570	5x	2-1/2	46195	97244	—
.109 (7/64)	1/8	.163	1.5x	.900	8x	2-1/2	46196	97245	—
.109 (7/64)	1/8	.570	5x	—	—	2-1/2	46197	97246	—
.109 (7/64)	1/8	.900	8x	—	—	2-1/2	46198	97247	—
.118	1/8	.177	1.5x	.625	5x	2-1/2	46199	97248	—
.118	1/8	.177	1.5x	.950	8x	2-1/2	46200	97249	—
.118	1/8	.177	1.5x	1.420	12x	3	46201	97250	—
.118	1/8	.625	5x	—	—	2-1/2	46202	97251	—
.118	1/8	.950	8x	—	—	2-1/2	46203	97252	—
.125 (1/8)	1/8	.187	1.5x	.375	3x	2-1/2	46204	97253	—
.125 (1/8)	1/8	.187	1.5x	.625	5x	2-1/2	46205	97254	97593
.125 (1/8)	1/8	.187	1.5x	1.000	8x	2-1/2	46206	97255	97594
.125 (1/8)	1/8	.187	1.5x	1.250	10x	2-1/2	46207	97256	—
.125 (1/8)	1/8	.187	1.5x	1.500	12x	3	46208	97257	97595
.125 (1/8)	1/8	.187	1.5x	1.875	15x	3	46209	97258	—
.125 (1/8)	1/8	.187	1.5x	2.250	18x	4	46210	97259	—
.125 (1/8)	1/8	.187	1.5x	2.500	20x	4	46211	97260	—
.125 (1/8)	1/8	.187	1.5x	3.125	25x	4	46212	97261	—
.125 (1/8)	1/8	.625	5x	—	—	2-1/2	46213	97262	97596
.125 (1/8)	1/8	1.000	8x	—	—	2-1/2	46214	97263	97597
.125 (1/8)	1/8	1.000	8x	1.500	12x	2-1/2	46215	97264	97598
.125 (1/8)	1/8	1.250	10x	—	—	2-1/2	46216	97265	—

(continued)

Solid Carbide 3-Flute Miniature Square End Single End Mills

List No. 5916 3-Flute Square End

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.125 (1/8)	1/8	1.500	12x	—	—	3	46217	97266	97599
.125 (1/8)	1/8	1.875	15x	—	—	3	46218	97267	97600
.140 (9/64)	3/16	.211	1.5x	.750	5x	3	46219	97268	—
.140 (9/64)	3/16	.211	1.5x	1.125	8x	3	46220	97269	—
.156 (5/32)	3/16	.234	1.5x	.470	3x	3	46221	97270	—
.156 (5/32)	3/16	.234	1.5x	.750	5x	3	46222	97271	—
.156 (5/32)	3/16	.234	1.5x	1.250	8x	3	46223	97272	—
.156 (5/32)	3/16	.234	1.5x	1.875	12x	4	46224	97273	—
.156 (5/32)	3/16	.234	1.5x	2.375	15x	4	46225	97274	—
.187 (3/16)	3/16	.281	1.5x	.570	3x	3	46226	97275	—
.187 (3/16)	3/16	.281	1.5x	1.000	5x	3	46227	97276	97601
.187 (3/16)	3/16	.281	1.5x	1.500	8x	3	46228	97277	97602
.187 (3/16)	3/16	.281	1.5x	1.875	10x	4	46229	97278	—
.187 (3/16)	3/16	.281	1.5x	2.250	12x	4	46230	97279	97603
.187 (3/16)	3/16	.281	1.5x	2.812	15x	4	46231	97280	—
.187 (3/16)	3/16	.281	1.5x	3.750	20x	6	46232	97281	—
.187 (3/16)	3/16	1.125	6x	1.625	8x	3	46233	97282	97604
.250 (1/4)	1/4	.375	1.5x	1.250	5x	4	46234	97283	97605
.250 (1/4)	1/4	.375	1.5x	2.000	8x	4	46235	97284	97606
.250 (1/4)	1/4	.375	1.5x	2.500	10x	4	46236	97285	—
.250 (1/4)	1/4	.375	1.5x	3.000	12x	6	46237	97286	97607
.250 (1/4)	1/4	.375	1.5x	3.750	15x	6	46238	97287	—
.250 (1/4)	1/4	1.500	6x	2.000	8x	4	46239	97288	97608

Solid Carbide 3-Flute Miniature Ball Nose Single End Mills

Micrograin Carbide – Center Cutting – 30° Helix Angle
For materials less than 48Rc hardness
Dia. Tolerance +.0005" / -.0005"

List No. 5917 3-Flute Ball Nose

ALTiN – Aluminum Titanium Nitride Coating for abrasive and hard-to-machine materials

DLC - Amorphous Diamond-Like Carbon for graphite and some non-ferrous materials.

Speeds & Feeds: Page 88

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.010	1/8	.015	1.5x	.050	5x	2-1/2	46250	97295	97620
.010	1/8	.015	1.5x	.080	8x	2-1/2	46251	97296	97621
.010	1/8	.015	1.5x	.125	12x	2-1/2	46252	97297	97622
.010	1/8	.015	1.5x	.150	15x	2-1/2	46253	97298	97623
.010	1/8	.050	5x	—	—	2-1/2	46254	97299	97624
.010	1/8	.050	5x	.100	10x	2-1/2	46255	97300	97625
.015 (1/64)	1/8	.022	1.5x	.045	3x	2-1/2	46256	97301	—
.015 (1/64)	1/8	.022	1.5x	.078	5x	2-1/2	46257	97302	97626
.015 (1/64)	1/8	.022	1.5x	.125	8x	2-1/2	46258	97303	97627
.015 (1/64)	1/8	.022	1.5x	.156	10x	2-1/2	46259	97304	97628
.015 (1/64)	1/8	.022	1.5x	.187	12x	2-1/2	46260	97305	97629
.015 (1/64)	1/8	.022	1.5x	.225	15x	2-1/2	46261	97306	97630
.015 (1/64)	1/8	.022	1.5x	.300	20x	2-1/2	46262	97307	97631
.015 (1/64)	1/8	.078	5x	—	—	2-1/2	46263	97308	97632
.015 (1/64)	1/8	.078	5x	.150	10x	2-1/2	46264	97309	97633
.015 (1/64)	1/8	.125	8x	—	—	2-1/2	46265	97310	97634
.020	1/8	.030	1.5x	.060	3x	2-1/2	46266	97311	—
.020	1/8	.030	1.5x	.100	5x	2-1/2	46267	97312	97635
.020	1/8	.030	1.5x	.160	8x	2-1/2	46268	97313	97636
.020	1/8	.030	1.5x	.200	10x	2-1/2	46269	97314	—
.020	1/8	.030	1.5x	.250	12x	2-1/2	46270	97315	97637
.020	1/8	.030	1.5x	.300	15x	2-1/2	46271	97316	97638
.020	1/8	.030	1.5x	.400	20x	2-1/2	46272	97317	—

(continued)

Solid Carbide 3-Flute Miniature Ball Nose Single End Mills

List No. 5917 3-Flute Ball Nose

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.020	1/8	.100	5x	—	—	2-1/2	46273	97318	97639
.020	1/8	.100	5x	.200	10x	2-1/2	46274	97319	97640
.020	1/8	.160	8x	—	—	2-1/2	46275	97320	—
.025	1/8	.037	1.5x	.075	3x	2-1/2	46276	97321	—
.025	1/8	.037	1.5x	.125	5x	2-1/2	46277	97322	97641
.025	1/8	.037	1.5x	.203	8x	2-1/2	46278	97323	97642
.025	1/8	.037	1.5x	.312	12x	2-1/2	46279	97324	97643
.025	1/8	.037	1.5x	.375	15x	2-1/2	46280	97325	97644
.030	1/8	.045	1.5x	.156	5x	2-1/2	46281	97326	97645
.030	1/8	.045	1.5x	.250	8x	2-1/2	46282	97327	97646
.030	1/8	.045	1.5x	.375	12x	2-1/2	46283	97328	97647
.030	1/8	.045	1.5x	.450	15x	2-1/2	46284	97329	—
.030	1/8	.150	5x	—	—	2-1/2	46285	97330	97648
.030	1/8	.150	5x	.300	10x	2-1/2	46286	97331	97649
.031 (1/32)	1/8	.046	1.5x	.093	3x	2-1/2	46287	97332	97650
.031 (1/32)	1/8	.046	1.5x	.156	5x	2-1/2	46288	97333	97651
.031 (1/32)	1/8	.046	1.5x	.250	8x	2-1/2	46289	97334	97652
.031 (1/32)	1/8	.046	1.5x	.312	10x	2-1/2	46290	97335	97653
.031 (1/32)	1/8	.046	1.5x	.375	12x	2-1/2	46291	97336	97654
.031 (1/32)	1/8	.046	1.5x	.470	15x	2-1/2	46292	97337	97655
.031 (1/32)	1/8	.046	1.5x	.565	18x	2-1/2	46293	97338	97656
.031 (1/32)	1/8	.046	1.5x	.625	20x	2-1/2	46294	97339	97657
.031 (1/32)	1/8	.046	1.5x	.775	25x	2-1/2	46295	97340	—
.031 (1/32)	1/8	.156	5x	—	—	2-1/2	46296	97341	97658
.031 (1/32)	1/8	.156	5x	.310	10x	2-1/2	46297	97342	97659
.031 (1/32)	1/8	.250	8x	—	—	2-1/2	46298	97343	97660
.031 (1/32)	1/8	.312	10x	—	—	2-1/2	46299	97344	—
.031 (1/32)	1/8	.375	12x	—	—	2-1/2	46300	97345	97661
.031 (1/32)	1/8	.470	15x	—	—	2-1/2	46301	97346	—
.035	1/8	.052	1.5x	.187	5x	2-1/2	46302	97347	97662
.035	1/8	.052	1.5x	.281	8x	2-1/2	46303	97348	97663
.035	1/8	.175	5x	—	—	2-1/2	46304	97349	97664
.040	1/8	.060	1.5x	.120	3x	2-1/2	46305	97350	—
.040	1/8	.060	1.5x	.203	5x	2-1/2	46306	97351	97665
.040	1/8	.060	1.5x	.325	8x	2-1/2	46307	97352	97666
.040	1/8	.060	1.5x	.400	10x	2-1/2	46308	97353	—
.040	1/8	.060	1.5x	.480	12x	2-1/2	46309	97354	97667
.040	1/8	.060	1.5x	.600	15x	2-1/2	46310	97355	97668
.040	1/8	.060	1.5x	.800	20x	2-1/2	46311	97356	—
.040	1/8	.200	5x	—	—	2-1/2	46312	97357	97669
.040	1/8	.200	5x	.400	10x	2-1/2	46313	97358	97670
.040	1/8	.325	8x	—	—	2-1/2	46314	97359	—
.040	1/8	.480	12x	—	—	2-1/2	46315	97360	—
.045	1/8	.067	1.5x	.225	5x	2-1/2	46316	97361	97671
.045	1/8	.067	1.5x	.375	8x	2-1/2	46317	97362	97672
.045	1/8	.067	1.5x	.550	12x	2-1/2	46318	97363	97673
.045	1/8	.225	5x	.450	10x	2-1/2	46319	97364	97674
.047 (3/64)	1/8	.070	1.5x	.141	3x	2-1/2	46320	97365	—
.047 (3/64)	1/8	.070	1.5x	.250	5x	2-1/2	46321	97366	97675
.047 (3/64)	1/8	.070	1.5x	.375	8x	2-1/2	46322	97367	97676
.047 (3/64)	1/8	.070	1.5x	.480	10x	2-1/2	46323	97368	—
.047 (3/64)	1/8	.070	1.5x	.570	12x	2-1/2	46324	97369	97677
.047 (3/64)	1/8	.070	1.5x	.710	15x	2-1/2	46325	97370	97678
.047 (3/64)	1/8	.070	1.5x	.950	20x	2-1/2	46326	97371	97679
.047 (3/64)	1/8	.070	1.5x	1.187	25x	2-1/2	46327	97372	—
.047 (3/64)	1/8	.250	5x	—	—	2-1/2	46328	97373	97680
.047 (3/64)	1/8	.250	5x	.500	10x	2-1/2	46329	97374	97681
.047 (3/64)	1/8	.375	8x	—	—	2-1/2	46330	97375	97682
.050	1/8	.075	1.5x	.250	5x	2-1/2	46331	97376	97683
.050	1/8	.075	1.5x	.400	8x	2-1/2	46332	97377	97684
.050	1/8	.075	1.5x	.600	12x	2-1/2	46333	97378	97685
.050	1/8	.300	6x	—	—	2-1/2	46334	97379	97686
.050	1/8	.300	6x	.600	12x	2-1/2	46335	97380	97687

(continued)

Solid Carbide 3-Flute Miniature Ball Nose Single End Mills

List No. 5917 3-Flute Ball Nose

(continued)

Speeds & Feeds: Page 88

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.055	1/8	.082	1.5x	.165	3x	2-1/2	46336	97381	—
.055	1/8	.082	1.5x	.275	5x	2-1/2	46337	97382	97688
.055	1/8	.082	1.5x	.450	8x	2-1/2	46338	97383	97689
.055	1/8	.082	1.5x	.660	12x	2-1/2	46339	97384	97690
.055	1/8	.275	5x	—	—	2-1/2	46340	97385	—
.060	1/8	.090	1.5x	.180	3x	2-1/2	46341	97386	—
.060	1/8	.090	1.5x	.312	5x	2-1/2	46342	97387	97691
.060	1/8	.090	1.5x	.500	8x	2-1/2	46343	97388	97692
.060	1/8	.090	1.5x	.625	10x	2-1/2	46344	97389	—
.060	1/8	.090	1.5x	.720	12x	2-1/2	46345	97390	97693
.060	1/8	.312	5x	—	—	2-1/2	46346	97391	—
.060	1/8	.500	8x	1.000	16x	2-1/2	46347	97392	97694
.062 (1/16)	1/8	.093	1.5x	.186	3x	2-1/2	46348	97393	97695
.062 (1/16)	1/8	.093	1.5x	.312	5x	2-1/2	46349	97394	97696
.062 (1/16)	1/8	.093	1.5x	.500	8x	2-1/2	46350	97395	97697
.062 (1/16)	1/8	.093	1.5x	.625	10x	2-1/2	46351	97396	97698
.062 (1/16)	1/8	.093	1.5x	.750	12x	2-1/2	46352	97397	97699
.062 (1/16)	1/8	.093	1.5x	.950	15x	2-1/2	46353	97398	97700
.062 (1/16)	1/8	.093	1.5x	1.125	18x	2-1/2	46354	97399	—
.062 (1/16)	1/8	.093	1.5x	1.250	20x	2-1/2	46355	97400	97701
.062 (1/16)	1/8	.093	1.5x	1.550	25x	3	46356	97401	—
.062 (1/16)	1/8	.312	5x	—	—	2-1/2	46357	97402	97702
.062 (1/16)	1/8	.500	8x	—	—	2-1/2	46358	97403	97703
.062 (1/16)	1/8	.500	8x	1.000	16x	2-1/2	46359	97404	97704
.062 (1/16)	1/8	.625	10x	—	—	2-1/2	46360	97405	—
.062 (1/16)	1/8	.750	12x	—	—	2-1/2	46361	97406	97705
.062 (1/16)	1/8	.950	15x	—	—	2-1/2	46362	97407	97706
.065	1/8	.097	1.5x	.325	5x	2-1/2	46363	—	—
.065	1/8	.097	1.5x	.530	8x	2-1/2	46364	97408	97707
.065	1/8	.500	8x	—	—	2-1/2	46365	97409	97708
.070	1/8	.105	1.5x	.375	5x	2-1/2	46366	—	—
.070	1/8	.105	1.5x	.570	8x	2-1/2	46367	97410	97709
.070	1/8	.500	7x	—	—	2-1/2	46368	97411	97710
.070	1/8	.500	7x	1.000	14x	2-1/2	46369	97412	97711
.075	1/8	.112	1.5x	.375	5x	2-1/2	46370	—	—
.075	1/8	.112	1.5x	.625	8x	2-1/2	46371	97413	97712
.078 (5/64)	1/8	.117	1.5x	.406	5x	2-1/2	46372	97414	97713
.078 (5/64)	1/8	.117	1.5x	.625	8x	2-1/2	46373	97415	97714
.078 (5/64)	1/8	.117	1.5x	.800	10x	2-1/2	46374	97416	—
.078 (5/64)	1/8	.117	1.5x	.940	12x	2-1/2	46375	97417	97715
.078 (5/64)	1/8	.117	1.5x	1.187	15x	2-1/2	46376	97418	—
.078 (5/64)	1/8	.117	1.5x	1.562	20x	3	46377	97419	—
.078 (5/64)	1/8	.406	5x	—	—	2-1/2	46378	97420	97716
.078 (5/64)	1/8	.500	6x	1.000	12x	2-1/2	46379	97421	97717
.078 (5/64)	1/8	.625	8x	—	—	2-1/2	46380	97422	97718
.078 (5/64)	1/8	.940	12x	—	—	2-1/2	46381	97423	97719
.078 (5/64)	1/8	1.187	15x	—	—	2-1/2	46382	97424	97720
.085	1/8	.127	1.5x	.425	5x	2-1/2	46383	97425	—
.085	1/8	.750	9x	1.250	14x	2-1/2	46384	97426	97721
.090	1/8	.135	1.5x	.450	5x	2-1/2	46385	—	—
.090	1/8	.750	8x	1.250	13x	2-1/2	46386	97427	97722
.093 (3/32)	1/8	.139	1.5x	.279	3x	2-1/2	46387	97428	—
.093 (3/32)	1/8	.139	1.5x	.500	5x	2-1/2	46388	97429	97723
.093 (3/32)	1/8	.139	1.5x	.750	8x	2-1/2	46389	97430	97724
.093 (3/32)	1/8	.139	1.5x	.950	10x	2-1/2	46390	97431	—
.093 (3/32)	1/8	.139	1.5x	1.125	12x	2-1/2	46391	97432	97725
.093 (3/32)	1/8	.139	1.5x	1.400	15x	3	46392	97433	97726
.093 (3/32)	1/8	.139	1.5x	1.875	20x	4	46393	97434	—
.093 (3/32)	1/8	.139	1.5x	2.312	25x	4	46394	97435	—
.093 (3/32)	1/8	.500	5x	—	—	2-1/2	46395	97436	97727
.093 (3/32)	1/8	.750	8x	—	—	2-1/2	46396	97437	97728
.093 (3/32)	1/8	.750	8x	1.250	13x	2-1/2	46397	97438	97729
.093 (3/32)	1/8	1.125	12x	—	—	2-1/2	46398	97439	97730
.093 (3/32)	1/8	1.400	15x	—	—	3	46399	97440	97731

(continued)

Solid Carbide 3-Flute Miniature Ball Nose Single End Mills

List No. 5917 3-Flute Ball Nose

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	TOTAL REACH	TOTAL REACH x DIA.	OAL	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.100	1/8	.150	1.5x	.500	5x	2-1/2	46400	97441	—
.100	1/8	.150	1.5x	.800	8x	2-1/2	46401	97442	97732
.100	1/8	.150	1.5x	1.200	12x	2-1/2	46402	97443	—
.100	1/8	.500	5x	—	—	2-1/2	46403	97444	—
.125 (1/8)	1/8	.187	1.5x	.375	3x	2-1/2	46404	97445	—
.125 (1/8)	1/8	.187	1.5x	.625	5x	2-1/2	46405	97446	97733
.125 (1/8)	1/8	.187	1.5x	1.000	8x	2-1/2	46406	97447	97734
.125 (1/8)	1/8	.187	1.5x	1.250	10x	2-1/2	46407	97448	—
.125 (1/8)	1/8	.187	1.5x	1.500	12x	3	46408	97449	97735
.125 (1/8)	1/8	.187	1.5x	1.875	15x	3	46409	97450	97736
.125 (1/8)	1/8	.187	1.5x	2.250	18x	4	46410	97451	—
.125 (1/8)	1/8	.187	1.5x	2.500	20x	4	46411	97452	97737
.125 (1/8)	1/8	.187	1.5x	3.125	25x	4	46412	—	—
.125 (1/8)	1/8	.625	5x	—	—	2-1/2	46413	97453	97738
.125 (1/8)	1/8	1.000	8x	—	—	2-1/2	46414	97454	97739
.125 (1/8)	1/8	1.000	8x	1.500	12x	2-1/2	46415	97455	97740
.125 (1/8)	1/8	1.250	10x	—	—	2-1/2	46416	97456	—
.125 (1/8)	1/8	1.500	12x	—	—	3	46417	97457	97741
.125 (1/8)	1/8	1.875	15x	—	—	3	46418	97458	97742
.156 (5/32)	3/16	.234	1.5x	1.250	8x	3	46419	97459	—
.187 (3/16)	3/16	.281	1.5x	1.000	5x	3	46420	97460	97743
.187 (3/16)	3/16	.281	1.5x	1.500	8x	3	46421	97461	97744
.187 (3/16)	3/16	.281	1.5x	1.875	10x	4	46422	97462	—
.187 (3/16)	3/16	.281	1.5x	2.250	12x	4	46423	97463	97745
.187 (3/16)	3/16	.281	1.5x	2.812	15x	4	46424	97464	—
.250 (1/4)	1/4	.375	1.5x	1.250	5x	4	46425	97465	97746
.250 (1/4)	1/4	.375	1.5x	2.000	8x	4	46426	97466	97747
.250 (1/4)	1/4	.375	1.5x	2.500	10x	4	46427	97467	—
.250 (1/4)	1/4	.375	1.5x	3.000	12x	6	46428	97468	97748
.250 (1/4)	1/4	.375	1.5x	3.750	15x	6	46429	97469	—

CUTTING FLUIDS

Coolants and lubricants offer many benefits including reduced friction and heat, enhanced chip removal, improved accuracy and surface finish, higher speeds and feeds, corrosion protection and increased tool life.

Proper selection and application of cutting fluids is critical to optimizing machining applications. **Please consult your cutting fluids supplier for advice on your specific machining application.**

TOOL COATING SERVICE

Tool Coatings enhance cutting tool performance for increased productivity and lower overall tooling cost. Benefits include increased surface hardness, lubricity & heat resistance and decreased chemical reactivity. Results include reduced friction & torque, higher speeds & feeds, increased tool life, decreased galling & chip welding and improved surface finish. **PLEASE INQUIRE.**

TiN — Titanium Nitride

TiCN — Titanium Carbonitride

TiALN — Titanium Aluminum Nitride

ALTiN — Aluminum Titanium Nitride

CrN — Chromium Nitride

CrC — Chromium Carbide

DLC — Amorphous Diamond-Like Carbon

Solid Carbide 4-Flute Miniature Square End Single End Mills

Micrograin Carbide – Center Cutting – 30° Helix Angle
Stub Length & Regular Length
For materials less than 48Rc hardness
Dia. Tolerance +.0005" / -.0005"

List No. 5918 4-Flute Square End

ALTiN – Aluminum Titanium Nitride Coating for abrasive and hard-to-machine materials

DLC - Amorphous Diamond-Like Carbon for graphite and some non-ferrous materials.

Speeds & Feeds: Page 88

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.005	1/8	.008	1.5x	1-1/2	Stub	45719	—	—
.005	1/8	.015	3x	1-1/2	Regular	45720	—	—
.006	1/8	.009	1.5x	1-1/2	Stub	45721	—	—
.006	1/8	.018	3x	1-1/2	Regular	45722	—	—
.007	1/8	.011	1.5x	1-1/2	Stub	45723	—	—
.007	1/8	.021	3x	1-1/2	Regular	45724	—	—
.008	1/8	.012	1.5x	1-1/2	Stub	45725	—	—
.008	1/8	.024	3x	1-1/2	Regular	45726	—	—
.009	1/8	.014	1.5x	1-1/2	Stub	45727	—	—
.009	1/8	.027	3x	1-1/2	Regular	45728	—	—
.010	1/8	.015	1.5x	1-1/2	Stub	45729	96675	96910
.010	1/8	.030	3x	1-1/2	Regular	45730	96676	96911
.011	1/8	.017	1.5x	1-1/2	Stub	45731	96677	—
.011	1/8	.033	3x	1-1/2	Regular	45732	96678	96912
.012	1/8	.018	1.5x	1-1/2	Stub	45733	96679	—
.012	1/8	.036	3x	1-1/2	Regular	45734	96680	96913
.013	1/8	.020	1.5x	1-1/2	Stub	45735	96681	—
.013	1/8	.039	3x	1-1/2	Regular	45736	96682	96914
.014	1/8	.021	1.5x	1-1/2	Stub	45737	96683	—
.014	1/8	.042	3x	1-1/2	Regular	45738	96684	96915
.015 (1/64)	1/8	.023	1.5x	1-1/2	Stub	45739	96685	96916
.015 (1/64)	1/8	.045	3x	1-1/2	Regular	45740	96686	96917
.016	1/8	.024	1.5x	1-1/2	Stub	45741	96687	—
.016	1/8	.048	3x	1-1/2	Regular	45742	96688	96918
.017	1/8	.026	1.5x	1-1/2	Stub	45743	96689	—
.017	1/8	.051	3x	1-1/2	Regular	45744	96690	96919
.018	1/8	.027	1.5x	1-1/2	Stub	45745	96691	—
.018	1/8	.054	3x	1-1/2	Regular	45746	96692	96920
.019	1/8	.029	1.5x	1-1/2	Stub	45747	96693	—
.019	1/8	.057	3x	1-1/2	Regular	45748	96694	96921
.020	1/8	.030	1.5x	1-1/2	Stub	45749	96695	96922
.020	1/8	.060	3x	1-1/2	Regular	45750	96696	96923
.021	1/8	.032	1.5x	1-1/2	Stub	45751	96697	—
.021	1/8	.063	3x	1-1/2	Regular	45752	96698	96924
.022	1/8	.033	1.5x	1-1/2	Stub	45753	96699	—
.022	1/8	.066	3x	1-1/2	Regular	45754	96700	96925
.023	1/8	.035	1.5x	1-1/2	Stub	45755	96701	—
.023	1/8	.069	3x	1-1/2	Regular	45756	96702	96926
.024	1/8	.036	1.5x	1-1/2	Stub	45757	96703	—
.024	1/8	.072	3x	1-1/2	Regular	45758	96704	96927
.025	1/8	.038	1.5x	1-1/2	Stub	45759	96705	96928
.025	1/8	.075	3x	1-1/2	Regular	45760	96706	96929
.026	1/8	.039	1.5x	1-1/2	Stub	45761	96707	—
.026	1/8	.078	3x	1-1/2	Regular	45762	96708	96930
.027	1/8	.041	1.5x	1-1/2	Stub	45763	96709	—
.027	1/8	.081	3x	1-1/2	Regular	45764	96710	96931
.028	1/8	.042	1.5x	1-1/2	Stub	45765	96711	—
.028	1/8	.084	3x	1-1/2	Regular	45766	96712	96932
.029	1/8	.044	1.5x	1-1/2	Stub	45767	96713	—
.029	1/8	.087	3x	1-1/2	Regular	45768	96714	96933
.030	1/8	.045	1.5x	1-1/2	Stub	45769	96715	96934
.030	1/8	.090	3x	1-1/2	Regular	45770	96716	96935
.031 (1/32)	1/8	.047	1.5x	1-1/2	Stub	45771	96717	96936
.031 (1/32)	1/8	.093	3x	1-1/2	Regular	45772	96718	96937
.032	1/8	.048	1.5x	1-1/2	Stub	45773	96719	—
.032	1/8	.096	3x	1-1/2	Regular	45774	96720	—
.033	1/8	.050	1.5x	1-1/2	Stub	45775	96721	—
.033	1/8	.099	3x	1-1/2	Regular	45776	96722	—
.034	1/8	.051	1.5x	1-1/2	Stub	45777	96723	—
.034	1/8	.102	3x	1-1/2	Regular	45778	96724	—

(continued)

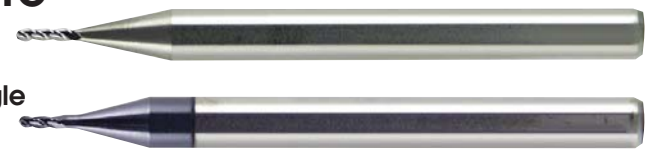
Solid Carbide 4-Flute Miniature Square End Single End Mills

List No. 5918 4-Flute Square End

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.035	1/8	.053	1.5x	1-1/2	Stub	45779	96725	96938
.035	1/8	.105	3x	1-1/2	Regular	45780	96726	96939
.036	1/8	.054	1.5x	1-1/2	Stub	45781	96727	—
.036	1/8	.108	3x	1-1/2	Regular	45782	96728	—
.037	1/8	.056	1.5x	1-1/2	Stub	45783	96729	—
.037	1/8	.111	3x	1-1/2	Regular	45784	96730	—
.038	1/8	.057	1.5x	1-1/2	Stub	45785	96731	—
.038	1/8	.114	3x	1-1/2	Regular	45786	96732	—
.039	1/8	.059	1.5x	1-1/2	Stub	45787	96733	—
.039	1/8	.117	3x	1-1/2	Regular	45788	96734	—
.040	1/8	.060	1.5x	1-1/2	Stub	45789	96735	96940
.040	1/8	.120	3x	1-1/2	Regular	45790	96736	96941
.041	1/8	.123	3x	1-1/2	Regular	45791	96737	—
.042	1/8	.126	3x	1-1/2	Regular	45792	96738	—
.043	1/8	.129	3x	1-1/2	Regular	45793	96739	—
.044	1/8	.132	3x	1-1/2	Regular	45794	96740	—
.045	1/8	.068	1.5x	1-1/2	Stub	45795	96741	96942
.045	1/8	.135	3x	1-1/2	Regular	45796	96742	96943
.046	1/8	.138	3x	1-1/2	Regular	45797	96743	—
.047 (3/64)	1/8	.071	1.5x	1-1/2	Stub	45798	96744	96944
.047 (3/64)	1/8	.141	3x	1-1/2	Regular	45799	96745	96945
.048	1/8	.144	3x	1-1/2	Regular	45800	96746	—
.049	1/8	.147	3x	1-1/2	Regular	45801	96747	—
.050	1/8	.075	1.5x	1-1/2	Stub	45802	96748	96946
.050	1/8	.150	3x	1-1/2	Regular	45803	96749	96947
.051	1/8	.153	3x	1-1/2	Regular	45804	96750	—
.052	1/8	.156	3x	1-1/2	Regular	45805	96751	—
.053	1/8	.159	3x	1-1/2	Regular	45806	96752	—
.054	1/8	.162	3x	1-1/2	Regular	45807	96753	—
.055	1/8	.083	1.5x	1-1/2	Stub	45808	96754	96948
.055	1/8	.165	3x	1-1/2	Regular	45809	96755	96949
.056	1/8	.168	3x	1-1/2	Regular	45810	96756	—
.057	1/8	.171	3x	1-1/2	Regular	45811	96757	—
.058	1/8	.174	3x	1-1/2	Regular	45812	96758	—
.059	1/8	.177	3x	1-1/2	Regular	45813	96759	—
.060	1/8	.090	1.5x	1-1/2	Stub	45814	96760	96950
.060	1/8	.180	3x	1-1/2	Regular	45815	96761	96951
.062 (1/16)	1/8	.093	1.5x	1-1/2	Stub	45816	96762	96952
.062 (1/16)	1/8	.186	3x	1-1/2	Regular	45817	96763	96953
.065	1/8	.098	1.5x	1-1/2	Stub	45818	96764	—
.065	1/8	.195	3x	1-1/2	Regular	45819	96765	96954
.070	1/8	.105	1.5x	1-1/2	Stub	45820	96766	—
.070	1/8	.210	3x	1-1/2	Regular	45821	96767	96955
.075	1/8	.113	1.5x	1-1/2	Stub	45822	96768	—
.075	1/8	.225	3x	1-1/2	Regular	45823	96769	96956
.078 (5/64)	1/8	.117	1.5x	1-1/2	Stub	45824	96770	96957
.078 (5/64)	1/8	.234	3x	1-1/2	Regular	45825	96771	96958
.080	1/8	.120	1.5x	1-1/2	Stub	45826	96772	—
.080	1/8	.240	3x	1-1/2	Regular	45827	96773	96959
.085	1/8	.128	1.5x	1-1/2	Stub	45828	96774	—
.085	1/8	.255	3x	1-1/2	Regular	45829	96775	96960
.090	1/8	.135	1.5x	1-1/2	Stub	45830	96776	—
.090	1/8	.270	3x	1-1/2	Regular	45831	96777	96961
.093 (3/32)	1/8	.140	1.5x	1-1/2	Stub	45832	96778	96962
.093 (3/32)	1/8	.279	3x	1-1/2	Regular	45833	96779	96963
.095	1/8	.143	1.5x	1-1/2	Stub	45834	96780	—
.095	1/8	.285	3x	1-1/2	Regular	45835	96781	96964
.100	1/8	.150	1.5x	1-1/2	Stub	45836	96782	—
.100	1/8	.300	3x	1-1/2	Regular	45837	96783	96965
.105	1/8	.158	1.5x	1-1/2	Stub	45838	96784	—
.105	1/8	.315	3x	1-1/2	Regular	45839	96785	96966
.110	1/8	.165	1.5x	1-1/2	Stub	45840	96786	—
.110	1/8	.330	3x	1-1/2	Regular	45841	96787	96967
.115	1/8	.173	1.5x	1-1/2	Stub	45842	96788	—
.115	1/8	.345	3x	1-1/2	Regular	45843	96789	96968

Solid Carbide 4-Flute Miniature Ball Nose Single End Mills



List No. 5919 4-Flute Ball Nose

Micrograin Carbide – Center Cutting – 30° Helix Angle
Stub Length & Regular Length
For materials less than 48Rc hardness
Dia. Tolerance +.0005" / -.0005"

ALTiN – Aluminum Titanium Nitride Coating for abrasive and hard-to-machine materials

DLC - Amorphous Diamond-Like Carbon for graphite and some non-ferrous materials.

Speeds & Feeds: Page 88

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.010	1/8	.015	1.5x	1-1/2	Stub	45849	96794	96974
.010	1/8	.030	3x	1-1/2	Regular	45850	96795	96975
.011	1/8	.017	1.5x	1-1/2	Stub	45851	96796	—
.011	1/8	.033	3x	1-1/2	Regular	45852	96797	—
.012	1/8	.018	1.5x	1-1/2	Stub	45853	96798	—
.012	1/8	.036	3x	1-1/2	Regular	45854	96799	—
.013	1/8	.020	1.5x	1-1/2	Stub	45855	96800	—
.013	1/8	.039	3x	1-1/2	Regular	45856	96801	—
.014	1/8	.021	1.5x	1-1/2	Stub	45857	96802	—
.014	1/8	.042	3x	1-1/2	Regular	45858	96803	—
.015 (1/64)	1/8	.023	1.5x	1-1/2	Stub	45859	96804	96976
.015 (1/64)	1/8	.045	3x	1-1/2	Regular	45860	96805	96977
.016	1/8	.024	1.5x	1-1/2	Stub	45861	96806	—
.016	1/8	.048	3x	1-1/2	Regular	45862	96807	—
.017	1/8	.026	1.5x	1-1/2	Stub	45863	96808	—
.017	1/8	.051	3x	1-1/2	Regular	45864	96809	—
.018	1/8	.027	1.5x	1-1/2	Stub	45865	96810	—
.018	1/8	.054	3x	1-1/2	Regular	45866	96811	—
.019	1/8	.029	1.5x	1-1/2	Stub	45867	96812	—
.019	1/8	.057	3x	1-1/2	Regular	45868	96813	—
.020	1/8	.030	1.5x	1-1/2	Stub	45869	96814	96978
.020	1/8	.060	3x	1-1/2	Regular	45870	96815	96979
.021	1/8	.032	1.5x	1-1/2	Stub	45871	96816	—
.021	1/8	.063	3x	1-1/2	Regular	45872	96817	—
.022	1/8	.033	1.5x	1-1/2	Stub	45873	96818	—
.022	1/8	.066	3x	1-1/2	Regular	45874	96819	—
.023	1/8	.035	1.5x	1-1/2	Stub	45875	96820	—
.023	1/8	.069	3x	1-1/2	Regular	45876	96821	—
.024	1/8	.036	1.5x	1-1/2	Stub	45877	96822	—
.024	1/8	.072	3x	1-1/2	Regular	45878	96823	—
.025	1/8	.038	1.5x	1-1/2	Stub	45879	96824	96980
.025	1/8	.075	3x	1-1/2	Regular	45880	96825	96981
.026	1/8	.039	1.5x	1-1/2	Stub	45881	96826	—
.026	1/8	.078	3x	1-1/2	Regular	45882	96827	—
.027	1/8	.041	1.5x	1-1/2	Stub	45883	96828	—
.027	1/8	.081	3x	1-1/2	Regular	45884	96829	—
.028	1/8	.042	1.5x	1-1/2	Stub	45885	96830	—
.028	1/8	.084	3x	1-1/2	Regular	45886	96831	—
.029	1/8	.044	1.5x	1-1/2	Stub	45887	96832	—
.029	1/8	.087	3x	1-1/2	Regular	45888	96833	—
.030	1/8	.045	1.5x	1-1/2	Stub	45889	96834	96982
.030	1/8	.090	3x	1-1/2	Regular	45890	96835	96983
.031 (1/32)	1/8	.047	1.5x	1-1/2	Stub	45891	96836	96984
.031 (1/32)	1/8	.093	3x	1-1/2	Regular	45892	96837	96985
.032	1/8	.048	1.5x	1-1/2	Stub	45893	96838	—
.032	1/8	.096	3x	1-1/2	Regular	45894	96839	—
.033	1/8	.050	1.5x	1-1/2	Stub	45895	96840	—
.033	1/8	.099	3x	1-1/2	Regular	45896	96841	—
.034	1/8	.051	1.5x	1-1/2	Stub	45897	96842	—
.034	1/8	.102	3x	1-1/2	Regular	45898	96843	—
.035	1/8	.053	1.5x	1-1/2	Stub	45899	96844	96986
.035	1/8	.105	3x	1-1/2	Regular	45900	96845	96987
.036	1/8	.054	1.5x	1-1/2	Stub	45901	96846	—
.036	1/8	.108	3x	1-1/2	Regular	45902	96847	—
.037	1/8	.056	1.5x	1-1/2	Stub	45903	96848	—
.037	1/8	.111	3x	1-1/2	Regular	45904	96849	—

(continued)

Solid Carbide 4-Flute Miniature Ball Nose Single End Mills

List No. 5919 4-Flute Ball Nose

(continued)

DIA.	SHANK DIA.	LOC	LOC x DIA.	OAL	LENGTH	UNCOATED EDP NO.	ALTIN COATED EDP NO.	DLC COATED EDP NO.
.038	1/8	.057	1.5x	1-1/2	Stub	45905	96850	—
.038	1/8	.114	3x	1-1/2	Regular	45906	96851	—
.039	1/8	.059	1.5x	1-1/2	Stub	45907	96852	—
.039	1/8	.117	3x	1-1/2	Regular	45908	96853	—
.040	1/8	.060	1.5x	1-1/2	Stub	45909	96854	96988
.040	1/8	.120	3x	1-1/2	Regular	45910	96855	96989
.041	1/8	.123	3x	1-1/2	Regular	45911	96856	—
.042	1/8	.126	3x	1-1/2	Regular	45912	96857	—
.043	1/8	.129	3x	1-1/2	Regular	45913	96858	—
.044	1/8	.132	3x	1-1/2	Regular	45914	96859	—
.045	1/8	.068	1.5x	1-1/2	Stub	45915	96860	96990
.045	1/8	.135	3x	1-1/2	Regular	45916	96861	96991
.046	1/8	.138	3x	1-1/2	Regular	45917	96862	—
.047 (3/64)	1/8	.071	1.5x	1-1/2	Stub	45918	96863	96992
.047 (3/64)	1/8	.141	3x	1-1/2	Regular	45919	96864	96993
.048	1/8	.144	3x	1-1/2	Regular	45920	96865	—
.049	1/8	.147	3x	1-1/2	Regular	45921	96866	—
.050	1/8	.075	1.5x	1-1/2	Stub	45922	96867	96994
.050	1/8	.150	3x	1-1/2	Regular	45923	96868	96995
.051	1/8	.153	3x	1-1/2	Regular	45924	96869	—
.052	1/8	.156	3x	1-1/2	Regular	45925	96870	—
.053	1/8	.159	3x	1-1/2	Regular	45926	96871	—
.054	1/8	.162	3x	1-1/2	Regular	45927	96872	—
.055	1/8	.083	1.5x	1-1/2	Stub	45928	96873	96996
.055	1/8	.165	3x	1-1/2	Regular	45929	96874	96997
.056	1/8	.168	3x	1-1/2	Regular	45930	96875	—
.057	1/8	.171	3x	1-1/2	Regular	45931	96876	—
.058	1/8	.174	3x	1-1/2	Regular	45932	96877	—
.059	1/8	.177	3x	1-1/2	Regular	45933	96878	—
.060	1/8	.090	1.5x	1-1/2	Stub	45934	96879	96998
.060	1/8	.180	3x	1-1/2	Regular	45935	96880	96999
.062 (1/16)	1/8	.093	1.5x	1-1/2	Stub	45936	96881	97000
.062 (1/16)	1/8	.186	3x	1-1/2	Regular	45937	96882	97001
.065	1/8	.098	1.5x	1-1/2	Stub	45938	96883	—
.065	1/8	.195	3x	1-1/2	Regular	45939	96884	97002
.070	1/8	.105	1.5x	1-1/2	Stub	45940	96885	—
.070	1/8	.210	3x	1-1/2	Regular	45941	96886	97003
.075	1/8	.113	1.5x	1-1/2	Stub	45942	96887	—
.075	1/8	.225	3x	1-1/2	Regular	45943	96888	—
.078 (5/64)	1/8	.117	1.5x	1-1/2	Stub	45944	96889	97004
.078 (5/64)	1/8	.234	3x	1-1/2	Regular	45945	96890	97005
.080	1/8	.120	1.5x	1-1/2	Stub	45946	96891	—
.080	1/8	.240	3x	1-1/2	Regular	45947	96892	97006
.085	1/8	.128	1.5x	1-1/2	Stub	45948	96893	—
.085	1/8	.255	3x	1-1/2	Regular	45949	96894	—
.090	1/8	.135	1.5x	1-1/2	Stub	45950	96895	—
.090	1/8	.270	3x	1-1/2	Regular	45951	96896	97007
.093 (3/32)	1/8	.140	1.5x	1-1/2	Stub	45952	96897	97008
.093 (3/32)	1/8	.279	3x	1-1/2	Regular	45953	96898	97009
.095	1/8	.143	1.5x	1-1/2	Stub	45954	96899	—
.095	1/8	.285	3x	1-1/2	Regular	45955	96900	—
.100	1/8	.150	1.5x	1-1/2	Stub	45956	96901	—
.100	1/8	.300	3x	1-1/2	Regular	45957	96902	97010
.105	1/8	.315	3x	1-1/2	Regular	45958	96903	—
.110	1/8	.330	3x	1-1/2	Regular	45959	96904	—
.115	1/8	.345	3x	1-1/2	Regular	45960	96905	—
.120	1/8	.360	3x	1-1/2	Regular	45961	96906	—

Miniature Solid Carbide End Mill Speed and Feed Recommendations

Workpiece			Type and Depth of Cut	Surface Speed (SFM)	FEED PER TOOTH BY END MILL DIAMETER							
Material		Examples			.005 - .015	.015 - .030	.030 - .045	.045 - .060	.060 - .075	.075 - .090	.090 - .105	.105 - .125
Steel (ISO P)	Low Alloy Steels - Maraging	10XX, 11XX, 13XX	Slotting ≤ 15% of D	150	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007
			Profiling 6% of D Axial & ≤ 35% of D Radial	300	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007
	Medium Alloy Steels	200, 250, 300	Slotting ≤ 15% of D	125	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006
			Profiling 6% of D Axial & ≤ 30% of D Radial	250	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006
	High Alloy Steels - Mold and Die	A-2, P20, O1, D2, H-13	Slotting ≤ 10% of D	125	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
			Profiling 6% of D Axial & ≤ 20% of D Radial	250	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
	High Strength Steels	4140, 4340, 52100	Slotting ≤ 15% of D	100	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
			Profiling 6% of D Axial & ≤ 30% of D Radial	180	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
Stainless Steel (ISO M)	Martensitic	403, 410, 416	Slotting ≤ 15% of D	100	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
			Profiling 6% of D Axial & ≤ 30% of D Radial	250	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
	Austenitic	302, 303, 304L, 316L	Slotting ≤ 15% of D	100	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
			Profiling 6% of D Axial & ≤ 30% of D Radial	250	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
	Precipitation Hardened	13-8, 15-5 PH, 17-4 PH, A-236, AM-350	Slotting ≤ 10% of D	90	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
			Profiling 6% of D Axial & ≤ 20% of D Radial	250	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
Cast Iron (ISO K)	Cast Iron	Grey Cast Iron	Slotting ≤ 25% of D	125	0.0004	0.0004	0.0005	0.0006	0.0008	0.0008	0.0010	0.0010
			Profiling 10% of D Axial & ≤ 35% of D Radial	400	0.0004	0.0004	0.0005	0.0006	0.0008	0.0008	0.0010	0.0010
	Ductile Iron	Ductile Cast Iron	Slotting ≤ 15% of D	100	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007
			Profiling 10% of D Axial & ≤ 25% of D Radial	250	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007
High Temperature Alloys (ISO S)	Iron Base	Incoloy 800-802, Multimet N-155, Timken 16-26-6	Slotting ≤ 7% of D	80	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004
			Profiling 5% of D Axial & ≤ 20% of D Radial	100	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004
	Nickel Base	Inconel 600, 625, 718, Nickel 200, 270, Invar, Monel 400, 405, K-Monel, PermoNikel 300, Incoly 600	Slotting ≤ 7% of D	40	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004
			Profiling 5% of D Axial & ≤ 20% of D Radial	60	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004
	Cobalt Base	Stellite, Haynes 25, 188, X-40, L-605	Slotting ≤ 7% of D	50	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004
			Profiling 5% of D Axial & ≤ 20% of D Radial	80	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004
	Titanium Alloys	6AL-4V, ASTM 1, 2, 3, 6AL-25 (Decrease SFM & IPM 25% for 5553)	Slotting ≤ 15% of D	125	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
			Profiling 6% of D Axial & ≤ 20% of D Radial	250	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005
Al (ISO N)	Aluminum Alloys	6061-T6, 7075	Slotting ≤ 15% of D	650	0.0004	0.0004	0.0005	0.0006	0.0008	0.0008	0.0010	0.0010
			Profiling 10% of D Axial & ≤ 35% of D Radial	775	0.0004	0.0004	0.0005	0.0006	0.0008	0.0008	0.0010	0.0010

Speeds and Feeds are suggested starting points and may be increased or decreased depending on actual material and machining conditions.

In general, use lower speeds and feeds for hard and difficult-to-machine materials. Use higher speeds and feeds for easy-to-machine materials. Use higher surface speed for lighter cuts, smaller tools, and better finishes. Higher feed rates can improve tool life and performance in softer materials and more abrasive materials.

For longer length tools, reduce feed rates by 50%.

For coated tools, speeds may be increased by up to 20% with the feed rate unchanged.

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

Carbide Burrs
1/4″ Shank

Single Cut
General Purpose. Recommended for steel, cast iron, ferrous materials. Offers good stock removal and smooth workpiece finish.

Double Cut
Most popular style. For rapid stock removal in tough applications. Design reduces the pulling action, reduces size of chips, ensures rapid stock removal.

List No. 5970
Single Cut

List No. 5970
Double Cut

STANDARD PACKAGE All sizes — 1 each

Cylinder Shape
No End Cut

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SA-11	1/8	1/2	59715	59500
SA-12	1/8	5/8	59816	59501
SA-13	5/32	5/8	59817	59502
SA-14	3/16	5/8	59818	59503
SA-1	1/4	5/8	59716	59504
SA-1L	1/4	1	59717	59505
SA-2	5/16	3/4	59718	59506
SA-3	3/8	3/4	59719	59507
SA-3L	3/8	1	59720	59508
SA-3X	3/8	1 1/2	59819	59509
SA-4	7/16	1	59820	59510
SA-5	1/2	1	59721	59511
SA-6	5/8	1	59722	59512
SA-15	3/4	1/2	59821	59513
SA-16	3/4	3/4	59723	59516
SA-7	3/4	1	59822	59517
SA-8	7/8	1	59823	59518
SA-9	1	1	59824	59519

Cylinder Shape
Radius End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SC-11	1/8	1/2	59724	59536
SC-12	1/8	5/8	59843	59537
SC-13	5/32	5/8	59844	59538
SC-14	3/16	5/8	59845	59539
SC-1	1/4	5/8	59846	59540
SC-1L	1/4	1	59725	59541
SC-2	5/16	3/4	59726	59542
SC-3	3/8	3/4	59847	59543
SC-3L	3/8	1	59727	59544
SC-3X	3/8	1 1/2	59848	59545
SC-4	7/16	1	59849	59546
SC-5	1/2	1	59728	59547
SC-6	5/8	1	59729	59548
SC-15	3/4	1/2	59850	59550
SC-16	3/4	3/4	59730	59549
SC-7	3/4	1	59851	59551
SC-9	1	1	59852	59552

Cylinder Shape
End Cut

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SB-11	1/8	1/2	59825	59875
SB-12	1/8	5/8	59826	59876
SB-13	5/32	5/8	59827	59877
SB-14	3/16	5/8	59828	59878
SB-1	1/4	5/8	59829	59879
SB-1L	1/4	1	59830	59880
SB-2	5/16	3/4	59831	59881
SB-3	3/8	3/4	59832	59882
SB-3L	3/8	1	59833	59883
SB-3X	3/8	1 1/2	59834	59884
SB-4	7/16	1	59835	59885
SB-5	1/2	1	59836	59886
SB-6	5/8	1	59837	59887
SB-15	3/4	1/2	59838	59888
SB-16	3/4	3/4	59839	59889
SB-7	3/4	1	59840	59890
SB-8	7/8	1	59841	59891
SB-9	1	1	59842	59892

Ball Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SD-11	1/8	3/32	59731	59554
SD-14	3/16	1/8	59732	59555
SD-1	1/4	7/32	59733	59556
SD-2	5/16	1/4	59734	59557
SD-3	3/8	5/16	59735	59558
SD-4	7/16	3/8	59853	59559
SD-5	1/2	7/16	59736	59560
SD-6	5/8	9/16	59737	59561
SD-7	3/4	11/16	59738	59562
SD-9	1	15/16	59854	59563

(continued)

Carbide Burrs 1/4″ Shank (continued)

List No. 5970

Oval Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SE-11	3/16	5/16	59739	59564
SE-1	1/4	3/8	59740	59565
SE-3	3/8	5/8	59741	59566
SE-5	1/2	7/8	59742	59567
SE-6	5/8	1	59743	59568
SE-7	3/4	1	59744	59569

Tree Shape Radius End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SF-11	1/8	1/2	59855	59570
SF-1	1/4	5/8	59745	59571
SF-3	3/8	3/4	59746	59572
SF-4	7/16	1	59856	59573
SF-13	1/2	3/4	59857	59575
SF-5	1/2	1	59747	59574
SF-6	5/8	1	59748	59576
SF-7	3/4	1	59514	59515
SF-14	3/4	1 1/4	59749	59578
SF-15	3/4	1 1/2	59859	59579

Tree Shape Pointed End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SG-1	1/4	5/8	59750	59580
SG-2	5/16	3/4	59751	59581
SG-3	3/8	3/4	59752	59582
SG-13	1/2	3/4	59753	59583
SG-5	1/2	1	59754	59584
SG-6	5/8	1	59755	59585
SG-7	3/4	1	59756	59586
SG-15	3/4	1 1/2	59860	59587

Flame Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SH-1	1/4	5/8	59774	59780
SH-2	5/16	3/4	59775	59781
SH-5	1/2	1 1/4	59776	59782
SH-6	5/8	1 7/16	59777	59783
SH-7	3/4	1 5/8	59778	59784

Inverted Cone Shape

TOOL NO.	DIA.	INCL. ANGLE	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SN-1	1/4	10°	5/16	59769	59618
SN-2	3/8	13°	3/8	59770	59619
SN-4	1/2	28°	1/2	59771	59620
SN-6	5/8	18°	3/4	59772	59621
SN-7	3/4	30°	5/8	59773	59622

60° Cone Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SJ-1	1/4	3/16	59861	59793
SJ-3	3/8	5/16	59862	59794
SJ-5	1/2	7/16	59863	59795
SJ-6	5/8	9/16	59864	59796
SJ-7	3/4	11/16	59865	59797
SJ-9	1	15/16	59866	59798

90° Cone Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SK-1	1/4	1/8	59867	59800
SK-3	3/8	3/16	59868	59801
SK-5	1/2	1/4	59869	59802
SK-6	5/8	5/16	59870	59803
SK-7	3/4	3/8	59871	59804
SK-9	1	1/2	59872	59805

Taper Shape Radius End

14° Included Angle

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SL-1	1/4	5/8	59757	59605
SL-2	5/16	7/8	59758	59606
SL-3	3/8	1 1/16	59759	59607
SL-4	1/2	1 1/8	59760	59608
SL-5	5/8	1 3/16	59873	59609
SL-6	5/8	1 5/16	59761	59610
SL-7	3/4	1 1/2	59762	59611

Cone Shape

TOOL NO.	DIA.	INCL. ANGLE	LENGTH OF CUT	EDP NO. SNGL. CUT	EDP NO. DBL. CUT
SM-1	1/4	22°	1/2	59763	59612
SM-2	1/4	14°	3/4	59764	59613
SM-3	1/4	10°	1	59765	59614
SM-4	3/8	28°	5/8	59766	59615
SM-5	1/2	28°	7/8	59767	59616
SM-6	5/8	31°	1	59768	59617

Long Shank Carbide Burrs
1/4″ × 6″ Long Steel Shank

Single Cut
General Purpose. Recommended for steel, cast iron, ferrous materials. Offers good stock removal and smooth workpiece finish.

Double Cut
Most popular style for rapid stock removal in tough applications. Design reduces the pulling action, reduces size of chips, ensures rapid stock removal.

List No. 5970
Single Cut

List No. 5970
Double Cut

STANDARD PACKAGE All sizes — 1 each

6″ Long Steel Shank for Hard to Reach Areas

Cylinder Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SA-1L6	¼	½	59655	59925
SA-3L6	⅜	¾	59656	59926
SA-5L6	½	1	59657	59927

Tree Shape Radius End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SF-1L6	¼	½	59667	59937
SF-3L6	⅜	¾	59668	59938
SF-5L6	½	1	59669	59939

Cylinder Shape Radius End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SC-1L6	¼	½	59658	59928
SC-3L6	⅜	¾	59659	59929
SC-5L6	½	1	59660	59930

Tree Shape Pointed End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SG-1L6	¼	½	59670	59940
SG-3L6	⅜	¾	59671	59941
SG-5L6	½	1	59672	59942

Ball Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SD-1L6	¼	7/32	59661	59931
SD-3L6	⅜	5/16	59662	59932
SD-5L6	½	7/16	59663	59933

Flame Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SH-2L6	5/16	¾	59673	59943
SH-5L6	½	1¼	59674	59944

Oval Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SE-1L6	¼	⅜	59664	59934
SE-3L6	⅜	⅝	59665	59935
SE-5L6	½	⅞	59666	59936

Taper Shape Radius End — 14°

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO. SINGLE CUT	EDP NO. DOUBLE CUT
SL-1L6	¼	⅝	59675	59945
SL-3L6	⅜	1 1/16	59676	59946
SL-4L6	½	1⅛	59677	59947

Carbide Burrs – 1/8″ Shank

Single Cut
General Purpose. Recommended for steel, cast iron, ferrous materials. Offers good stock removal and smooth workpiece finish.

Double Cut
Most popular style for rapid stock removal in tough applications. Design reduces the pulling action, reduces size of chips, ensures rapid stock removal.

List 5970
STANDARD PACKAGE All sizes — 1 each

TOOL SHAPE	TOOL NO.	DIA.	LENGTH OF CUT	OAL	EDP NO. SNGL. CUT	EDP NO. DBL. CUT	
Cylindrical - No End Cut	SA-41	1/16	1/4	1-1/2	59527	59713	
	SA-42	3/32	7/16	1-1/2	59528	59691	
	SA-43	1/8	9/16	1-1/2	59529	59690	
	SA-43L2	1/8	9/16	2	59530	59533	
	SA-43L3	1/8	9/16	3	59531	59534	
	SA-53	3/16	1/2	2	59532	59535	
	SA-51	1/4	1/2	2	59678	59553	
Cylindrical - End Cut	SB-41	1/16	1/4	1-1/2	59577	59703	
	SB-42	3/32	7/16	1-1/2	59588	59592	
	SB-43	1/8	9/16	1-1/2	59589	59714	
	SB-43L2	1/8	9/16	2	59590	59593	
	SB-43L3	1/8	9/16	3	59591	59594	
	SB-51	1/4	3/16	1-11/16	59679	59595	
	SB-51A	1/4	1/2	2	59975	59976	
Cylindrical - Ball Nose	SC-41	3/32	7/16	1-1/2	59596	59693	
	SC-42	1/8	9/16	1-1/2	59597	59692	
	SC-42L2	1/8	9/16	2	59598	59602	
	SC-42L3	1/8	9/16	3	59599	59603	
	SC-52	5/32	1/2	2	59600	59604	
	SC-53	3/16	1/2	2	59601	59688	
	SC-51	1/4	1/2	2	59680	59623	
Ball	SD-41	3/32	3/32	1-1/2	59624	59894	
	SD-42	1/8	1/8	1-1/2	59654	59694	
	SD-42L2	1/8	1/8	2	59705	59787	
	SD-42L3	1/8	1/8	3	59779	59788	
	SD-52	5/32	5/32	1-21/32	59785	59789	
	SD-53	3/16	5/32	1-21/32	59786	59689	
	SD-51	1/4	7/32	1-23/32	59681	59790	
Oval	SE-41	1/8	7/32	1-1/2	59791	59695	
	SE-41L2	1/8	7/32	2	59792	59808	
	SE-41L3	1/8	7/32	3	59799	59809	
	SE-53	3/16	9/32	1-25/32	59806	59858	
	SE-51	1/4	3/8	1-7/8	59682	59874	
Tree - Radius End	SF-41	1/8	1/4	1-1/2	59902	59696	
	SF-42	1/8	1/2	1-1/2	59904	59895	
	SF-42L2	1/8	1/2	2	59906	59912	
	SF-42L3	1/8	1/2	3	59908	59914	
	SF-53	3/16	1/2	2	59910	59896	
	SF-51	1/4	1/2	2	59683	59916	
Tree - Pointed End	SG-41	1/8	1/4	1-1/2	59920	59697	
	SG-43	1/8	3/8	1-1/2	59921	59897	
	SG-44	1/8	1/2	1-1/2	59922	59898	
	SG-44L2	1/8	1/2	2	59923	59948	
	SG-44L3	1/8	1/2	3	59924	59949	
	SG-51	1/4	1/2	2	59684	59950	

(continued)

Carbide Burrs – 1/8″ Shank (continued)

TOOL SHAPE	TOOL NO.	DIA.	LENGTH OF CUT	OAL	EDP NO. SNGL. CUT	EDP NO. DBL. CUT	
Flame	SH-41	1/8	1/4	1-1/2	59951	59700	
60° Cone * Double End	SJ-42 *	1/8	3/32	1-1/2	59952	59698	
90° Cone * Double End	SK-42 *	1/8	1/16	1-1/2	59953	59702	
Taper - Radius End ** 8° Incl. Angle *** 14° Incl. Angle	SL-41 **	1/8	3/8	1-1/2	59954	59699	
	SL-42 **	1/8	1/2	1-1/2	59955	59893	
	SL-42L2 **	1/8	1/2	2	59956	59959	
	SL-42L3 **	1/8	1/2	3	59957	59960	
	SL-53 ***	3/16	1/2	2	59958	59961	
Cone	SM-41	1/8	11/32	1-1/2	59962	59968	
	SM-42	1/8	7/16	1-1/2	59963	59899	
	SM-42L2	1/8	7/16	2	59964	59969	
	SM-42L3	1/8	7/16	3	59965	59970	
	SM-43	1/8	5/8	1-1/2	59966	59900	
	SM-53	3/16	1/2	2	59967	59971	
	SM-51	1/4	1/2	2	59685	59972	
Inverted Cone - 10° Incl. Angle	SN-42	1/8	3/16	1-1/2	59973	59701	
	SN-51	1/4	1/4	1-3/4	59686	59974	

Carbide Burr Sets — Double Cut

List 5970

Supplied in a premium hardwood case.

EDP	SET NO.	SHANK DIA.	PIECES PER SET	INCLUDES
59901	C-150	1/8	9	SA-42, SA-43, SC-42, SC-41, SF-42, SG-42, SM-43, SE-41, SD-42
59711	C-100	1/8	12	SA-43, SA-42, SC-42, SC-41, SD-42, SE-41, SF-41, SG-41, SJ-42, SL-41, SH-41, SN-42
59903	C-350	1/8	6	SA-51, SC-51, SF-51, SG-51, SM-51, SD-51
59687	C-300	1/8	9	SA-51, SB-51, SC-51, SD-51, SE-51, SF-51, SG-51, SM-51, SN-51
59913	C-600	1/4	8	SA-1, SA-5, SC-1, SC-3, SC-5, SF-5, SL-3, SL-4
59905	C-400	1/4	8	SA-1, SC-1, SF-1, SG-1, SM-2, SE-1, SL-1, SD-1
59911	C-550	1/4	8	SA-5, SC-1, SC-3, SD-3, SE-5, SH-5, SK-5, SG-1
59918	C-725	1/4	8	SA-5, SC-3, SC-5, SD-5, SF-3, SF-5, SG-3, SL-4
59909	C-500	1/4	8	SA-5, SC-5, SD-5, SE-5, SG-5, SM-5, SL-4, SH-5
59907	C-450	1/4	8	SA-5, SC-5, SF-5, SG-5, SM-5, SE-5, SL-4, SD-5
59915	C-650	1/4	8	SB-1, SC-3, SD-2, SE-5, SF-5, SL-4, SG-3, SM-5
59917	C-700	1/4	9	SA-1, SA-3, SA-5, SC-1, SC-3, SC-5, SF-1, SF-3, SF-5
59712	C-200	1/4	12	SA-1, SA-14, SC-1, SC-14, SD-1, SE-1, SF-1, SG-1, SK-1, SL-1, SH-1, SN-1
59919	C-750	1/4	16	SA-1, SA-3, SA-5, SC-1, SC-3, SC-5, SD-3, SD-5, SE-3, SF-1, SF-3, SF-5, SG-1, SG-3, SL-3, SL-4

RECOMMENDED CUTTING SPEEDS

BURR DIAMETER	R.P.M.
1/16	55000-85000
3/32	50000-60000
1/8	35000-65000
3/16	30000-55000
1/4	25000-50000
5/16	18000-38000

BURR DIAMETER	R.P.M.
3/8	17000-38000
7/16	13000-37000
1/2	14000-36000
5/8	11000-23000
3/4	8000-19000
1	7000-18000

NOTE: Information in this chart is for reference only. We will not be held liable for any consequential damages or economic loss due to the use of information contained within this chart.

Increase speeds for softer non-ferrous materials.
Decrease speeds for harder ferrous materials.

Carbide Burrs For Non-Ferrous Materials

1/4″ Shank

NF Burrs are designed for use on aluminum, non-ferrous metals, soft steel, reinforced plastics, and other soft materials. High flute design for easy chip flow and fast stock removal. Provides excellent work finish with minimum loading when cutting soft, sticky metals.

List 5970

STANDARD PACKAGE All sizes — 1 each

Cylinder Shape No End Cut

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO.
SA-1-NF	1/4	5/8	59625
SA-3-NF	3/8	3/4	59626
SA-5-NF	1/2	1	59627
SA-6-NF	5/8	1	59628
SA-7-NF	3/4	1	59629
SA-7-NF 3/8	3/4	1	59810*

Cylinder Shape End Cut

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO.
SB-1-NF	1/4	5/8	59522
SB-3-NF	3/8	3/4	59523
SB-5-NF	1/2	1	59524
SB-6-NF	5/8	1	59525
SB-7-NF	3/4	1	59526

Cylinder Shape Radius End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO.
SC-1-NF	1/4	5/8	59630
SC-3-NF	3/8	3/4	59631
SC-5-NF	1/2	1	59632
SC-6-NF	5/8	1	59633
SC-7-NF	3/4	1	59634
SC-7-NF 3/8	3/4	1	59811*

Ball Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO.
SD-1-NF	1/4	7/32	59635
SD-3-NF	3/8	5/16	59636
SD-5-NF	1/2	7/16	59637
SD-6-NF	5/8	9/16	59638
SD-7-NF	3/4	11/16	59639
SD-7-NF3/8	3/4	11/16	59812*

Oval Shape

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO.
SE-3-NF	3/8	5/8	59640
SE-5-NF	1/2	7/8	59641
SE-6-NF	5/8	1	59642
SE-7-NF	3/4	1	59643
SE-7-NF 3/8	3/4	1	59813*

Tree Shape Radius End

TOOL NO.	DIA.	LENGTH OF CUT	EDP NO.
SF-1-NF	1/4	5/8	59644
SF-3-NF	3/8	3/4	59645
SF-5-NF	1/2	1	59646
SF-6-NF	5/8	1	59647
SF-7-NF	3/4	1	59520
SF-14-NF	3/4	1 1/4	59648
SF-14-NF 3/8	3/4	1 1/4	59814*

Taper Shape Radius End

14° Included Angle

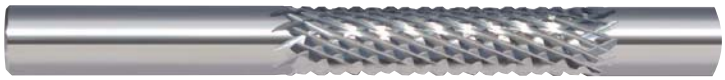
TOOL NO.	DIA.	LENGTH OF CUT	EDP NO.
SL-1-NF	1/4	5/8	59521
SL-3-NF	3/8	1 1/16	59649
SL-4-NF	1/2	1 1/8	59650
SL-5-NF	5/8	1 3/16	59651
SL-6-NF	5/8	1 5/16	59652
SL-7-NF	3/4	1 1/2	59653
SL-7-NF3/8	3/4	1 1/2	59815*

For Aluminum, Non-Ferrous Metals, Soft Steel, Reinforced Plastics and other Soft Materials.

*** 3/8" Shank Diameter. Available While Supplies Last.**

Solid Carbide Piloted Die Trimmer

Micrograin Carbide
Right Hand Cut



List No. 5939

Double Cut for rapid stock removal and improved operator control.

Non-Cutting Pilot permits removal of excess welding or fill material without damage to the die area beyond the repair area.

Recommended for ferrous materials including mold and die steels up to 60Rc hardness.

Solid Carbide offers higher cutting speeds, high rigidity, excellent hardness, wear resistance and heat resistance and long tool life.

TOLERANCES
Pilot Length +.0000 / -.0005
Shank Dia. +.0000 / -.0005

DIA.	SHANK DIA.	LENGTH OF CUT	PILOT LENGTH	OAL	EDP NO.
1/8	1/8	1	1/2	2-1/2	59045
1/8	1/8	1	1/2	3	59046
3/16	3/16	1	1/2	2-1/2	59047
1/4	1/4	1	1/2	2-1/2	59048
1/4	1/4	1	1/2	3	59049
3/8	3/8	1	1/2	2-1/2	59050
1/2	1/2	1	1/2	2-1/2	59051

CUTTING FLUIDS

Coolants and lubricants offer many benefits including reduced friction and heat, enhanced chip removal, improved accuracy and surface finish, higher speeds and feeds, corrosion protection and increased tool life.

Proper selection and application of cutting fluids is critical to optimizing machining applications. **Please consult your cutting fluids supplier for advice on your specific machining application.**

TOOL COATING SERVICE

Tool Coatings enhance cutting tool performance for increased productivity and lower overall tooling cost. Benefits include increased surface hardness, lubricity & heat resistance and decreased chemical reactivity. Results include reduced friction & torque, higher speeds & feeds, increased tool life, decreased galling & chip welding and improved surface finish. **PLEASE INQUIRE.**

TiN — Titanium Nitride

TiCN — Titanium Carbonitride

TiALN — Titanium Aluminum Nitride

ALTiN — Aluminum Titanium Nitride

CrN — Chromium Nitride

CrC — Chromium Carbide

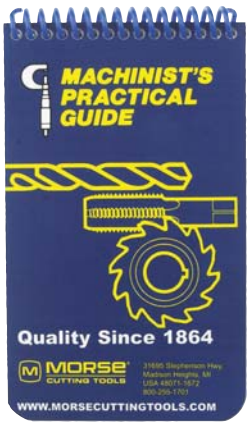
DLC — Amorphous Diamond-Like Carbon

Technical Publications

Guide technique Guía técnica

Machinist's Practical Guide

The original concept of a pocket size manual covering a wide range of practical information for the machinist, tool maker, engineer and student. End mills, cutters, drills, reamers, taps and tool bits are some of the cutting tool areas covered. Tool steels, tapers, speeds, feeds, cutting fluids, and a wealth of additional useful information is found in this complete 108-page handbook. Fits handily into shop coats, tool boxes, desk drawers, etc.



Machinist's Guide for Taps

Taps and screw threads play a very important part in "holding the world together by a thread." This booklet contains all the needed information for correct tapping work. Included are thread forms and dimensions, fits and limits, hole preparation and size, type of taps, speeds and lubricants, tap sharpening and troubleshooting hints.

Machinist's Guide for Carbide Tooling

Carbide and its many applications is fully explained in this handy booklet. Complete coverage is given from the introduction and manufacture of carbide to its present major position in the cutting tools field. Included are design, application, geometrics, troubleshooting, speeds and feeds.

GUIDES	LIST NO.	DISPLAY BOX OF 50 (1 BOX) EDP. NO.	INDIVIDUAL COPIES EDP NO.
Machinist's Practical Guide	1001	20401	20402
Machinist's Guide for Taps	1002	20403	20404
Machinist's Guide for Carbide Tooling	1004	20407	20408

Morse® Plastic Wall Chart

Tableau mural Tabla mural

NEW LOOK! LARGER SIZE! Redesigned for enhanced readability. Decimal Equivalents. Tap Drill Sizes for inch, metric and pipe threads. 24" × 36" printed on heavy duty .023" gage plastic with three punched holes across top for wall mounting. Also available Custom Imprinted with your company logo and information.

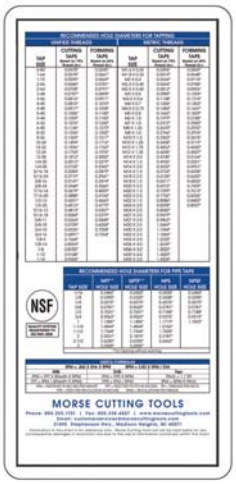
List No. 1007 **EDP No. 01650**

Decimal Equivalent Pocket Chart

List No. 1005

Tableau décimal Tabla de medidas decimales

Front



Back

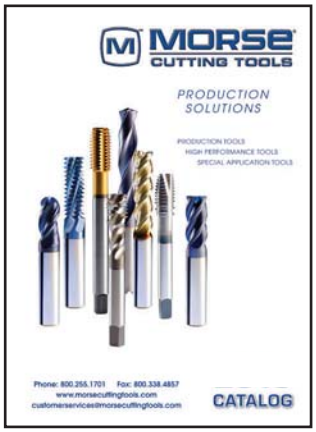
NEW LOOK! LARGER SIZE! Decimal Equivalents. Tap Drill Sizes for inch, metric and pipe threads. Size: 3⅜" × 7", Printed on plastic

Pack of 50 **EDP No. 20412**

Pack of 100 **EDP No. 20413**

MORSE CUTTING TOOLS

MORSE CUTTING TOOLS 150 Years



YOUR ONE STOP for CUTTING TOOLS

MORSE CUTTING TOOLS

NSF ISR

Certificate of Registration

This certifies that the Quality Management System of

Morse Cutting Tools

31695 Stephenson Hwy.
Madison Heights, Michigan, 48071-1672, United States

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 9001:2008

Scope of Registration:
The design of cutting tools and accessories including distribution services and sales thereof.

ANAB ACCREDITED ISO/IEC 17021 MANAGEMENT SYSTEMS CERTIFICATION BODY

IAF MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT

Certificate Number:	64541-IS3
Certificate Issue Date:	07-MAY-2015
Registration Date:	29-AUG-2015
Expiration Date *:	28-AUG-2018

Carl Blazik,
Director, Technical
Operations & Business Units,
NSF-ISR, Ltd.

NSF International Strategic Registrations
789 North Dixboro Road, Ann Arbor, Michigan 48105 | (888) NSF-9000 | www.nsf-isr.org

Authorized Registration and /or Accreditation Marks. This certificate is property of NSF-ISR and must be returned upon request.
*Company is audited for conformance at regular intervals. To verify registrations call (888) NSF-9000 or visit our web site at www.nsf-isr.org

Distributed By:

NSF
QUALITY SYSTEM REGISTERED TO ISO 9001:2008

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