



# PHC High Feed Cutter

## PH Machining Guide

### Roughing & Semi-Finishing (LDR 4xD)

For LDR Greater See LDR Notes

#### High Speed Machining Guide (Aggressive Parameters)

Material				Carbon/Alloy Steel (30-40 HRC)				Tool Steel (40-50 HRC)				Tool Steel (50-60 HRC)*			
Insert Size	Tool Dia. Inch	Tool Dia. mm	No. Teeth	RPM	Feed per Tooth	Feed Rate IPM	Axial Cut Depth (aa)	RPM	Feed per Tooth	Feed Rate IPM	Axial Cut Depth (aa)	RPM	Feed per Tooth	Feed Rate IPM	Axial Cut Depth (aa)
SDMT09	1.000	25	2	2255	0.050	225.50	0.035	1340	0.040	107.20	0.025	955	0.020	38.20	0.015
			3	2255	0.050	338.25	0.035	1340	0.040	160.80	0.025	955	0.020	57.30	0.015
	1.250	32	2	1800	0.050	180.00	0.035	1070	0.040	85.60	0.025	765	0.020	30.60	0.015
	2.000	50	5	1130	0.050	282.50	0.035	670	0.040	134.00	0.025	480	0.020	48.00	0.015
	2.500	63	6	900	0.050	270.00	0.035	535	0.040	128.40	0.025	385	0.020	46.20	0.015
3.000	80	8	750	0.050	300.00	0.035	445	0.040	142.40	0.025	320	0.020	51.20	0.015	
SXMT12	1.250	32	2	1800	0.070	252.00	0.040	1070	0.050	107.00	0.030	765	0.025	38.25	0.020
			3	1800	0.070	378.00	0.040	1070	0.050	160.50	0.030	765	0.025	57.38	0.020
	1.500	40	3	1500	0.070	315.00	0.040	890	0.050	133.50	0.030	640	0.025	48.00	0.020
			4	1130	0.070	316.40	0.040	670	0.050	134.00	0.030	480	0.025	48.00	0.020
	2.500	63	4	900	0.070	252.00	0.040	535	0.050	107.00	0.030	385	0.025	38.50	0.020
			5	900	0.070	315.00	0.040	535	0.050	133.75	0.030	385	0.025	48.13	0.020
	3.000	80	5	750	0.070	262.50	0.040	445	0.050	111.25	0.030	320	0.025	40.00	0.020
			7	750	0.070	367.50	0.040	445	0.050	155.75	0.030	320	0.025	56.00	0.020
	4.000	100	6	565	0.070	237.30	0.040	335	0.050	100.50	0.030	240	0.025	36.00	0.020
			8	565	0.070	316.40	0.040	335	0.050	134.00	0.030	240	0.025	48.00	0.020
	5.000	125	10	450	0.070	315.00	0.040	270	0.050	135.00	0.030	190	0.025	47.50	0.020
6.000	160	12	375	0.070	315.00	0.040	225	0.050	135.00	0.030	160	0.025	48.00	0.020	

\*Materials hardened to 50-60HRC are very difficult to machine and not recommended.

#### Machining Guide (Moderate Parameters)

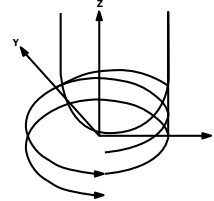
Material				Carbon/Alloy Steel (30-40 HRC)				Tool Steel (40-50 HRC)				Tool Steel (50-60 HRC)*			
Insert Size	Tool Dia. Inch	Tool Dia. mm	No. Teeth	RPM	Feed per Tooth	Feed Rate IPM	Axial Cut Depth (aa)	RPM	Feed per Tooth	Feed Rate IPM	Axial Cut Depth (aa)	RPM	Feed per Tooth	Feed Rate IPM	Axial Cut Depth (aa)
SDMT09	1.000	25	2	1870	0.032	119.68	0.032	1145	0.016	36.64	0.020	765	0.012	18.36	0.012
			3	1870	0.032	179.52	0.032	1145	0.016	54.96	0.020	765	0.012	27.54	0.012
	1.250	32	2	1500	0.032	96.00	0.032	915	0.016	29.28	0.020	610	0.012	14.64	0.012
	2.000	50	5	935	0.032	149.60	0.032	575	0.016	46.00	0.020	385	0.012	23.10	0.012
	2.500	63	6	750	0.032	144.00	0.032	460	0.016	44.16	0.020	305	0.012	21.96	0.012
3.000	80	8	625	0.032	160.00	0.032	385	0.016	49.28	0.020	255	0.012	24.48	0.012	
SXMT12	1.250	32	2	1500	0.050	150.00	0.047	915	0.028	51.24	0.028	610	0.020	24.40	0.020
			3	1500	0.050	225.00	0.047	915	0.028	76.86	0.028	610	0.020	36.60	0.020
	1.500	40	3	1250	0.050	187.50	0.047	765	0.028	64.26	0.028	510	0.020	30.60	0.020
			4	935	0.050	187.00	0.047	575	0.028	64.40	0.028	385	0.020	30.80	0.020
	2.500	63	4	750	0.050	150.00	0.047	460	0.028	51.52	0.028	305	0.020	24.40	0.020
			5	750	0.050	187.50	0.047	460	0.028	64.40	0.028	305	0.020	30.50	0.020
	3.000	80	5	625	0.050	156.25	0.047	385	0.028	53.90	0.028	255	0.020	25.50	0.020
			7	625	0.050	218.75	0.047	385	0.028	75.46	0.028	255	0.020	35.70	0.020
	4.000	100	6	470	0.050	141.00	0.047	285	0.028	47.88	0.028	190	0.020	22.80	0.020
			8	470	0.050	188.00	0.047	285	0.028	63.84	0.028	190	0.020	30.40	0.020
	5.000	125	10	375	0.050	187.50	0.047	230	0.028	64.40	0.028	155	0.020	31.00	0.020
6.000	160	12	310	0.050	186.00	0.047	190	0.028	63.84	0.028	130	0.020	31.20	0.020	

\*Materials hardened to 50-60HRC are very difficult to machine and not recommended.

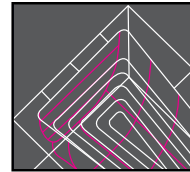
# High Speed Machining Guide

## Machining Tips

- Use Z-Level climb cutting for roughing operations.
- Use Helical for material engagement whenever possible for material entry (See Helical chart for ramp angles and arc limits depending on tool diameter).
- Add radiuses larger than cutter to corner of tool path for smooth operation.
- LDR should always be as short as possible.
- LDR of 4xD or less use chart on reverse side.
- LDR of 6xD to 10xD reduce spindle speed by 35% and feed rate by 25% to get started.
- LDR of 10xD and over reduce RPM by 50% and depth of cut by 65% to get started. **Machining is very difficult over 10xD.**
- Leave extra stock for semi-finishing to prevent gouging of surface when using long reach tools.
- Use air or oil mist for all applications except those involving gummy or sticky materials such as stainless, which machines well with water based coolant.



Helical Interpolation



Corner Rounding on Tool Path

## Formulas

$$\text{RPM} = (3.82 \times \text{SFM}) / \text{Tool Diameter}$$

$$\text{SFM} = 0.262 \times \text{RPM} \times \text{Tool Diameter}$$

$$\text{IPM} = \text{RPM} \times \# \text{ Flutes} \times \text{Chip Load}$$

$$\text{Chip Load} = \text{IPM} / (\text{RPM} \times \# \text{ Flutes})$$

## Depth of Cut

Adjusting depths of cuts based on LDR (Length Diameter Ratio)

### Axial Depths of Cuts

- Depth of cut should be reduced by 5% per increment of LDR.

### Radial Depths of Cuts

- This cutter performs best with step over amounts 100% to 50% of cutter diameter. Lesser amounts will result in less stability and reduce performance overall.

## Diagnosing Problems

**Insert Chipping** - early during use means chip load too high, please reduce feed rate in increments of 20% until problem is resolved or shorten the length of the tool.

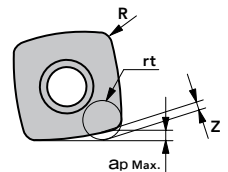
**Insert Burning** - of coating or glowing at the tip means RPM is too high. Reduce RPM by 20% increments until problem is resolved along with feed rate until excessive heat is subdued.

**Chatter** - excessive tool length is a primary cause. After reducing tool length if possible, lower RPM and feed rate until chatter is minimized.

## Flute Shape Definitions

For Machining Purposes. Create machining programs for the respective simulated R radius cutters.

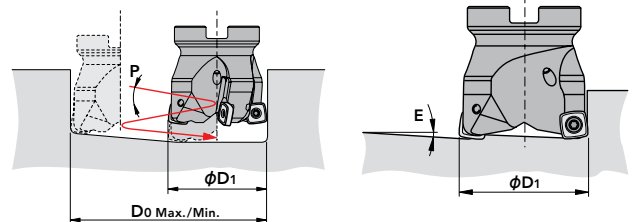
Insert Size	R (mm)	Axial Max (mm)	rt (mm)	z (mm)
SDMT09...	0.8	1	2	0.7
SXMT12...	1	2	3	1.15



Insert Size	R (inch)	Axial Max (inch)	rt (inch)	z (inch)
SDMT09...	0.03150	0.03937	0.07874	0.02755
SXMT12...	0.03937	0.07874	0.11811	0.04528

## Maximum Helical Ramping Angle

Insert Size	SDMT09				SXMT12			
	Diameter (Inch)	Ramping Angle	Helical Milling (Inch)	Helical Angle	Ramping Angle	Helical Milling (Inch)	Helical Angle	
D1	E	Do Min	Do Max	P	E	Do Min	Do Max	P
1.000	3.5°	1.409	1.921	3.0°	-	-	-	-
1.250	1.9°	1.909	2.421	1.7°	7.2°	1.713	2.421	6.1°
1.500	1.2°	2.409	2.921	1.0°	2.9°	2.213	2.921	2.5°
2.000	0.8°	3.409	3.921	0.7°	1.4°	3.213	3.921	1.2°
2.500	0.7°	4.409	4.921	0.7°	1.1°	4.213	4.921	0.9°
3.000	0.45°	5.409	5.921	0.4°	1.0°	5.213	5.921	0.8°
4.000	-	-	-	-	0.7°	7.213	7.921	0.6°
5.000	-	-	-	-	0.5°	9.213	9.921	0.35°
6.000	-	-	-	-	0.4°	11.213	11.921	0.3°



## Recommended Materials by Application

Insert Grade	Chip Breaker	Coolant	Carbon Steels	Stainless Steels	Cast Irons	Hi-Temp Alloys	Hardened Steels
			P	M	K	S	H
XP3035	GM	-	⊙	○	○		
XP2040	GM	-	○				⊙
		Yes		⊙		○	
XC1015	GM	-			⊙		
XC5035	SM	-		⊙			○
		Yes		○		○	
XC5040	SM	Yes		○		⊙	○

GM:Medium Cutting SM:Heat Resistant Alloy

○ good ⊙ best

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