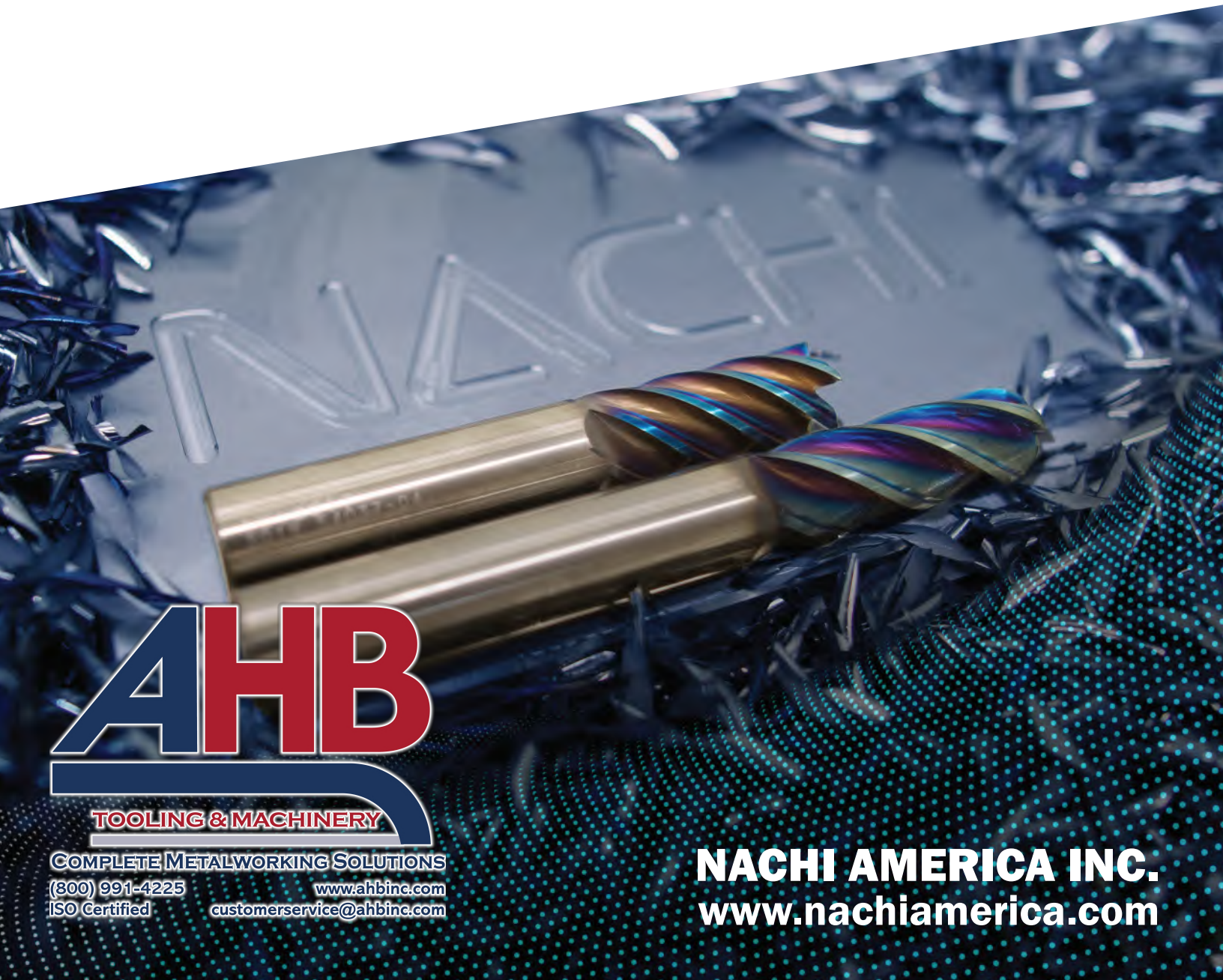
NACHI

High Performance Carbide End Mills

Expanded Offering with New Diameters, Cut Lengths, Corner Radius Sizes, and Neck Relieved Options



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COMPLETE METALWORKING SOLUTIONS
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NACHI AMERICA INC.
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Aqua V Mill - 4 Flute

Offering

New Sizes

- 9701/9702 Square End
- 9703/9704 Corner Radius

Features

- Variable helix, variable index to reduce vibrations and chatter
- Excellent at HSM/HEM
- Versatile across a range of materials
- Available in Square End, Corner Radius
- Aqua Mill Nano-layer Coating for high heat and wear resistance

Work Materials

- Cast Iron
- Tool Steel
- Titanium
- Carbon Steel
- 300/400 Series SS
- High Temp Alloys
- Alloy Steel
- PH SS

Performance

For High Performance Machining of a Range of Materials

Aqua V Mill - 5 Flute

Offering

New Series & Sizes

- 9705/9706 Square End
- 9707/9708 Corner Radius
- 9709/9710 Ball Nose
- 9727 Square End Neck Relief

Features

- Variable helix, variable index to reduce vibrations and chatter
- Excellent at HSM/HEM
- 5 Flute Design for faster feed rates and better surface finishes
- Available in Square End, Corner Radius and Ball End
- Aqua Mill Nano-layer Coating for high heat and wear resistance

Work Materials

- Cast Iron
- Tool Steel
- Titanium
- Carbon Steel
- 300/400 Series SS
- High Temp Alloys
- Alloy Steel
- PH SS

Performance

For High Performance Machining of a Range of Materials

Aqua Mill Hard

Offering

New Sizes

- 9711/9712 Square End
- 9713/9714 Corner Radius
- 9715/9716 Ball Nose
- 9729 Corner Radius Neck Relief

Features

- Excellent for HSM of hardened steels up to 70 HRC
- Thick core and wide land width for increased rigidity
- Available in Square End, Corner Radius, and Ball End
- Aqua Mill Nano-layer Coating for high heat and wear resistance

Work Materials

- Tool steels 50+ HRC
- Hardened Steels 50+ HRC
- High Speed Steels

Performance

For Machining Hard Materials 50-70 HRC

ALH Mill

Offering

New Series & Sizes

- 9717/9718 Square End
- 9719/9720 Corner Radius
- 9721/9722 Ball Nose
- 9723 Square End Neck Relief
- 9725 Ball Nose Neck Relief

Features

- Cylindrical land allows for great surface finishes and high feed rates
- 3 Flutes allow for faster feed rates while not sacrificing chip evacuation
- High polished flutes help shear and clear chips
- Available in Square End, Corner Radius, and Ball End
- Available with coating through our 72 hour modification service

Work Materials

- Aluminum alloys
- Aluminum castings
- Copper Alloys
- Magnesium

Performance

For Aluminum and Non-ferrous Materials

Aqua V Mill - 4 Flute

List No. 9701

Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000409	1/8	1/4	1-1/2	4
41000138	1/8	3/8	1-1/2	4
41000410	1/8	1/2	2	4
41000411	5/32	3/16	2	4
41000412	5/32	7/16	2	4
41000413	3/16	5/16	2	4
41000139	3/16	7/16	2	4
41000140	1/4	1/2	2-1/2	4
41000583	1/4	3/4	2-1/2	4
41000415	1/4	1	3	4
41000416	5/16	1/2	2	4
41000141	5/16	13/16	2-1/2	4
41000417	5/16	1	3	4
41000418	3/8	1/2	2	4
41000142	3/8	7/8	2-1/2	4
41000419	3/8	1	3	4
41000143	3/8	1-1/8	3	4
41000420	1/2	5/8	2-1/2	4
41000144	1/2	1	3	4
41000145	1/2	1-1/4	3-1/4	4
41000421	1/2	1-5/8	4	4
41000422	5/8	3/4	3	4
41000146	5/8	1-1/4	3-1/2	4
41000423	5/8	2	4	4
41000424	3/4	7/8	3	4
41000147	3/4	1-1/2	4	4
41000425	3/4	2-1/4	5	4

List No. 9702

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000001	3	8	57	4
41000002	4	11	57	4
41000003	5	11	57	4
41000004	6	13	57	4
41000005	8	19	70	4
41000006	10	22	70	4
41000007	12	26	75	4
41000008	16	32	90	4
41000009	18	38	100	4
41000010	20	45	100	4

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua V Mill - 4 Flute Corner Radius

List No. 9703

Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.010 CR	0.015 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	Flutes
41000469	1/8	1/4	1-1/2	X						4
41000470	1/8	3/8	1-1/2	X						4
41000181	1/8	3/8	1-1/2		X					4
41000471	1/8	1/2	2			X				4
41000472	3/16	5/16	2		X					4
41000182	3/16	7/16	2			X				4
41000473	3/16	7/16	2		X					4
41000183	1/4	1/2	2-1/2			X				4
41000474	1/4	1/2	2-1/2		X					4
41000475	1/4	3/4	2-1/2		X					4
41000476	1/4	1	3			X				4
41000477	5/16	1/2	2-1/2		X					4
41000184	5/16	13/16	2-1/2			X				4
41000478	5/16	1	3				X			4
41000479	3/8	1/2	2		X					4
41000185	3/8	7/8	2-1/2			X				4
41000480	3/8	7/8	2-1/2				X			4
41000481	3/8	1	3					X		4
41000482	1/2	5/8	2-1/2		X					4
41000186	1/2	1	3			X				4
41000187	1/2	1-1/4	3-1/4			X				4
41000483	1/2	1-1/4	3-1/4					X		4
41000189	1/2	1	3				X			4
41000190	1/2	1	3						X	4
41000484	5/8	3/4	3			X				4
41000191	5/8	1-1/4	3-1/2			X				4
41000192	5/8	1-1/4	3-1/2				X			4
41000485	5/8	1-1/4	3-1/2					X		4
41000193	5/8	1-1/4	3-1/2						X	4
41000486	5/8	2	4			X				4
41000487	3/4	7/8	3			X				4
41000194	3/4	1-1/2	4			X				4
41000195	3/4	1-1/2	4				X			4
41000488	3/4	1-1/2	4					X		4
41000196	3/4	1-1/2	4						X	4

List No. 9704

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	1.0 CR	2.0 CR	Flutes
41000021	3	8	57	X				4
41000022	4	11	57	X				4
41000023	5	11	57		X			4
41000024	6	13	57		X			4
41000025	8	19	70		X			4
41000026	8	19	70			X		4
41000027	10	22	80		X			4
41000028	10	22	80			X		4
41000029	12	26	90		X			4
41000030	12	26	90			X		4
41000031	12	26	90				X	4
41000032	16	32	90			X		4
41000033	16	32	90				X	4
41000034	18	38	100			X		4
41000035	18	38	100				X	4
41000036	20	45	100				X	4

1 per tube

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Aqua V Mill - 5 Flute

List No. 9705

Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000148	1/8	1/4	1-1/2	5
41000149	1/8	1/2	1-1/2	5
41000150	1/8	3/4	2-1/2	5
41000426	5/32	3/16	2	5
41000427	5/32	7/16	2	5
41000151	3/16	5/16	2	5
41000152	3/16	9/16	2	5
41000153	3/16	3/4	2-1/2	5
41000154	1/4	3/8	2	5
41000428	1/4	1/2	2-1/2	5
41000155	1/4	3/4	2-1/2	5
41000156	1/4	1-1/8	3	5
41000157	5/16	7/16	2	5
41000158	5/16	13/16	2-1/2	5
41000159	5/16	1-1/4	3	5
41000160	5/16	2-1/8	4	5
41000161	3/8	1/2	2	5
41000162	3/8	1	2-1/2	5
41000163	3/8	1-1/4	3	5
41000164	3/8	1-5/8	4	5
41000165	3/8	2-1/2	6	5
41000166	1/2	5/8	2-1/2	5
41000167	1/2	1	3	5
41000168	1/2	1-1/4	3	5
41000169	1/2	1-5/8	4	5
41000170	1/2	2-1/8	4	5
41000171	1/2	3-1/4	6	5
41000172	5/8	3/4	3	5
41000173	5/8	1-5/8	3-1/2	5
41000174	5/8	2-1/8	4	5
41000175	5/8	2-5/8	5	5
41000176	5/8	3-1/4	6	5
41000177	3/4	1	3	5
41000178	3/4	1-5/8	4	5
41000179	3/4	2-3/8	5	5
41000180	3/4	3-1/4	6	5

List No. 9706

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000011	3	8	57	5
41000012	4	11	57	5
41000013	5	11	57	5
41000014	6	13	57	5
41000015	8	19	70	5
41000016	10	22	70	5
41000017	12	26	75	5
41000018	16	32	90	5
41000019	18	38	100	5
41000020	20	45	100	5

1 per tube

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Aqua V Mill - 5 Flute Corner Radius

List No. L9707 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.010 CR	0.015 CR	0.020 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	0.125 CR	Flutes
41000197	1/8	1/4	1-1/2		X							5
41000489	1/8	1/4	1-1/2	X								5
41000198	1/8	1/2	1-1/2		X							5
41000490	1/8	1/2	1-1/2	X								5
41000491	1/8	1/2	1-1/2				X					5
41000199	1/8	3/4	2-1/2		X							5
41000589	3/16	5/16	2	X								5
41000492	3/16	5/16	2		X							5
41000200	3/16	5/16	2				X					5
41000201	3/16	9/16	2				X					5
41000578	3/16	5/8	2		X							5
41000202	3/16	3/4	2-1/2				X					5
41000493	1/4	3/8	2		X							5
41000494	1/4	3/8	2				X					5
41000203	1/4	3/8	2					X				5
41000495	1/4	1/2	2-1/2				X					5
41000496	1/4	1/2	2-1/2					X				5
41000497	1/4	1/2	2-1/2						X			5
41000204	1/4	3/4	2-1/2					X				5
41000205	1/4	1-1/8	3					X				5
41000498	5/16	7/16	2		X							5
41000206	5/16	7/16	2				X					5
41000207	5/16	7/16	2					X				5
41000499	5/16	7/16	2						X			5
41000500	5/16	13/16	2-1/2		X							5
41000208	5/16	13/16	2-1/2				X					5
41000209	5/16	13/16	2-1/2					X				5
41000210	5/16	1-1/4	3				X					5
41000211	5/16	2-1/8	4				X					5
41000590	3/8	1/2	2	X								5
41000501	3/8	1/2	2		X							5
41000212	3/8	1/2	2				X					5
41000213	3/8	1/2	2					X				5
41000502	3/8	1/2	2						X			5
41000580	3/8	1/2	2-1/2		X							5
41000579	3/8	7/8	2-1/2			X						5
41000503	3/8	1	2-1/2		X							5
41000214	3/8	1	2-1/2				X					5
41000215	3/8	1	2-1/2					X				5
41000504	3/8	1	2-1/2						X			5
41000216	3/8	1	2-1/2							X		5
41000217	3/8	1-1/4	3					X				5
41000218	3/8	1-5/8	4					X				5
41000219	3/8	2-1/2	6					X				5
41000591	1/2	5/8	2-1/2	X								5
41000505	1/2	5/8	2-1/2		X							5
41000220	1/2	5/8	2-1/2				X					5
41000221	1/2	5/8	2-1/2					X				5
41000506	1/2	5/8	2-1/2						X			5

(cont. on next page)

Aqua V Mill - 5 Flute Corner Radius *(cont.)*

List No. L9707 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.010 CR	0.015 CR	0.020 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	0.125 CR	Flutes
41000222	1/2	5/8	2-1/2							X		5
41000507	1/2	1	3		X							5
41000223	1/2	1	3				X					5
41000224	1/2	1	3					X				5
41000508	1/2	1	3						X			5
41000225	1/2	1	3							X		5
41000585	1/2	1-1/4	3		X							5
41000226	1/2	1-1/4	3				X					5
41000577	1/2	1-1/4	3								X	5
41000227	1/2	1-5/8	4				X					5
41000228	1/2	2-1/8	4				X					5
41000229	1/2	3-1/4	6				X					5
41000509	5/8	3/4	3		X							5
41000230	5/8	3/4	3				X					5
41000231	5/8	3/4	3					X				5
41000510	5/8	3/4	3						X			5
41000511	5/8	3/4	3							X		5
41000232	5/8	1-5/8	3-1/2				X					5
41000233	5/8	1-5/8	3-1/2					X				5
41000234	5/8	1-5/8	3-1/2							X		5
41000235	5/8	2-1/8	4				X					5
41000236	5/8	2-5/8	5				X					5
41000237	5/8	3-1/4	6				X					5
41000512	3/4	1	3		X							5
41000238	3/4	1	3				X					5
41000239	3/4	1	3					X				5
41000513	3/4	1	3						X			5
41000240	3/4	1	3							X		5
41000241	3/4	1-5/8	4				X					5
41000242	3/4	1-5/8	4					X				5
41000514	3/4	1-5/8	4						X			5
41000243	3/4	1-5/8	4							X		5
41000244	3/4	2-3/8	5				X					5
41000245	3/4	3-1/4	6				X					5

List No. L9708 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	1.0 CR	2.0 CR	Flutes
41000037	3	8	57	X				5
41000038	4	11	57	X				5
41000039	5	11	57		X			5
41000040	6	13	57		X			5
41000041	8	19	70		X			5
41000042	8	19	70			X		5
41000043	10	22	80		X			5
41000044	10	22	80			X		5
41000045	12	26	90		X			5
41000046	12	26	90			X		5
41000047	12	26	90				X	5
41000048	16	32	90			X		5
41000049	16	32	90				X	5
41000050	18	38	100			X		5
41000051	18	38	100				X	5
41000052	20	45	100				X	5

1 per tube

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Aqua V Mill - 5 Flute Ball Nose

List No. 9709 Fractional Sizes

EDP#	Size	Length of Cut	Overall Length	Flutes
41000246	1/8	1/4	1-1/2	5
41000247	1/8	1/2	1-1/2	5
41000248	1/8	3/4	2-1/2	5
41000249	3/16	5/16	2	5
41000250	3/16	9/16	2	5
41000251	3/16	3/4	2-1/2	5
41000252	1/4	3/8	2	5
41000253	1/4	3/4	2-1/2	5
41000254	1/4	1-1/8	3	5
41000255	5/16	7/16	2	5
41000256	5/16	13/16	2-1/2	5
41000257	5/16	1-1/4	3	5
41000258	3/8	1/2	2	5
41000259	3/8	1	2-1/2	5
41000260	3/8	1-1/4	3	5

EDP#	Size	Length of Cut	Overall Length	Flutes
41000261	3/8	1-5/8	3-1/2	5
41000262	3/8	1-5/8	6	5
41000263	1/2	5/8	2-1/2	5
41000264	1/2	1	3	5
41000265	1/2	1-1/4	3	5
41000266	1/2	1-5/8	4	5
41000267	1/2	1-5/8	6	5
41000268	5/8	3/4	3	5
41000269	5/8	1-5/8	3-1/2	5
41000270	5/8	2-1/8	4	5
41000271	5/8	2-1/8	6	5
41000272	3/4	1	3	5
41000273	3/4	1-5/8	4	5
41000274	3/4	2-3/8	5	5
41000275	3/4	2-3/8	6	5

List No. 9710 Metric Sizes

EDP#	Size	Length of Cut	Overall Length	Flutes
41000053	3	8	57	5
41000054	4	11	57	5
41000055	5	11	57	5
41000056	6	13	57	5
41000057	8	19	70	5
41000058	10	22	90	5
41000059	12	26	90	5
41000060	16	32	100	5
41000061	18	38	100	5
41000062	20	45	100	5

1 per tube

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Aqua V Mill - 5 Flute Neck Relief

List No. 9727 Fractional Sizes

EDP#	Size	Length of Cut	Neck Diameter	Neck Length	Overall Length	Flutes
41000447	1/8	5/32	0.118	3/4	2-1/2	5
41000448	1/8	5/32	0.118	1	2-1/2	5
41000449	3/16	7/32	0.178	3/4	3	5
41000450	3/16	7/32	0.178	1-1/8	3	5
41000451	1/4	3/8	0.237	1-1/8	4	5
41000452	1/4	3/8	0.237	1-5/8	4	5
41000454	3/8	1/2	0.356	1-5/8	4	5
41000455	3/8	1/2	0.356	2-1/8	4	5
41000456	3/8	1/2	0.356	2-1/2	5	5
41000458	1/2	5/8	0.475	1-3/4	4	5
41000459	1/2	5/8	0.475	2-1/4	4	5
41000460	1/2	5/8	0.475	2-3/4	5	5
41000463	5/8	3/4	0.593	2-3/8	6	5
41000464	5/8	3/4	0.593	3-3/8	6	5
41000466	3/4	1	0.712	2-1/2	6	5
41000467	3/4	1	0.712	2-7/8	6	5

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions

Aqua V Mill 4 & 5 Flute Series

List No. 9701, 9702, 9703, 9704, 9705, 9706, 9707, 9708, 9709, 9710, 9727

Profile Roughing

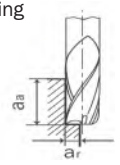
Mill Dia.	Radial WOC		Work Material								
			Cast Irons	Carbon Steel (1018/1020	Alloy Steels 4130/4140	Tool Steels < 40 HRC	Stainless Steels 400 series	Stainless Steels 300 series	Stainless Steels PH	Titanium	High Temp Alloys
			425-475 SFM	400-450 SFM	350-400 SFM	350-400 SFM	350-400 SFM	300-350 SFM	275-325 SFM	225-275 SFM	75-125 SFM
3	Ar	RPM	14550	13750	12150	12150	12150	10500	9700	8100	3250
	5%		0.0023	0.0023	0.0018	0.0015	0.0015	0.0018	0.0015	0.0015	0.0015
	10%	IPT	0.0016	0.0016	0.0013	0.0011	0.0011	0.0013	0.0011	0.0011	0.0011
	30%		0.0009	0.0009	0.0007	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006
1/8	Ar	RPM	13750	13000	11450	11450	11450	9900	9200	7650	3050
	5%		0.0023	0.0023	0.0018	0.0018	0.0018	0.0018	0.0015	0.0015	0.0018
	10%	IPT	0.0016	0.0016	0.0013	0.0013	0.0013	0.0013	0.0011	0.0011	0.0013
	30%		0.0009	0.0009	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0007
4	Ar	RPM	10900	10300	9100	9100	9100	7900	7300	6100	2400
	5%		0.0028	0.0028	0.0023	0.0020	0.0020	0.0023	0.0018	0.0018	0.0023
	10%	IPT	0.0020	0.0020	0.0016	0.0014	0.0014	0.0016	0.0013	0.0013	0.0016
	30%		0.0011	0.0011	0.0009	0.0008	0.0008	0.0009	0.0007	0.0007	0.0009
3/16	Ar	RPM	9150	8700	7650	7650	7650	6600	6100	5100	2000
	5%		0.0033	0.0033	0.0028	0.0025	0.0025	0.0028	0.0023	0.0023	0.0025
	10%	IPT	0.0023	0.0023	0.0020	0.0018	0.0018	0.0020	0.0016	0.0016	0.0018
	30%		0.0013	0.0013	0.0011	0.0010	0.0010	0.0011	0.0009	0.0009	0.0010
5	Ar	RPM	8750	8250	7300	7300	7300	6300	5800	4850	1950
	5%		0.0033	0.0033	0.0028	0.0028	0.0028	0.0030	0.0023	0.0025	0.0028
	10%	IPT	0.0023	0.0023	0.0020	0.0020	0.0020	0.0022	0.0016	0.0018	0.0020
	30%		0.0013	0.0013	0.0011	0.0011	0.0011	0.0012	0.0009	0.0010	0.0011
6	Ar	RPM	7300	6900	6100	6100	6100	5250	4850	4050	1600
	5%		0.0038	0.0038	0.0033	0.0033	0.0033	0.0035	0.0028	0.0028	0.0033
	10%	IPT	0.0027	0.0027	0.0023	0.0023	0.0023	0.0025	0.0020	0.0020	0.0023
	30%		0.0015	0.0015	0.0013	0.0013	0.0013	0.0014	0.0011	0.0011	0.0013
1/4	Ar	RPM	6900	6500	5700	5700	5700	5000	4600	3800	1500
	5%		0.0040	0.0040	0.0035	0.0033	0.0033	0.0038	0.0030	0.0030	0.0035
	10%	IPT	0.0029	0.0029	0.0025	0.0023	0.0023	0.0027	0.0022	0.0022	0.0025
	30%		0.0016	0.0016	0.0014	0.0013	0.0013	0.0015	0.0012	0.0012	0.0014
5/16	Ar	RPM	5500	5200	4600	4600	4600	4000	3700	3050	1200
	5%		0.0048	0.0048	0.0043	0.0043	0.0043	0.0045	0.0035	0.0038	0.0043
	10%	IPT	0.0034	0.0034	0.0031	0.0031	0.0031	0.0032	0.0025	0.0027	0.0031
	30%		0.0019	0.0019	0.0017	0.0017	0.0017	0.0018	0.0014	0.0015	0.0017
8	Ar	RPM	5500	5200	4600	4600	4600	4000	3700	3050	1200
	5%		0.0048	0.0048	0.0043	0.0043	0.0043	0.0045	0.0035	0.0038	0.0043
	10%	IPT	0.0034	0.0034	0.0031	0.0031	0.0031	0.0032	0.0025	0.0027	0.0031
	30%		0.0019	0.0019	0.0017	0.0017	0.0017	0.0018	0.0014	0.0015	0.0017
3/8	Ar	RPM	4600	4300	3800	3800	3800	3300	3050	2550	1000
	5%		0.0058	0.0058	0.0053	0.0050	0.0050	0.0055	0.0040	0.0045	0.0050
	10%	IPT	0.0041	0.0041	0.0038	0.0036	0.0036	0.0040	0.0029	0.0032	0.0036
	30%		0.0023	0.0023	0.0021	0.0020	0.0020	0.0022	0.0016	0.0018	0.0020
10	Ar	RPM	4350	4100	3600	3600	3600	3150	2900	2400	970
	5%		0.0060	0.0060	0.0055	0.0053	0.0053	0.0058	0.0043	0.0048	0.0053
	10%	IPT	0.0043	0.0043	0.0040	0.0038	0.0038	0.0041	0.0031	0.0034	0.0038
	30%		0.0024	0.0024	0.0022	0.0021	0.0021	0.0023	0.0017	0.0019	0.0021
7/16	Ar	RPM	3900	3700	3300	3300	3300	2800	2600	2200	870
	5%		0.0065	0.0065	0.0060	0.0058	0.0058	0.0065	0.0048	0.0053	0.0060
	10%	IPT	0.0047	0.0047	0.0043	0.0041	0.0041	0.0047	0.0034	0.0038	0.0043
	30%		0.0026	0.0026	0.0024	0.0023	0.0023	0.0026	0.0019	0.0021	0.0024
12	Ar	RPM	3600	3400	3000	3000	3000	2600	2400	2000	800
	5%		0.0070	0.0070	0.0065	0.0063	0.0063	0.0070	0.0050	0.0055	0.0065
	10%	IPT	0.0050	0.0050	0.0047	0.0045	0.0045	0.0050	0.0036	0.0040	0.0047
	30%		0.0028	0.0028	0.0026	0.0025	0.0025	0.0028	0.0020	0.0022	0.0026
1/2	Ar	RPM	3400	3250	2850	2850	2850	2500	2300	1900	760
	5%		0.0073	0.0073	0.0068	0.0065	0.0065	0.0073	0.0055	0.0060	0.0068
	10%	IPT	0.0052	0.0052	0.0049	0.0047	0.0047	0.0052	0.0040	0.0043	0.0049
	30%		0.0029	0.0029	0.0027	0.0026	0.0026	0.0029	0.0022	0.0024	0.0027
9/16	Ar	RPM	3050	2900	2550	2550	2550	2200	2000	1700	680
	5%		0.0083	0.0083	0.0078	0.0075	0.0075	0.0083	0.0060	0.0063	0.0075
	10%	IPT	0.0059	0.0059	0.0056	0.0054	0.0054	0.0059	0.0043	0.0045	0.0054
	30%		0.0033	0.0033	0.0031	0.0030	0.0030	0.0033	0.0024	0.0025	0.0030
5/8	Ar	RPM	2750	2600	2300	2300	2300	2000	1800	1500	600
	5%		0.0090	0.0090	0.0085	0.0083	0.0083	0.0093	0.0068	0.0070	0.0085
	10%	IPT	0.0065	0.0065	0.0061	0.0059	0.0059	0.0067	0.0049	0.0050	0.0061
	30%		0.0036	0.0036	0.0034	0.0033	0.0033	0.0037	0.0027	0.0028	0.0034
16	Ar	RPM	2750	2600	2300	2300	2300	2000	1800	1500	600
	5%		0.0090	0.0090	0.0085	0.0083	0.0083	0.0093	0.0068	0.0070	0.0085
	10%	IPT	0.0065	0.0065	0.0061	0.0059	0.0059	0.0067	0.0049	0.0050	0.0061
	30%		0.0036	0.0036	0.0034	0.0033	0.0033	0.0037	0.0027	0.0028	0.0034
3/4	Ar	RPM	2300	2150	1900	1900	1900	1650	1500	1300	500
	5%		0.0108	0.0108	0.0103	0.0098	0.0098	0.0110	0.0080	0.0083	0.0103
	10%	IPT	0.0077	0.0077	0.0074	0.0070	0.0070	0.0079	0.0058	0.0059	0.0074
	30%		0.0043	0.0043	0.0041	0.0039	0.0039	0.0044	0.0032	0.0033	0.0041
20	Ar	RPM	2200	2050	1800	1800	1800	1550	1450	1200	480
	5%		0.0113	0.0113	0.0108	0.0103	0.0103	0.0115	0.0083	0.0085	0.0108
	10%	IPT	0.0081	0.0081	0.0077	0.0074	0.0074	0.0083	0.0059	0.0061	0.0077
	30%		0.0045	0.0045	0.0043	0.0041	0.0041	0.0046	0.0033	0.0034	0.0043

Depth Of Cut = Aa

For applications with radial engagement > 15% of tool diameter, please use a max 1.5XD for depth of cut.

D: Dia. Of Mill

Side Milling



- For slotting, it is recommended to use Aqua V Mill 4 Flute. Please refer to slotting speed/feed chart.
- For Entry, it is recommended to reduce RPM and IPT by 50%.
- When using long reach, neck relieved tools, decrease width of cut and feed rate by 50%.
- Adjust milling condition when unusual vibration or sound occurs.
- For finishing parameters, please use 0.01XD WOC, max SFM shown on chart, and IPT value shown at 30% engagment.
- If assistance is needed please reach out to the cutting tools technical team.

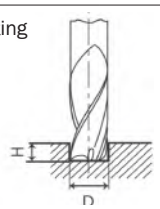
Standard Milling Conditions

Aqua V Mill 4 Flute Series List No. 9701, 9702, 9703, and 9704

Slotting

Mill Diameter		Work Material								
		Cast Irons	Carbon Steel 1018/1020	Medium Alloy Steels 4130/4140	Tool Steels <40 HRC	Stainless Steels 400 series	Stainless Steels 300 series	Stainless Steels PH	Titanium	High Temp Alloys
		325-375 SFM	325-375 SFM	275-325 SFM	275-325 SFM	275-325 SFM	250-300 SFM	225-275 SFM	225-275 SFM	60-80 SFM
3	RPM	11300	11300	9700	9700	9700	8900	8100	8100	1950
	IPT	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
1/8	RPM	10700	10700	9150	8400	8400	8400	7650	7650	1850
	IPT	0.0006	0.0007	0.0006	0.0006	0.0006	0.0007	0.0005	0.0005	0.0005
4	RPM	8500	8500	7300	7300	7300	6700	6700	6100	1450
	IPT	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007	0.0007
3/16	RPM	7100	7100	6100	6100	6100	5600	5100	5100	1200
	IPT	0.0008	0.0010	0.0009	0.0009	0.0009	0.0010	0.0008	0.0008	0.0008
5	RPM	6800	6800	5800	5800	5800	5350	4850	4850	1150
	IPT	0.0008	0.0011	0.0009	0.0009	0.0009	0.0011	0.0008	0.0008	0.0008
6	RPM	5650	5650	4850	4850	4850	4500	4050	4050	970
	IPT	0.0011	0.0013	0.0011	0.0011	0.0011	0.0013	0.0010	0.0010	0.0010
1/4	RPM	5350	5350	4600	4600	4600	4200	3800	3800	920
	IPT	0.0011	0.0013	0.0011	0.0011	0.0011	0.0013	0.0010	0.0010	0.0010
5/16	RPM	4300	4300	3700	3700	3700	3350	3050	3050	730
	IPT	0.0014	0.0017	0.0015	0.0015	0.0015	0.0017	0.0013	0.0013	0.0013
8	RPM	4300	4300	3700	3700	3700	3350	3050	3050	730
	IPT	0.0014	0.0017	0.0015	0.0015	0.0015	0.0017	0.0013	0.0013	0.0013
3/8	RPM	3550	3550	3050	3050	3050	2800	2550	2550	610
	IPT	0.0017	0.0020	0.0018	0.0018	0.0018	0.0020	0.0015	0.0016	0.0016
10	RPM	3400	3400	2900	2900	2900	2650	2400	2400	580
	IPT	0.0018	0.0021	0.0019	0.0019	0.0019	0.0021	0.0016	0.0016	0.0016
7/16	RPM	3050	3050	2600	2600	2600	2400	2200	2200	520
	IPT	0.0019	0.0023	0.0021	0.0021	0.0021	0.0023	0.0018	0.0018	0.0018
12	RPM	2800	2800	2400	2400	2400	2200	2000	2000	480
	IPT	0.0021	0.0025	0.0023	0.0023	0.0023	0.0025	0.0019	0.0019	0.0020
1/2	RPM	2650	2650	2300	2300	2300	2100	1900	1900	460
	IPT	0.0022	0.0026	0.0024	0.0024	0.0024	0.0026	0.0020	0.0020	0.0021
9/16	RPM	2400	2400	2000	2000	2000	1850	1700	1700	400
	IPT	0.0025	0.0030	0.0027	0.0027	0.0027	0.0030	0.0023	0.0023	0.0024
5/8	RPM	2150	2150	1800	1800	1800	1700	1500	1500	370
	IPT	0.0028	0.0033	0.0030	0.0030	0.0030	0.0033	0.0025	0.0025	0.0026
16	RPM	2150	2150	1800	1800	1800	1700	1500	1500	370
	IPT	0.0028	0.0033	0.0030	0.0030	0.0030	0.0033	0.0025	0.0025	0.0026
3/4	RPM	1800	1800	1500	1500	1500	1400	1250	1250	310
	IPT	0.0033	0.0039	0.0036	0.0036	0.0036	0.0039	0.0030	0.0030	0.0031
20	RPM	1700	1700	1450	1450	1450	1350	1200	1200	290
	IPT	0.0035	0.0041	0.0038	0.0038	0.0038	0.0041	0.0032	0.0032	0.0033
DOC	H	0.5D			0.25D					0.15D
	D	1.0D								

D: Dia. Of Mill Slotting



- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease depth of cut and feed rate by 50%.
- If assistance is needed please reach out to the cutting tools technical team.

Aqua Mill Hard

List No. 9711 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000276	1/8	3/8	1-1/2	6
41000277	3/16	7/16	2	6
41000278	1/4	5/8	2-1/2	6
41000279	5/16	13/16	2-1/2	6
41000280	3/8	1	3	6
41000281	1/2	1-1/8	3	6
41000282	5/8	1-1/2	4	8
41000283	3/4	1-3/4	4	8

List No. 9712 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000063	3	8	50	6
41000064	4	11	50	6
41000065	5	13	50	6
41000066	6	13	50	6
41000067	8	19	63	6
41000068	10	22	70	6
41000069	12	26	75	6
41000070	16	32	93	8
41000071	20	38	150	8

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Mill Hard Corner Radius

List No. 9713 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.015 CR	0.030 CR	0.060 CR	Flutes
41000284	1/8	3/8	1-1/2	X			6
41000285	3/16	7/16	2	X			6
41000586	3/16	7/16	2			X	6
41000286	1/4	5/8	2-1/2	X			6
41000587	1/4	5/8	2-1/2			X	6
41000287	5/16	13/16	2-1/2	X			6
41000288	3/8	1	3		X		6
41000289	1/2	1-1/8	3		X		6
41000588	1/2	1-1/8	3			X	6
41000403	3/4	1-3/4	4			X	8

List No. 9714 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	Flutes
41000072	3	8	50	X		6
41000074	4	11	50	X		6
41000076	5	13	63	X		6
41000078	6	13	63	X		6
41000080	8	19	65	X		6
41000083	10	22	70		X	6
41000085	12	26	75		X	6

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Mill Hard Ball Nose

List No. 9715

Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000298	1/8	3/16	2-1/2	2
41000299	3/16	9/32	2-1/2	2
41000300	1/4	3/8	2-1/2	2
41000301	5/16	15/32	2-1/2	2
41000302	3/8	9/16	3	2
41000303	1/2	5/8	4	2

List No. 9716

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000093	3	3	50	2
41000094	6	6	76	2
41000095	8	8	90	2
41000096	10	10	100	2
41000097	12	12	100	2
41000098	16	16	100	2

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Hard Mill Corner Radius - Neck Relief

Carbide | AQ Mill | h6 | Variable V

> 1/2, >12

List No. 9729 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Neck Length	Overall Length	0.015 CR	Flutes
41000292	3/16	7/32	1	3	X	6
41000293	1/4	9/32	1	3	X	6
41000294	3/8	15/32	1-1/4	3-1/2	X	6
41000295	1/2	5/8	2-1/4	4	X	6

List No. 9730 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Neck Length	Overall Length	0.3 CR	Flutes
41000088	5	8	15	63	X	6
41000089	6	9	20	63	X	6
41000091	10	15	30	100	X	6
41000092	12	18	35	100	X	6

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions
Conventional

List No: 9711, 9712, 9713, 9714, 9729, 9730

Mill Diameter		Work Material			
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC	Hardened Steel 65-70 HRC
		280-320 SFM	220-250 SFM	200-220 SFM	140-160 SFM
3	RPM	10400	8200	7400	5200
	IPT	0.0007	0.0005	0.0005	0.0005
1/8	RPM	9200	7200	6400	4600
	IPT	0.0007	0.0006	0.0006	0.0005
4	RPM	7300	5700	5100	3600
	IPT	0.0010	0.0009	0.0008	0.0008
3/16	RPM	6100	4800	4300	3050
	IPT	0.0014	0.0011	0.0010	0.0010
5	RPM	5800	4500	4100	2900
	IPT	0.0014	0.0011	0.0010	0.0010
6	RPM	5200	4100	3700	2600
	IPT	0.0016	0.0013	0.0012	0.0012
1/4	RPM	4900	3850	3500	2450
	IPT	0.0017	0.0014	0.0013	0.0013
5/16	RPM	3900	3050	2800	1950
	IPT	0.0022	0.0017	0.0016	0.0016
8	RPM	3900	3050	2800	1950
	IPT	0.0022	0.0017	0.0016	0.0016
3/8	RPM	3250	2600	2300	1650
	IPT	0.0026	0.0020	0.0019	0.0019
10	RPM	3100	2450	2200	1550
	IPT	0.0028	0.0022	0.0020	0.0020
12	RPM	2600	2050	1850	1300
	IPT	0.0033	0.0026	0.0024	0.0024
1/2	RPM	2450	1950	1750	1250
	IPT	0.0035	0.0027	0.0025	0.0025
5/8	RPM	1950	1550	1400	980
	IPT	0.0041	0.0032	0.0030	0.0029
16	RPM	1950	1550	1400	980
	IPT	0.0041	0.0032	0.0030	0.0029
3/4	RPM	1650	1300	1150	820
	IPT	0.0045	0.0036	0.0032	0.0032
20	RPM	1450	1150	1000	780
	IPT	0.0046	0.0038	0.0034	0.0034
Depth of Cut	Aa	1-1.5D			
	Ar	0.07D		0.02D	
	H	0.07D		0.05D - Max 0.5mm	

- Recommended to run dry with air blow only.
- When altering depth of cut or speed, it is important to read chips in order to ensure that heat is coming off in chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%.
- Conventional conditions are recommended for finishing

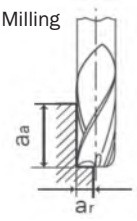
Standard Milling Conditions
High Speed

List No: 9711, 9712, 9713, 9714, 9729, 9730

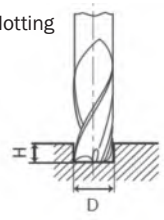
Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		800-1000 SFM	600-740 SFM	400-450 SFM
3	RPM	32000	24000	13900
	IPT	0.0010	0.0007	0.0008
1/8	RPM	27500	20500	13150
	IPT	0.0012	0.0009	0.0009
4	RPM	24000	18000	10400
	IPT	0.0016	0.0012	0.0013
3/16	RPM	20100	15100	8700
	IPT	0.0020	0.0015	0.0015
5	RPM	19200	14400	8300
	IPT	0.0021	0.0015	0.0016
6	RPM	16000	12000	6950
	IPT	0.0024	0.0018	0.0018
1/4	RPM	15100	11500	6600
	IPT	0.0025	0.0018	0.0019
5/16	RPM	12000	9000	5250
	IPT	0.0032	0.0023	0.0025
8	RPM	12000	9000	5200
	IPT	0.0032	0.0023	0.0025
3/8	RPM	10000	7500	4400
	IPT	0.0038	0.0028	0.0030
10	RPM	9600	7200	4200
	IPT	0.0040	0.0029	0.0031
12	RPM	8000	6000	3500
	IPT	0.0048	0.0035	0.0039
1/2	RPM	7550	5750	3300
	IPT	0.0050	0.0037	0.0042
5/8	RPM	6000	4500	2600
	IPT	0.0059	0.0044	0.0050
16	RPM	6000	4500	2600
	IPT	0.0059	0.0044	0.0050
3/4	RPM	5000	3750	2200
	IPT	0.0063	0.0046	0.0055
20	RPM	4800	3600	2100
	IPT	0.0067	0.0049	0.0058
Depth of Cut	Aa	1-1.5D		
	Ar	0.03D		0.02D

D: Dia. Of Mill

Side Milling



Slotting



- Recommended to run dry with air blow only.
- When altering depth of cut or speed, it is important to read chips in order to ensure that heat is coming off in chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%.
- Conventional conditions are recommended for finishing

Standard Milling Conditions
Roughing List No. 9715, 9716

Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		320-350 SFM	250-280 SFM	200-250 SFM
3	RPM	11000	8600	7400
	IPT	0.0016	0.0012	0.0011
1/8	RPM	10400	8100	6900
	IPT	0.0017	0.0013	0.0012
4	RPM	8250	6450	5600
	IPT	0.0022	0.0018	0.0016
3/16	RPM	6900	5400	4700
	IPT	0.0026	0.0020	0.0018
5	RPM	660	5150	4450
	IPT	0.0027	0.0021	0.0019
6	RPM	5500	4300	3700
	IPT	0.0032	0.0025	0.0023
1/4	RPM	5200	4050	3500
	IPT	0.0034	0.0026	0.0024
5/16	RPM	4150	3200	2800
	IPT	0.0042	0.0033	0.0030
8	RPM	4150	3200	2800
	IPT	0.0042	0.0033	0.0030
3/8	RPM	3500	2700	2350
	IPT	0.0049	0.0040	0.0036
10	RPM	3300	2600	2250
	IPT	0.0050	0.0042	0.0038
12	RPM	2800	2150	1850
	IPT	0.0060	0.0050	0.0045
1/2	RPM	2600	2000	1800
	IPT	0.0063	0.0053	0.0048
5/8	RPM	2100	1600	1400
	IPT	0.0079	0.0066	0.0060
16	RPM	2100	1600	1400
	IPT	0.0079	0.0066	0.0060
3/4	RPM	1750	1350	1200
	IPT	0.0080	0.0067	0.0060
20	RPM	1650	1300	1100
	IPT	0.0082	0.0069	0.0062
Depth of Cut	Aa	0.025”-0.035”	0.015”-0.025”	
	Pf	0.25D		

- Recommended to run dry with air blow.
- When altering depth of cut or speed, it is important to read chips in order to ensure that the heat is being removed in the chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%

Standard Milling Conditions
High Speed Finishing List No. 9715, 9716

Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		800-1000 SFM	700-900 SFM	600-800 SFM
3	RPM	29100	25900	22600
	IPT	0.0024	0.0014	0.0014
1/8	RPM	27500	24500	21400
	IPT	0.0025	0.0015	0.0015
4	RPM	21800	19400	17000
	IPT	0.0028	0.0016	0.0016
3/16	RPM	18300	16300	14300
	IPT	0.0028	0.0017	0.0017
5	RPM	17500	15500	13600
	IPT	0.0029	0.0017	0.0017
6	RPM	14550	13000	11300
	IPT	0.0031	0.0019	0.0019
1/4	RPM	13750	12200	10700
	IPT	0.0032	0.0019	0.0019
5/16	RPM	11000	9800	8550
	IPT	0.0034	0.0021	0.0021
8	RPM	10900	9700	8500
	IPT	0.0034	0.0021	0.0021
3/8	RPM	9150	8150	7100
	IPT	0.0038	0.0024	0.0024
10	RPM	8700	7800	6800
	IPT	0.0039	0.0024	0.0024
12	RPM	7300	6450	5650
	IPT	0.0041	0.0027	0.0027
1/2	RPM	6900	6100	5350
	IPT	0.0042	0.0028	0.0028
5/8	RPM	5500	4900	4300
	IPT	0.0049	0.0033	0.0033
16	RPM	5500	4900	4300
	IPT	0.0049	0.0033	0.0033
3/4	RPM	4600	4100	3550
	IPT	0.0056	0.0037	0.0037
20	RPM	4400	3900	3400
	IPT	0.0058	0.0039	0.0039
Depth of Cut	Aa	0.025”-0.035”	0.015”-0.025”	
	Pf	0.005”		

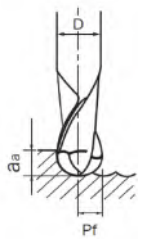
- Recommended to run dry with air blow.
- When altering depth of cut or speed, it is important to read chips in order to ensure that the heat is being removed in the chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%

Standard Milling Conditions
Low Speed Finishing List No. 9715, 9716

Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		245-275 SFM	150-180 SFM	120-150 SFM
3	RPM	8400	5350	4350
	IPT	0.0007	0.0006	0.0006
1/8	RPM	7950	5050	4100
	IPT	0.0007	0.0006	0.0006
4	RPM	6300	4000	3300
	IPT	0.0010	0.0007	0.0007
3/16	RPM	5300	3400	2750
	IPT	0.0010	0.0009	0.0009
5	RPM	5050	3200	2600
	IPT	0.0011	0.0009	0.0009
6	RPM	4200	2650	2200
	IPT	0.0013	0.0010	0.0010
1/4	RPM	4000	2500	2050
	IPT	0.0013	0.0011	0.0011
5/16	RPM	3200	2000	1650
	IPT	0.0016	0.0014	0.0014
8	RPM	3200	2000	1650
	IPT	0.0016	0.0014	0.0014
3/8	RPM	2650	1700	1400
	IPT	0.0019	0.0016	0.0016
10	RPM	2500	0	1300
	IPT	0.0020	0.0017	0.0017
12	RPM	2100	1350	1100
	IPT	0.0024	0.0020	0.0020
1/2	RPM	2000	1250	1050
	IPT	0.0025	0.0021	0.0021
5/8	RPM	1600	1000	830
	IPT	0.0031	0.0026	0.0026
16	RPM	1600	1000	830
	IPT	0.0031	0.0026	0.0026
3/4	RPM	1300	850	700
	IPT	0.0037	0.0031	0.0031
20	RPM	1250	800	650
	IPT	0.0039	0.0033	0.0033
Depth of Cut	Aa	0.005”		
	Pf	0.005”		

D: Dia. Of Mill

R: Ball Radius



- Recommended to run dry with air blow.
- When altering depth of cut or speed, it is important to read chips in order to ensure that the heat is being removed in the chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%

ALH Mill

List No. 9717 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000304	1/8	1/4	1-1/2	3
41000305	1/8	3/8	2	3
41000306	1/8	1/2	2-1/2	3
41000515	1/8	3/4	2-1/2	3
41000307	3/16	5/16	2	3
41000308	3/16	9/16	2-1/2	3
41000516	3/16	3/4	2-1/2	3
41000309	1/4	3/8	2	3
41000310	1/4	1/2	2-1/2	3
41000311	1/4	5/8	2-1/2	3
41000312	1/4	1	3	3
41000517	1/4	1-1/4	3	3
41000313	5/16	7/16	2	3
41000314	5/16	5/8	2-1/2	3
41000315	5/16	1	3	3
41000316	5/16	1-1/4	3	3
41000317	3/8	1/2	2	3
41000518	3/8	3/4	2-1/2	3

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000318	3/8	1	3	3
41000319	3/8	1-1/4	3-1/2	3
41000320	3/8	1-1/2	4	3
41000321	3/8	2	4	3
41000322	1/2	5/8	2-1/2	3
41000323	1/2	1	3	3
41000324	1/2	1-1/4	3	3
41000325	1/2	1-5/8	4	3
41000326	1/2	2	4	3
41000327	1/2	2-1/2	5	3
41000328	5/8	3/4	3	3
41000519	5/8	1-1/4	3-1/2	3
41000329	5/8	1-5/8	3-1/2	3
41000330	5/8	2-1/8	4	3
41000331	3/4	1	4	3
41000332	3/4	1-5/8	4	3
41000333	3/4	2-1/4	5	3

List No. 9718 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000100	3	8	57	3
41000101	4	11	57	3
41000102	5	11	57	3
41000103	6	13	57	3
41000104	8	19	70	3
41000105	10	22	70	3
41000106	12	26	75	3
41000107	12	32	94	3
41000108	16	32	90	3
41000109	18	38	90	3
41000110	20	45	100	3

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill Corner Radius

List No. 9719 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.015 CR	0.20 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	Flutes
41000334	1/8	1/4	1-1/2	X						3
41000539	1/8	1/4	1-1/2			X				3
41000335	1/8	3/8	2	X						3
41000540	1/8	3/8	2			X				3
41000336	1/8	1/2	2-1/2	X						3
41000541	3/16	5/16	2	X						3
41000337	3/16	5/16	2			X				3
41000542	3/16	9/16	2-1/2	X						3
41000338	3/16	9/16	2-1/2			X				3
41000543	1/4	3/8	2	X						3
41000339	1/4	3/8	2			X				3
41000340	1/4	3/8	2				X			3
41000544	1/4	1/2	2-1/2	X						3
41000341	1/4	1/2	2-1/2			X				3
41000545	1/4	1/2	2-1/2				X			3
41000546	1/4	1	3	X						3
41000345	5/16	7/16	2			X				3
41000346	5/16	7/16	2				X			3
41000347	5/16	5/8	2-1/2			X				3
41000348	5/16	1	3			X				3
41000349	5/16	1	3				X			3
41000350	5/16	1-1/4	3			X				3
41000547	3/8	1/2	2	X						3
41000351	3/8	1/2	2			X				3
41000352	3/8	1/2	2				X			3
41000548	3/8	1/2	2					X		3
41000353	3/8	1/2	2						X	3
41000549	3/8	1	3	X						3
41000402	3/8	1	3		X					3
41000354	3/8	1	3			X				3
41000355	3/8	1	3				X			3
41000550	3/8	1	3					X		3
41000356	3/8	1	3						X	3
41000357	3/8	1-1/4	3-1/2				X			3
41000358	3/8	1-1/2	4				X			3
41000359	3/8	2	4			X				3
41000551	1/2	5/8	2-1/2	X						3
41000360	1/2	5/8	2-1/2			X				3
41000361	1/2	5/8	2-1/2				X			3
41000552	1/2	5/8	2-1/2					X		3
41000362	1/2	5/8	2-1/2						X	3

(cont. on next page)

ALH Mill Corner Radius *(cont.)*

List No. 9719 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.015 CR	0.20 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	Flutes
41000553	1/2	1	3	X						3
41000363	1/2	1	3			X				3
41000364	1/2	1	3				X			3
41000554	1/2	1	3					X		3
41000365	1/2	1	3						X	3
41000366	1/2	1-1/4	3			X				3
41000584	1/2	1-1/4	3					X		3
41000367	1/2	1-5/8	4			X				3
41000368	1/2	2	4			X				3
41000369	1/2	2-1/2	5			X				3
41000555	5/8	3/4	3			X				3
41000370	5/8	3/4	3				X			3
41000556	5/8	3/4	3					X		3
41000371	5/8	3/4	3						X	3
41000372	5/8	1-5/8	3-1/2				X			3
41000557	5/8	1-5/8	3-1/2					X		3
41000373	5/8	1-5/8	3-1/2						X	3
41000374	5/8	2-1/8	4			X				3
41000375	5/8	2-1/2	5			X				3
41000376	3/4	1	4				X			3
41000558	3/4	1	4					X		3
41000377	3/4	1	4						X	3
41000378	3/4	1-5/8	4				X			3
41000379	3/4	1-5/8	4						X	3
41000380	3/4	2-1/4	5			X				3
41000381	3/4	3-1/4	6			X				3

List No. 9720 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	1.0 CR	2.0 CR	Flutes
41000111	3	8	57	X				3
41000112	4	11	57	X				3
41000113	5	11	57	X				3
41000114	6	13	57	X				3
41000115	6	13	57		X			3
41000116	8	19	70		X			3
41000117	8	19	70			X		3
41000118	10	22	70		X			3
41000119	10	22	70			X		3
41000120	12	26	75		X			3
41000121	12	26	75			X		3
41000123	16	32	90			X		3
41000124	16	32	90				X	3
41000126	18	38	90				X	3
41000128	20	45	100				X	3

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill Ball Nose

List No. 9721

Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000382	1/8	1/4	1-1/2	3
41000383	1/8	3/8	2	3
41000384	1/8	1/2	2-1/2	3
41000385	3/16	3/8	2	3
41000386	3/16	3/4	2-1/2	3
41000387	3/16	1	3	3
41000388	1/4	3/8	2	3
41000389	1/4	3/4	2-1/2	3
41000390	1/4	1	3	3
41000391	5/16	13/16	2-1/2	3
41000392	3/8	1/2	2	3
41000393	3/8	1	2-1/2	3
41000394	3/8	1-1/2	3-1/2	3
41000395	1/2	5/8	2-1/2	3
41000396	1/2	1	3	3
41000397	1/2	1-1/4	3-1/2	3
41000398	5/8	1	3	3
41000399	5/8	1-5/8	4-1/2	3
41000400	3/4	1	3	3
41000401	3/4	1-5/8	4	3

List No. L9722

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000129	3	8	57	3
41000130	4	11	57	3
41000131	5	11	57	3
41000132	6	13	57	3
41000133	8	19	70	3
41000134	10	22	70	3
41000135	12	26	75	3
41000136	16	32	90	3
41000137	18	38	100	3

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill - Neck Relief

List No. 9723 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Neck Diameter	Neck Length	Overall Length	Flutes
41000520	1/8	5/32	0.118	3/4	3	3
41000521	1/8	5/32	0.118	1	3	3
41000522	3/16	7/32	0.178	3/4	3	3
41000523	3/16	7/32	0.178	1	3	3
41000524	1/4	3/8	0.237	1-1/8	3	3
41000525	1/4	3/8	0.237	1-5/8	3	3
41000527	3/8	1/2	0.356	1-5/8	3	3
41000528	3/8	1/2	0.356	2-1/8	4	3
41000530	1/2	5/8	0.475	1-3/4	3-1/2	3
41000531	1/2	5/8	0.475	2-1/4	4	3
41000532	1/2	5/8	0.475	2-3/4	4-1/2	3
41000533	1/2	5/8	0.475	3-3/8	5	3
41000535	5/8	3/4	0.593	2-3/8	4	3
41000536	5/8	3/4	0.593	3-3/8	6	3
41000537	3/4	1	0.712	2-1/2	5	3
41000538	3/4	1	0.712	3-3/8	6	3

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill Ball Nose - Neck Relief

List No. 9725 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Neck Diameter	Neck Length	Overall Length	Flutes
41000559	1/8	5/32	0.118	3/4	3	3
41000560	1/8	5/32	0.118	1	3	3
41000561	3/16	7/32	0.178	3/4	3	3
41000562	3/16	7/32	0.178	1	3	3
41000563	1/4	3/8	0.237	1-1/8	3	3
41000564	1/4	3/8	0.237	1-5/8	3	3
41000566	3/8	1/2	0.356	1-5/8	3	3
41000567	3/8	1/2	0.356	2-1/8	4	3
41000569	1/2	5/8	0.475	1-3/4	3-1/2	3
41000570	1/2	5/8	0.475	2-1/4	4	3
41000571	1/2	5/8	0.475	2-3/4	4-1/2	3
41000573	5/8	3/4	0.593	2-3/8	4	3
41000574	5/8	3/4	0.593	3-3/8	6	3
41000575	3/4	1	0.712	2	4	3
41000576	3/4	1	0.712	3-3/8	6	3

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions
ALH 3 Flute Series
Profile Roughing

List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Dia.	Radial WOC		Work Material		
			Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
			950-1050 SFM	650-750 SFM	525-625 SFM
3	Ar	RPM	32300	22600	18600
	5%	IPT	0.0034	0.0030	0.0030
	10%		0.0025	0.0022	0.0022
	25%		0.0017	0.0015	0.0015
	50%		0.0015	0.0013	0.0013
1/8	Ar	RPM	30600	21400	17600
	5%	IPT	0.0037	0.0032	0.0032
	10%		0.0027	0.0023	0.0023
	25%		0.0018	0.0016	0.0016
	50%		0.0016	0.0014	0.0014
4	Ar	RPM	24300	17000	14000
	5%	IPT	0.0046	0.0041	0.0039
	10%		0.0033	0.0030	0.0028
	25%		0.0023	0.0021	0.0020
	50%		0.0020	0.0018	0.0017
3/16	Ar	RPM	20400	14300	11700
	5%	IPT	0.0055	0.0048	0.0048
	10%		0.0040	0.0035	0.0035
	25%		0.0028	0.0024	0.0024
	50%		0.0024	0.0021	0.0021
5	Ar	RPM	19400	13600	11200
	5%	IPT	0.0060	0.0050	0.0050
	10%		0.0043	0.0037	0.0037
	25%		0.0030	0.0025	0.0025
	50%		0.0026	0.0022	0.0022
6	Ar	RPM	16200	11300	9300
	5%	IPT	0.0071	0.0060	0.0060
	10%		0.0052	0.0043	0.0043
	25%		0.0036	0.0030	0.0030
	50%		0.0031	0.0026	0.0026
1/4	Ar	RPM	15300	10700	8800
	5%	IPT	0.0076	0.0064	0.0064
	10%		0.0055	0.0047	0.0047
	25%		0.0038	0.0032	0.0032
	50%		0.0033	0.0028	0.0028
5/16	Ar	RPM	12200	8550	7000
	5%	IPT	0.0094	0.0078	0.0078
	10%		0.0068	0.0057	0.0057
	25%		0.0047	0.0039	0.0039
	50%		0.0041	0.0034	0.0034
8	Ar	RPM	12200	8550	7000
	5%	IPT	0.0094	0.0080	0.0080
	10%		0.0068	0.0058	0.0058
	25%		0.0047	0.0040	0.0040
	50%		0.0041	0.0035	0.0035
3/8	Ar	RPM	10200	7100	5850
	5%	IPT	0.0112	0.0094	0.0094
	10%		0.0082	0.0068	0.0068
	25%		0.0057	0.0047	0.0047
	50%		0.0049	0.0041	0.0041

Mill Dia.	Radial WOC		Work Material		
			Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
			950-1050 SFM	650-750 SFM	525-625 SFM
10	Ar	RPM	9700	6800	5600
	5%	IPT	0.0119	0.0099	0.0099
	10%		0.0087	0.0072	0.0072
	25%		0.0060	0.0050	0.0050
	50%		0.0052	0.0043	0.0043
7/16	Ar	RPM	8700	6100	5000
	5%	IPT	0.0133	0.0110	0.0110
	10%		0.0097	0.0080	0.0080
	25%		0.0067	0.0055	0.0055
	50%		0.0058	0.0048	0.0048
12	Ar	RPM	8100	5650	4650
	5%	IPT	0.0142	0.0117	0.0119
	10%		0.0103	0.0085	0.0087
	25%		0.0072	0.0059	0.0060
	50%		0.0062	0.0051	0.0052
1/2	Ar	RPM	7600	5300	4400
	5%	IPT	0.0151	0.0124	0.0126
	10%		0.0110	0.0090	0.0092
	25%		0.0076	0.0062	0.0064
	50%		0.0066	0.0054	0.0055
9/16	Ar	RPM	6800	4800	3900
	5%	IPT	0.0170	0.0140	0.0142
	10%		0.0123	0.0102	0.0103
	25%		0.0085	0.0070	0.0072
	50%		0.0074	0.0061	0.0062
5/8	Ar	RPM	6100	4300	3500
	5%	IPT	0.0190	0.0156	0.0158
	10%		0.0138	0.0113	0.0115
	25%		0.0096	0.0079	0.0080
	50%		0.0083	0.0068	0.0069
16	Ar	RPM	6100	4300	3500
	5%	IPT	0.0190	0.0156	0.0158
	10%		0.0138	0.0113	0.0115
	25%		0.0096	0.0079	0.0080
	50%		0.0083	0.0068	0.0069
3/4	Ar	RPM	5100	3550	2900
	5%	IPT	0.0227	0.0186	0.0190
	10%		0.0165	0.0135	0.0138
	25%		0.0114	0.0094	0.0096
	50%		0.0099	0.0081	0.0083
20	Ar	RPM	4850	3400	2800
	5%	IPT	0.0239	0.0195	0.0200
	10%		0.0173	0.0142	0.0145
	25%		0.0120	0.0098	0.0100
	50%		0.0104	0.0085	0.0087
Depth Of Cut = Aa	If Radial Engagement is > 15% of Tool Diameter, Please Use Max 1.5D				

- For entry, it is recommended to use slotting conditions.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease width of cut and feed rate by 50%.
- For Finishing, please use 0.01D WOC, Max SFM shown on chart, and the IPT value for 50% stepover.

Standard Milling Conditions
For Spindle Under 10K RPM
Profile Roughing

List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Diameter	Radial WOC		Work Material		
			Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
3	Ar	RPM	10000	10000	10000
	5%	IPT	0.0034	0.0030	0.0030
	10%		0.0025	0.0022	0.0022
	25%		0.0017	0.0015	0.0015
	50%		0.0015	0.0013	0.0013
1/8	Ar	RPM	10000	10000	10000
	5%	IPT	0.0037	0.0032	0.0032
	10%		0.0027	0.0023	0.0023
	25%		0.0018	0.0016	0.0016
	50%		0.0016	0.0014	0.0014
4	Ar	RPM	10000	10000	10000
	5%	IPT	0.0046	0.0041	0.0039
	10%		0.0033	0.0030	0.0028
	25%		0.0023	0.0021	0.0020
	50%		0.0020	0.0018	0.0017
3/16	Ar	RPM	10000	10000	10000
	5%	IPT	0.0055	0.0048	0.0048
	10%		0.0040	0.0035	0.0035
	25%		0.0028	0.0024	0.0024
	50%		0.0024	0.0021	0.0021
5	Ar	RPM	10000	10000	10000
	5%	IPT	0.0060	0.0050	0.0050
	10%		0.0043	0.0037	0.0037
	25%		0.0030	0.0025	0.0025
	50%		0.0026	0.0022	0.0022
6	Ar	RPM	10000	10000	
	5%	IPT	0.0071	0.0060	
	10%		0.0052	0.0043	
	25%		0.0036	0.0030	
	50%		0.0031	0.0026	
1/4	Ar	RPM	10000	10000	
	5%	IPT	0.0076	0.0064	
	10%		0.0055	0.0047	
	25%		0.0038	0.0032	
	50%		0.0033	0.0028	
5/16	Ar	RPM	10000		
	5%	IPT	0.0094		
	10%		0.0068		
	25%		0.0047		
	50%		0.0041		
8	Ar	RPM	10000		
	5%	IPT	0.0094		
	10%		0.0068		
	25%		0.0047		
	50%		0.0041		
3/8	Ar	RPM	10000		
	5%	IPT	0.0112		
	10%		0.0082		
	25%		0.0057		
	50%		0.0049		
Depth Of Cut = Aa	If Radial Engagement is > 15% of Tool Diameter, Please Use Max 1.5D				

- For entry, it is recommended to use slotting conditions.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease width of cut and feed rate by 50%.
- For Finishing, please use 0.01D WOC, Max SFM shown on chart, and the IPT value for 50% stepover.

Standard Milling Conditions
ALH 3 Flute Series
Slotting

List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Diameter		Work Material		
		Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
		750-850 SFM	450-550 SFM	450-550 SFM
3	RPM	25900	16200	16200
	IPT	0.0014	0.0011	0.0011
1/8	RPM	24500	15300	15300
	IPT	0.0015	0.0011	0.0011
4	RPM	19400	12100	12100
	IPT	0.0019	0.0014	0.0014
3/16	RPM	16300	10200	10200
	IPT	0.0023	0.0017	0.0017
5	RPM	15500	9700	9700
	IPT	0.0024	0.0018	0.0018
6	RPM	12900	8100	8100
	IPT	0.0029	0.0021	0.0021
1/4	RPM	12200	7600	7600
	IPT	0.0030	0.0022	0.0022
5/16	RPM	9700	6100	6100
	IPT	0.0038	0.0028	0.0028
8	RPM	9700	6100	6100
	IPT	0.0038	0.0028	0.0028
3/8	RPM	8150	5100	5100
	IPT	0.0045	0.0033	0.0033
10	RPM	7750	4850	4850
	IPT	0.0047	0.0035	0.0035
7/16	RPM	7000	4350	4350
	IPT	0.0053	0.0039	0.0039
12	RPM	6500	4050	4050
	IPT	0.0057	0.0042	0.0042
1/2	RPM	6100	3800	3800
	IPT	0.0060	0.0044	0.0044
9/16	RPM	5400	3400	3400
	IPT	0.0068	0.0050	0.0050
5/8	RPM	4900	3050	3050
	IPT	0.0075	0.0055	0.0055
16	RPM	4900	3050	3050
	IPT	0.0076	0.0056	0.0056
3/4	RPM	4100	2550	2550
	IPT	0.0090	0.0066	0.0066
20	RPM	3900	2400	2400
	IPT	0.0095	0.0069	0.0069
Depth Of Cut = H		1D		

Standard Milling Conditions

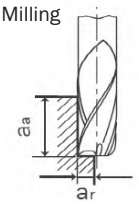
Slotting List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Diameter		Work Material		
		Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
		750-850 SFM	450-550 SFM	450-550 SFM
3	RPM	10000	10000	10000
	IPT	0.0014	0.0011	0.0011
1/8	RPM	10000	10000	10000
	IPT	0.0015	0.0011	0.0011
4	RPM	10000	10000	10000
	IPT	0.0019	0.0014	0.0014
3/16	RPM	10000	10000	10000
	IPT	0.0023	0.0017	0.0017
5	RPM	10000		
	IPT	0.0024		
6	RPM	10000		
	IPT	0.0029		
1/4	RPM	10000		
	IPT	0.0030		
Depth Of Cut = H		1D		

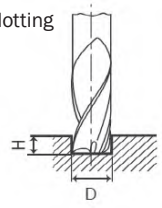
- For entry, it is recommended to use slotting conditions.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease width of cut and feed rate by 50%.
- For Finishing, please use 0.01D WOC, Max SFM shown on chart, and the IPT value for 50% stepover.

D: Dia. Of Mill

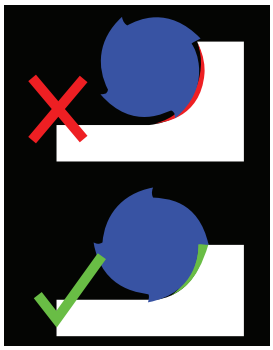
Side Milling



Slotting



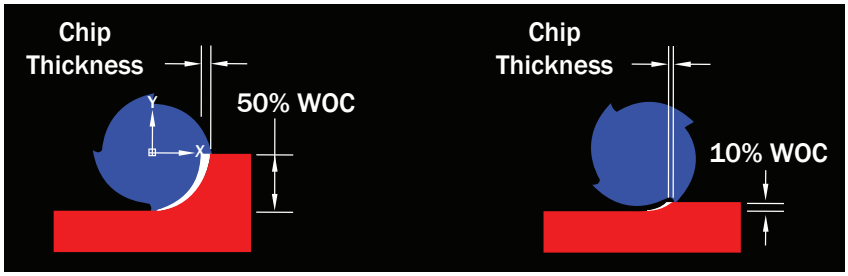
Shaping Up Your Chips



Chip Load vs. Chip Thickness

Chip shape plays an important role in proper performance, chip evacuation, and heat management while milling. A thick-to-thin chip shape is ideal. This is created when radial width of cut is 50% or less. This is a part of the reason slotting can be so hard on cutters.

Chip load and chip thickness are commonly mistaken as being one and the same. This stems from traditional toolpaths engaging half of cutter diameter. As a round tool comes around to shear a chip, width of cut plays an important role in how thick that chip will be.



Now comes the fun part- compensating for chip thinning allows for increased feed rates. As radial width of cut decreases, feed rate increases to maintain the same chip thickness. Use the formula below to find your ideal cutting condition.

$$\text{Adjusted Feed Rate} = \frac{IPT \times D}{2 \times \sqrt{(D \times RDOC)} - RDOC}$$

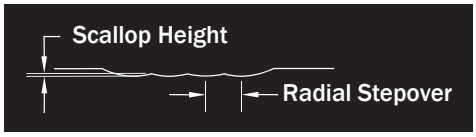
IPT = IPT @ 50% RDOC
D = Cutter Diameter
RDOC = Radial Depth of Cut

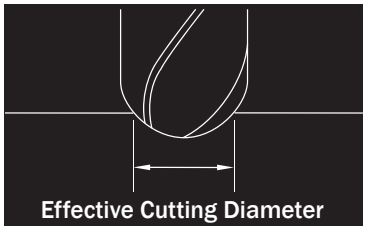
Ball Nose End Mill

Ball nose end mills are commonly used for finishing contoured surfaces. Being a full radius end, depth of cut determines effective cutting diameter. Calculating the effective cutting diameter is necessary to determine proper feed and speed adjustments.

$$\text{Effective Cutting Diameter} = 2 \times \sqrt{ADOC \times (D\text{-}ADOC)}$$

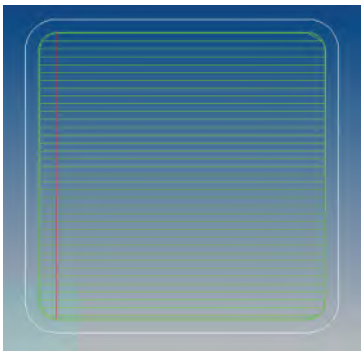
Radial stepover is a major variable in determining surface finish. This will create a “scallop height”.

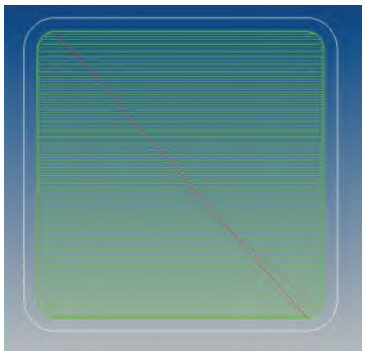




High Speed Machining

High Performance Tooling





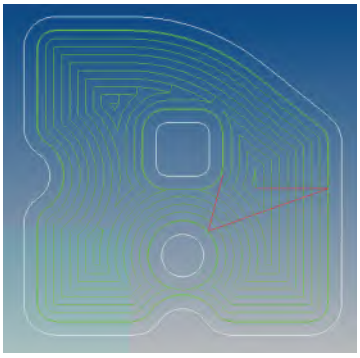
Machining 300 Series Stainless Steel

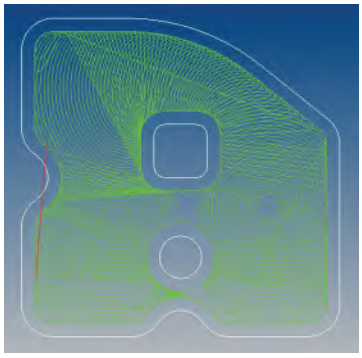
Traditional Strategy	HSM Strategy
½" 4 Flute End Mill	½" 4 Flute End Mill
290 SFM	720 SFM
0.0027 IPT	0.0046 IPT
0.5XD Axial DOC	1.5XD Axial DOC
0.3XD Radial WOC	0.1XD Radial WOC
30 Minute Cycle	18 Minute Cycle

High Speed Machining is a strategy used to decrease cycle time and increase tool life. HSM uses light radial width of cut and heavy axial depth of cut to remove a lot of material quickly. The light radial width of cut allows for faster feed rates. Using as much of the full LOC of the end mill promotes better work distribution through the flutes and leads to increased tool life. Along with increased feed rates, increased surface speed is also desirable with HSM. Because the tool is engaging less material, less heat is generated. SFM can be increased to achieve even faster cycle time.

High Efficiency Machining

HSM Meets Modern CAM





Machining 300 Series Stainless Steel

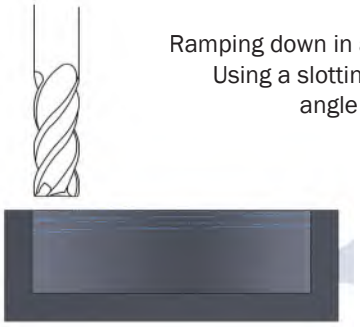
Traditional Strategy	HSM Strategy
½" 4 Flute End Mill	½" 4 Flute End Mill
290 SFM	720 SFM
0.0027 IPT	0.0046 IPT
0.5XD Axial DOC	1.5XD Axial DOC
0.3XD Radial WOC	0.1XD Radial WOC
22 Minute Cycle	11 Minute Cycle

High Efficiency Machining is a strategy combining HSM and modern CAM software capabilities. HEM strategy uses paths that create consistent chip load, avoiding sharp turns and crunching in corners. Utilizing chip thinning calculation, light radial depths of cut allow for faster feed rates with the same actual chip thickness. This not only allows for parts to be machined faster, but also is much easier on tooling.

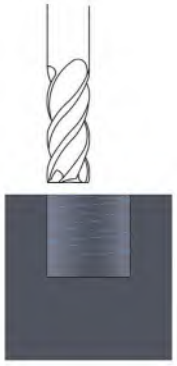
Entry Methods

Plunge • Ramp • Helix • Pilot

The simplest way, and harshest way, to enter a pocket is to plunge into the part. Using a decreased feed rate, plunge to the desired depth and then start milling. This is extremely rough on tools and will lead to a short tool life, especially in harder materials.



Ramping down in a straight line offers an advantage over plunging. Using a slotting speed/feed and ramping down at a 1-3 degree angle promote less tool wear than traditional plunging.



Helical ramp entry has always been known as a preferred method to enter a pocket. Using a slotting speed/feed and helixing down at a 1-3 degree angle promote less tool wear than traditional plunging.

Another common method to enter a pocket is to drill a pilot hole using a standard point drill. This leaves a drill point angle at the bottom of the pocket that must be cleaned up with the end mill.

Nachi offers a unique solution to pilot the starting hole with our Aqua EX Flat Bottom Drill. Creating this pilot hole allows for plunging straight down and getting to work. This eliminates the need to mill out a drill point angle at the bottom of the pocket. This is the fastest way, and the best method for tool life.

Finishing Methods

Radial width of cut can play an important role in finishing. When taking a finish pass, it is important to keep the cutter engaged enough that it does not chatter. Two common methods can be used to eliminate chatter.

Taking a heavier cut can engage the tool more and prevent it from vibrating too much.

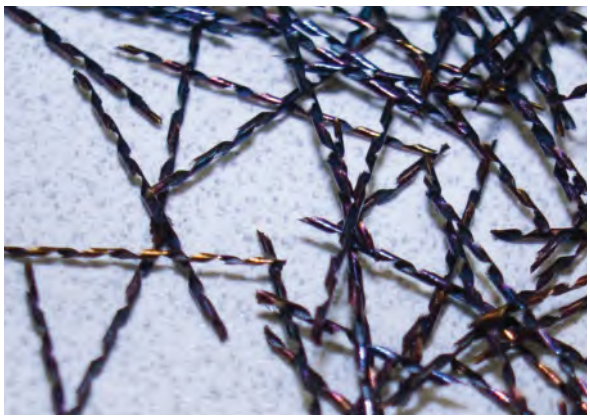
Tipping the balance between RPM and feed rate can engage the tool more to decrease vibration. Try decreasing RPM 5 or 10%, or increasing feed rate 5 or 10%.

Hard Milling

Read Your Chips

When hard milling, it is important to use air blow rather than coolant. Due to the high heat generated while machining hard materials, using coolant can cause a pulsating hot and cold effect that causes the carbide to fracture.

✓ Good



✓ Good

It is important to read your chips while hard milling. The goal is to machine just enough material to pull the heat out in the chip. This will cause the chips to discolor, being blue, gold, purple, etc.

✗ Bad

A chip that is silver in color is a good indicator that the heat generated from milling is being left in the material and in the tool. This will lead to decreased tool life. This can also indicate that the tool is worn and near the end of it's life.

NACHI

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