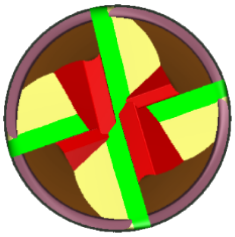
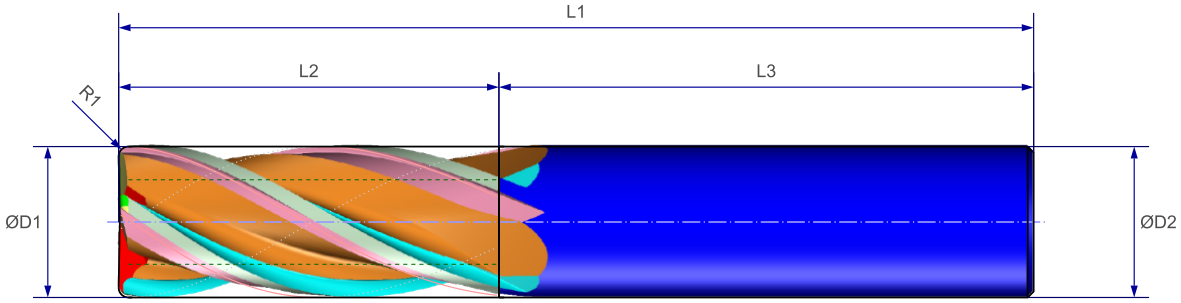
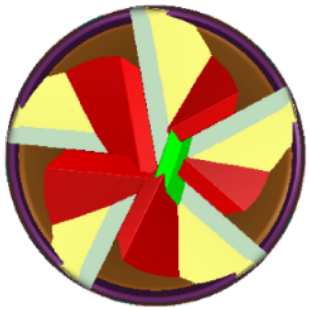
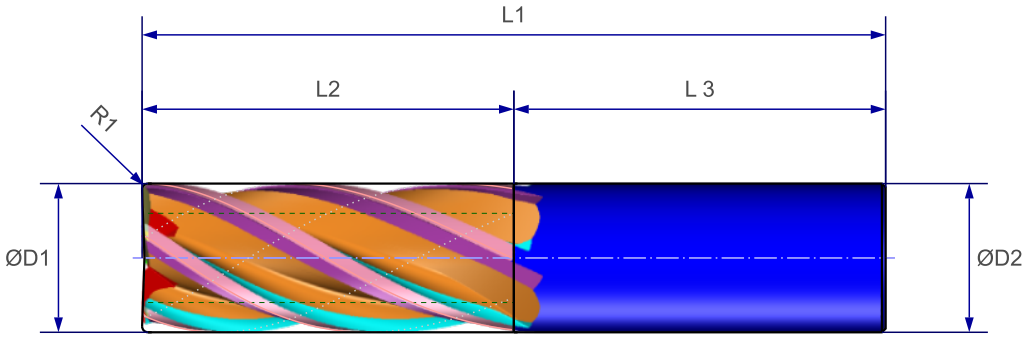




STEEL "L" SERIES

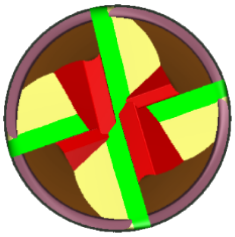
CUTTING DIA.	SHANK DIA.	LOC	OAL	RAD	PN 4-FL	PN 5-FL
1/8	1/8	1/4	1 1/2	.008-.012	L401250250P	L501250250P
1/8	1/8	3/8	1 1/2	.008-.012	L401250375P	L501250375P
3/16	3/16	5/16	2	.008-.012	L401880313P	L501880313P
3/16	3/16	7/16	2	.008-.012	L401880438P	L501880438P
1/4	1/4	3/8	2	.015-.020	L402500375P	L502500375P
1/4	1/4	1/2	2 1/2	.015-.020	L402500500P	L502500500P
1/4	1/4	3/4	2 1/2	.015-.020	L402500755P	L502500755P
5/16	5/16	1/2	2	.015-.020	L403130500P	L503130500P
5/16	5/16	13/16	2 1/2	.015-.020	L403130813P	L503130813P
3/8	3/8	1/2	2	.015-.020	L403750500P	L503750500P
3/8	3/8	5/8	2	.015-.020	L403750625P	L503750625P
1/2	1/2	5/8	2	.025-.030	L405000625P	L505000625P
1/2	1/2	1	3	.025-.030	L405001000P	L505001000P
1/2	1/2	1 1/4	3	.025-.030	L405001250P	L505001250P
1/2	1/2	2	4	.025-.030	L405002000P	L505002000P
5/8	5/8	3/4	2	.035-.040	L406250755P	L506250755P
5/8	5/8	1 1/4	3 1/2	.035-.040	L406251250P	L506251250P
5/8	5/8	2 1/4	5	.035-.040	L406252250P	L506252250P
3/4	3/4	1	2	.035-.040	L407501000P	L507501000P
3/4	3/4	1 1/2	4	.035-.040	L407501500P	L507501500P
3/4	3/4	2 1/4	5	.035-.040	L407502250P	L507502250P
3/4	3/4	3 1/4	6	.035-.040	L407503250P	L507503250P
1	1	1	2	.035-.040	L410001000P	L510001000P
1	1	1 1/2	4	.035-.040	L410001500P	L510001500P
1	1	2 1/4	5	.035-.040	L410002250P	L510002250P
1	1	3 1/4	6	.035-.040	L410003250P	L510003250P

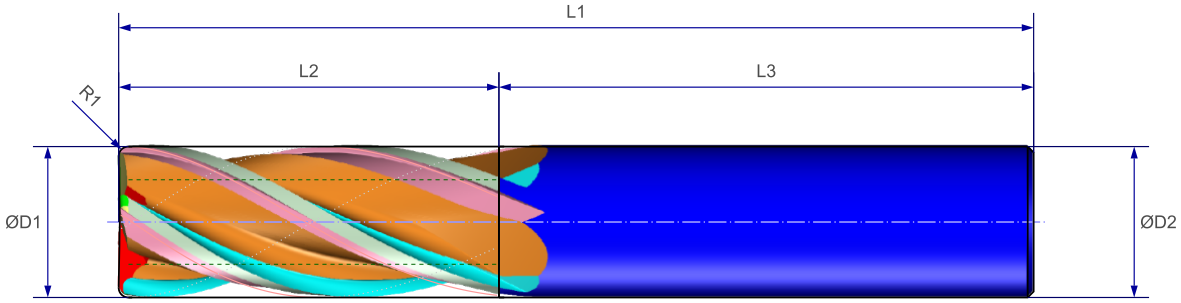




SPEEDS & FEEDS

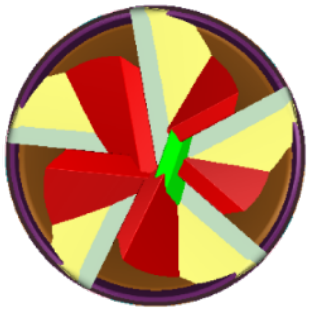
Materials Annealed	Speed S.F.M. Under 28 Rc	Materials Hardened	Speed S.F.M. Over 28 HRc	Feed (Inch/Tooth) "IPT" End Mill Diameter 1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"	Coatings
STEELS												
High Steel Strength 4340, 6150, 52100, H-11, H-13	300-485	4340M 300M, MAR D2, , H13, M42	Decrease by 25%-30%	0.0007	0.001	0.0014	0.002	0.0026	0.0029	0.0034	0.004	On Steels >45 HRc on Roughing use Coolant on Finishing Run Dry
High Alloy Steels A-2/10, P20/10,	260-460	Magenese AmorPlate	Decrease by 25%-30%	0.0007	0.001	0.0014	0.002	0.0026	0.0029	0.0034	0.004	
Medium Alloy Steels 200, 250, 300	450-620	200 / 300	Decrease by 25%-30%	0.0009	0.0014	0.0018	0.0027	0.0035	0.004	0.0043	0.005	
Low Alloy Steels 10XX, 11XX, 13XX	100-400	23XX, 31XX, 86XX	485-650	0.0009	0.0014	0.0018	0.0027	0.0035	0.004	0.0043	0.005	

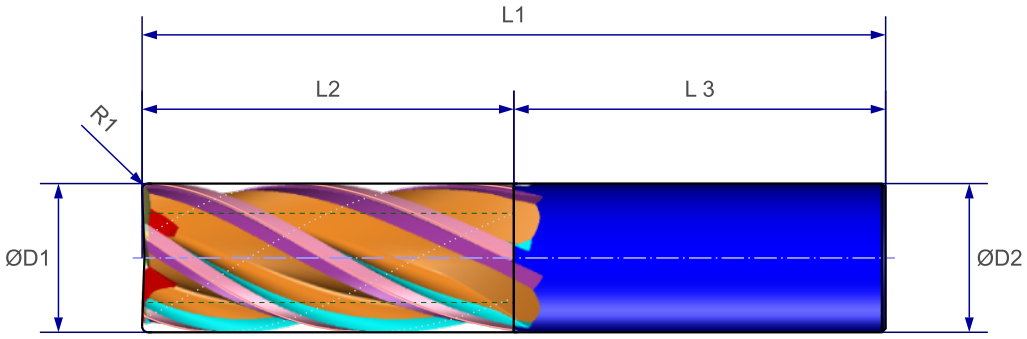




CAST IRON KELLY

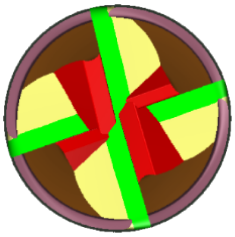
CUTTING DIA.	SHANK DIA.	LOC	OAL	RAD	PN 4-FL	PN 5-FL
1/8	1/8	1/4	1 1/2	.008-.012	K401250250P	K501250250P
1/8	1/8	3/8	1 1/2	.008-.012	K401250375P	K501250375P
3/16	3/16	5/16	2	.008-.012	K401880313P	K501880313P
3/16	3/16	7/16	2	.008-.012	K401880438P	K501880438P
1/4	1/4	3/8	2	.015-.020	K402500375P	K502500375P
1/4	1/4	1/2	2 1/2	.015-.020	K402500500P	K502500500P
1/4	1/4	3/4	2 1/2	.015-.020	K402500755P	K502500755P
5/16	5/16	1/2	2	.015-.020	K403130500P	K503130500P
5/16	5/16	13/16	2 1/2	.015-.020	K403130813P	K503130813P
3/8	3/8	1/2	2	.015-.020	K403750500P	K503750500P
3/8	3/8	5/8	2	.015-.020	K403750625P	K503750625P
1/2	1/2	5/8	2	.025-.030	K405000625P	K505000625P
1/2	1/2	1	3	.025-.030	K405001000P	K505001000P
1/2	1/2	1 1/4	3	.025-.030	K405001250P	K505001250P
1/2	1/2	2	4	.025-.030	K405002000P	K505002000P
5/8	5/8	3/4	2	.035-.040	K406250755P	K506250755P
5/8	5/8	1 1/4	3 1/2	.035-.040	K406251250P	K506251250P
5/8	5/8	2 1/4	5	.035-.040	K406252250P	K506252250P
3/4	3/4	1	2	.035-.040	K407501000P	K507501000P
3/4	3/4	1 1/2	4	.035-.040	K407501500P	K507501500P
3/4	3/4	2 1/4	5	.035-.040	K407502250P	K507502250P
3/4	3/4	3 1/4	6	.035-.040	K407503250P	K507503250P
1	1	1	2	.035-.040	K410001000P	K510001000P
1	1	1 1/2	4	.035-.040	K410001500P	K510001500P
1	1	2 1/4	5	.035-.040	K410002250P	K510002250P
1	1	3 1/4	6	.035-.040	K410003250P	K510003250P

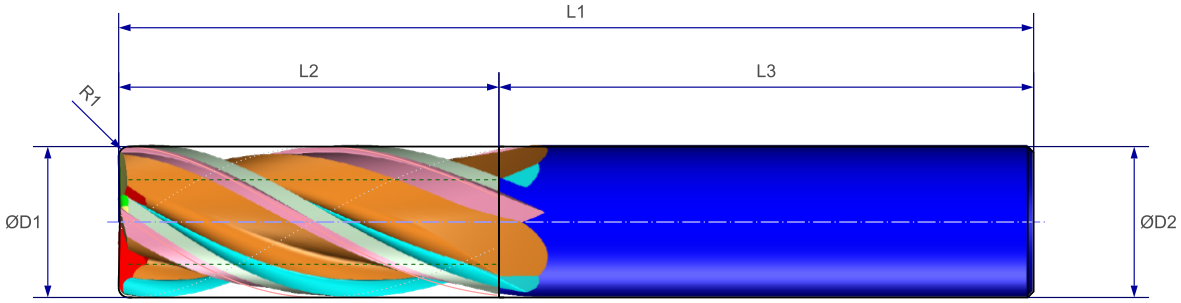




SPEEDS & FEEDS

Materials Soft Grades	**Speed** S.F.M. Under 28 HRc	**Materials** Hard Grades	**Speed** S.F.M. Over 28 HRc	Feed (Inch/Tooth) "IPT" End Mill Diameter								**Coatings**
				1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"	
CAST IRON												
Ductile Cast Iron	375-500	Ductile Cast Iron	Decrease by 25%-30%	0.0007	0.001	0.0015	0.002	0.003	0.0034	0.0038	0.0045	Always use coolant
Gray Cast Iron	380-580	Malleable, Chilled	Decrease by 25%-30%	0.0009	0.0014	0.002	0.0027	0.0038	0.004	0.0043	0.005	





STAINLESS & HIGH TEMP. ALLOYS

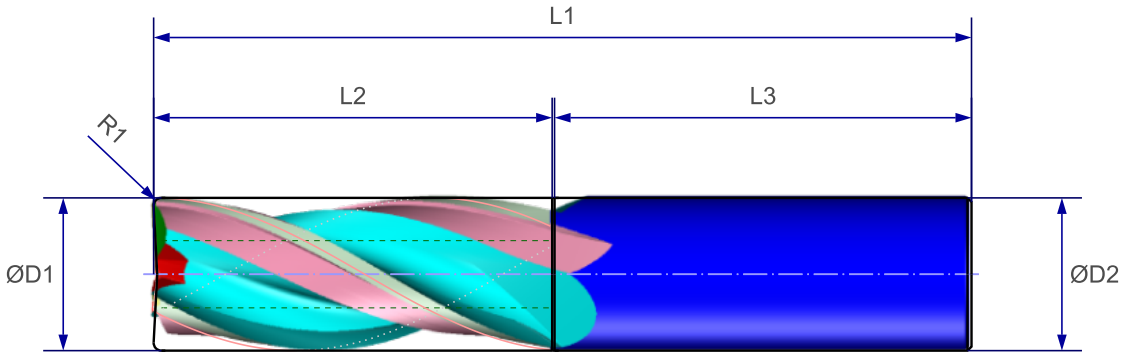
CUTTING DIA.	SHANK DIA.	LOC	OAL	RAD	PN 4-FL	PN 5-FL
1/8	1/8	1/4	1 1/2	.008-.012	C401250250P	C501250250P
1/8	1/8	3/8	1 1/2	.008-.012	C401250375P	C501250375P
3/16	3/16	5/16	2	.008-.012	C401880313P	C501880313P
3/16	3/16	7/16	2	.008-.012	C401880438P	C501880438P
1/4	1/4	3/8	2	.015-.020	C402500375P	C502500375P
1/4	1/4	1/2	2 1/2	.015-.020	C402500500P	C502500500P
1/4	1/4	3/4	2 1/2	.015-.020	C402500755P	C502500755P
5/16	5/16	1/2	2	.015-.020	C403130500P	C503130500P
5/16	5/16	13/16	2 1/2	.015-.020	C403130813P	C503130813P
3/8	3/8	1/2	2	.015-.020	C403750500P	C503750500P
3/8	3/8	5/8	2	.015-.020	C403750625P	C503750625P
1/2	1/2	5/8	2	.025-.030	C405000625P	C505000625P
1/2	1/2	1	3	.025-.030	C405001000P	C505001000P
1/2	1/2	1 1/4	3	.025-.030	C405001250P	C505001250P
1/2	1/2	2	4	.025-.030	C405002000P	C505002000P
5/8	5/8	3/4	2	.035-.040	C406250755P	C506250755P
5/8	5/8	1 1/4	3 1/2	.035-.040	C406251250P	C506251250P
5/8	5/8	2 1/4	5	.035-.040	C406252250P	C506252250P
3/4	3/4	1	2	.035-.040	C407501000P	C507501000P
3/4	3/4	1 1/2	4	.035-.040	C407501500P	C507501500P
3/4	3/4	2 1/4	5	.035-.040	C407502250P	C507502250P
3/4	3/4	3 1/4	6	.035-.040	C407503250P	C507503250P
1	1	1	2	.035-.040	C410001000P	C510001000P
1	1	1 1/2	4	.035-.040	C410001500P	C510001500P
1	1	2 1/4	5	.035-.040	C410002250P	C510002250P
1	1	3 1/4	6	.035-.040	C410003250P	C510003250P

SPEEDS & FEEDS

STAINLESS STEEL												
Precipitation 13/8, 15/5, AM-350/355	200-325	17/4, 17/7, AF-71, Custom 450/636, 15/7 Mo, 21-6-9	Decrease by 25%-30%	0.0005	0.0008	0.001	0.0015	0.002	0.0022	0.0025	0.003	
Austenitic 200 Series, 302, 303, 304L, 316L	240-350	304, 310, 314, 316, 321, 330, 347, 348, 21-6-9	Decrease by 25%-30%	0.0006	0.0009	0.0012	0.0018	0.0023	0.0027	0.003	0.0036	
Martensitic 403, 410, 416	200-325	420, 430F, 440C, 446	Decrease by 25%-30%	0.0003	0.0006	0.0009	0.0013	0.0018	0.002	0.0023	0.0028	

Materials Soft Grades	**Speed** S.F.M. Under 28 HRc	**Materials** Hard Grades	**Speed** S.F.M. Over 28 HRc	Feed (Inch/Tooth) "IPT" End Mill Diameter								**Coatings**
				1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"	
HIGH TEMP ALLOYS												
Cobalt Base Stellite, HS-21, HAYNES25/188, x-40, L-605	160-260	Air-Resist 13/213/215, Haynes 21/36, NASA CO-W-RE	Decrease by 25%-30%	0.0006	0.0009	0.0012	0.0018	0.0023	0.0027	0.003	0.0043	
Nickel Base INCONEL 600/625, Nickel 200-270, Monel 400-405	70-130	Hastalloy-C/B/X, INCONEL 718/X/W, Waspalloy, Rene 41-95	Decrease by 25%-30%	0.0004	0.0006	0.0009	0.0013	0.0016	0.0018	0.002	0.0026	
Iron Base Incoly 600-802, Multimet N-155, Timkin 16-25-6	160-300	A-286, Haynes 556, Discoly, V57	Decrease by 25%-30%	0.0007	0.0011	0.0015	0.0022	0.003	0.0032	0.0038	0.0045	

Materials	**Speed** S.F.M. Under 30 HRc	**Materials** Hard Grades	**Speed** S.F.M. Over 30 HRc	Feed Inch/Tooth) "IPT" End Mill Diameter								**Coatings**
				1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"	
TITANIUM												
Titanium Alloys Commercially, Pure, 6AL-4V, Astm 1/2/3, 6 AL-25N-4Zr-2Mo-Si	160-275	5AL-2.5Sn-Eli 8Al-1 Mo-1V	Decrease by 25%-30%	0.0005	0.0008	0.0012	0.0018	0.0022	0.0025	0.0028	0.0033	Always use coolant / No Dry Machining



ALUMINUM & ALLOYS

CUTTING DIA.	SHANK DIA.	LOC	OAL	RAD	PN 3-FL	PN COATED
1/8	1/8	1/4	1 1/2	.008-.012	B301250250	B301250250I
1/8	1/8	3/8	1 1/2	.008-.012	B301250375	B301250375I
3/16	3/16	5/16	2	.008-.012	B301880313	B301880313I
3/16	3/16	7/16	2	.008-.012	B301880438	B301880438I
1/4	1/4	3/8	2	.015-.020	B302500375	B302500375I
1/4	1/4	1/2	2 1/2	.015-.020	B302500500	B302500500I
1/4	1/4	3/4	2 1/2	.015-.020	B302500755	B302500755I
5/16	5/16	1/2	2	.015-.020	B303130500	B303130500I
5/16	5/16	13/16	2 1/2	.015-.020	B303130813	B303130813I
3/8	3/8	1/2	2	.015-.020	B303750500	B303750500I
3/8	3/8	5/8	2	.015-.020	B303750625	B303750625I
1/2	1/2	5/8	2	.025-.030	B305000625	B305000625I
1/2	1/2	1	3	.025-.030	B305001000	B305001000I
1/2	1/2	1 1/4	3	.025-.030	B305001250	B305001250I
1/2	1/2	2	4	.025-.030	B305002000	B305002000I
5/8	5/8	3/4	2	.035-.040	B306250755	B306250755I
5/8	5/8	1 1/4	3 1/2	.035-.040	B306251250	B306251250I
5/8	5/8	2 1/4	5	.035-.040	B306252250	B306252250I
3/4	3/4	1	2	.035-.040	B307501000	B307501000I
3/4	3/4	1 1/2	4	.035-.040	B307501500	B307501500I
3/4	3/4	2 1/4	5	.035-.040	B307502250	B307502250I
3/4	3/4	3 1/4	6	.035-.040	B307503250	B307503250I
1	1	1	2	.035-.040	B310001000	B310001000I
1	1	1 1/2	4	.035-.040	B310001500	B310001500I
1	1	2 1/4	5	.035-.040	B310002250	B310002250I
1	1	3 1/4	6	.035-.040	B310003250	B310003250I

SPEEDS & FEEDS

Materials Soft Grades	Speed S.F.M.	Materials Hard Grades	Speed S.F.M.	Feed (Inch/Tooth) "IPT" End Mill Diameter								Coatings
				1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"	
NONFERROUS MATERIALS												
Aluminum + Aluminum Alloys 2024-T4/T6, 2014, 6061-T6/T651, 7075-T6	1600-5000	440, 356, 380, C61300		0.0004	0.0005	0.0008	0.0014	0.002	0.0024	0.0028	0.0034	TiB2 Increase SFM 40%
Copper Yellow Brass, High Lead Brass, Red Brass	800-2000	Naval Brass, High Silicon Bronze, A-17, C-17200		0.0005	0.0007	0.001	0.0016	0.0021	0.0027	0.0033	0.004	TiB2 Increase SFM 40%
Copper Alloys Alum/Bronze, Low Silicon Bronze	800-1000	Nickel Silver, Beryllium Copper, Oxygen-Free Copper		0.0004	0.0005	0.0006	0.0013	0.0016	0.002	0.0023	0.0026	TiB2 Increase SFM 40%
Magnesium De-CAt, Extruded	1600-5000	Nickel Silver, Beryllium Copper, Oxygen-Free Copper		0.0004	0.0005	0.0008	0.0014	0.002	0.0024	0.0028	0.0034	ZrN Increase SFM 40%
Plastics, Acrylics, Phenolics Polysulfone	330-1650	Polycarbonate		0.0005	0.0008	0.001	0.0015	0.0019	0.0022	0.0024	0.0029	TiB2 Increase SFM 40%
Carbon, Graphites	330-1650			0.001	0.0015	0.002	0.003	0.004	0.005	0.006	0.008	CVD Diamond Increase SFM 60%