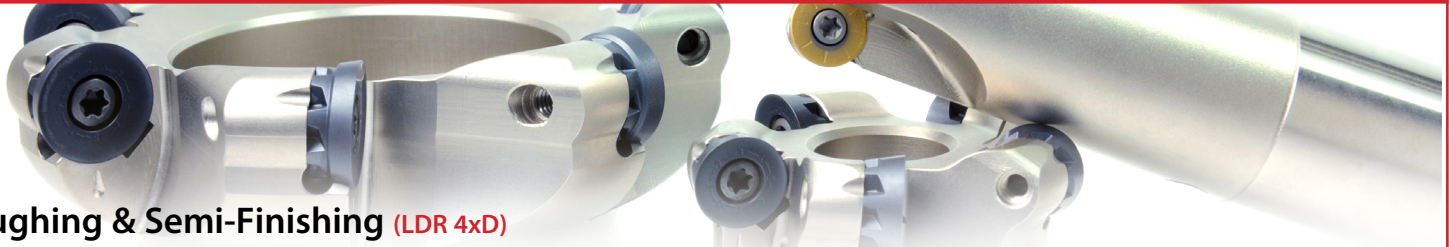




PRC Radius Cutter
PH Machining Guide



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) |
| RPHT10 | 1.000 | 25 | 3 | 2370 | 0.010 | 71.10 | 0.040 | 1260 | 0.0075 | 28.35 | 0.020 | 480 | 0.005 | 7.20 | 0.010 |
| | 1.250 | 32 | 4 | 1895 | 0.010 | 75.80 | 0.040 | 1010 | 0.0075 | 30.30 | 0.020 | 385 | 0.005 | 7.70 | 0.010 |
| | 2.000 | 50 | 5 | 1185 | 0.010 | 59.25 | 0.040 | 630 | 0.0075 | 23.62 | 0.020 | 240 | 0.005 | 6.00 | 0.010 |
| | 2.500 | 63 | 6 | 950 | 0.010 | 57.00 | 0.040 | 505 | 0.0075 | 22.72 | 0.020 | 190 | 0.005 | 5.70 | 0.010 |
| RPHT12 | 1.250 | 32 | 2 | 1895 | 0.0125 | 47.38 | 0.050 | 1010 | 0.0125 | 25.25 | 0.030 | 385 | 0.007 | 5.39 | 0.010 |
| | 1.500 | 40 | 3 | 1580 | 0.0125 | 59.25 | 0.050 | 840 | 0.0125 | 31.50 | 0.030 | 320 | 0.007 | 6.72 | 0.010 |
| | 2.000 | 50 | 4 | 1185 | 0.0125 | 59.25 | 0.050 | 630 | 0.0125 | 31.50 | 0.030 | 240 | 0.007 | 6.72 | 0.010 |
| | | | 5 | 1185 | 0.0125 | 74.06 | 0.050 | 630 | 0.0125 | 39.38 | 0.030 | 240 | 0.007 | 8.40 | 0.010 |
| | 2.500 | 63 | 4 | 950 | 0.0125 | 47.50 | 0.050 | 505 | 0.0125 | 25.25 | 0.030 | 190 | 0.007 | 5.32 | 0.010 |
| | | | 6 | 950 | 0.0125 | 71.25 | 0.050 | 505 | 0.0125 | 37.88 | 0.030 | 190 | 0.007 | 7.98 | 0.010 |
| | 3.000 | 80 | 5 | 790 | 0.0125 | 49.38 | 0.050 | 420 | 0.0125 | 26.25 | 0.030 | 160 | 0.007 | 5.60 | 0.010 |
| | | | 8 | 790 | 0.0125 | 79.00 | 0.050 | 420 | 0.0125 | 42.00 | 0.030 | 160 | 0.007 | 8.96 | 0.010 |
| | 4.000 | 100 | 6 | 595 | 0.0125 | 44.63 | 0.050 | 315 | 0.0125 | 23.63 | 0.030 | 120 | 0.007 | 5.04 | 0.010 |
| | | | 10 | 595 | 0.0125 | 74.38 | 0.050 | 315 | 0.0125 | 39.38 | 0.030 | 120 | 0.007 | 8.40 | 0.010 |
| 5.000 | 125 | 12 | 475 | 0.0125 | 71.25 | 0.050 | 255 | 0.0125 | 38.25 | 0.030 | 95 | 0.007 | 7.98 | 0.010 | |
| RPHT16 | 1.500 | 40 | 3 | 1580 | 0.015 | 71.10 | 0.065 | 840 | 0.014 | 35.28 | 0.035 | 320 | 0.009 | 8.64 | 0.010 |
| | 2.000 | 50 | 3 | 1185 | 0.015 | 53.33 | 0.065 | 630 | 0.014 | 26.46 | 0.035 | 240 | 0.009 | 6.48 | 0.010 |
| | 2.500 | 63 | 5 | 950 | 0.015 | 71.25 | 0.065 | 505 | 0.014 | 35.35 | 0.035 | 190 | 0.009 | 8.55 | 0.010 |
| | 3.000 | 80 | 6 | 790 | 0.015 | 71.10 | 0.065 | 420 | 0.014 | 35.28 | 0.035 | 160 | 0.009 | 8.64 | 0.010 |
| | 4.000 | 100 | 7 | 595 | 0.015 | 62.48 | 0.065 | 315 | 0.014 | 30.87 | 0.035 | 120 | 0.009 | 7.56 | 0.010 |
| | 5.000 | 125 | 8 | 475 | 0.015 | 57.00 | 0.065 | 255 | 0.014 | 28.56 | 0.035 | 95 | 0.009 | 6.84 | 0.010 |
| 6.000 | 160 | 10 | 395 | 0.015 | 59.25 | 0.065 | 210 | 0.014 | 29.40 | 0.035 | 80 | 0.009 | 7.20 | 0.010 | |

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

Machining Guide (Moderate Parameters)

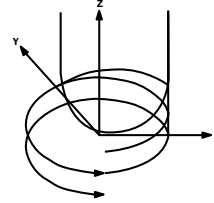
| Material | | | | Carbon/Alloy Steel (30-40 HRC) | | | | Tool Steel (40-50 HRC) | | | | Tool Steel (50-60 HRC)* | | | |
|-------------|------------------|----------------|-----------|--------------------------------|----------------|-----------------|----------------------|------------------------|----------------|-----------------|----------------------|-------------------------|----------------|-----------------|----------------------|
| 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) |
| RPHT10 | 1.000 | 25 | 3 | 1890 | 0.008 | 45.36 | 0.040 | 1030 | 0.006 | 18.54 | 0.020 | 385 | 0.004 | 4.62 | 0.010 |
| | 1.250 | 32 | 4 | 1515 | 0.008 | 48.48 | 0.040 | 825 | 0.006 | 19.80 | 0.020 | 305 | 0.004 | 4.88 | 0.010 |
| | 2.000 | 50 | 5 | 945 | 0.008 | 37.80 | 0.040 | 515 | 0.006 | 15.45 | 0.020 | 190 | 0.004 | 3.80 | 0.010 |
| | 2.500 | 63 | 6 | 760 | 0.008 | 36.48 | 0.040 | 415 | 0.006 | 14.94 | 0.020 | 155 | 0.004 | 3.72 | 0.010 |
| RPHT12 | 1.250 | 32 | 2 | 1515 | 0.010 | 30.30 | 0.050 | 825 | 0.010 | 16.50 | 0.030 | 305 | 0.006 | 3.66 | 0.010 |
| | 1.500 | 40 | 3 | 1260 | 0.010 | 37.80 | 0.050 | 690 | 0.010 | 20.70 | 0.030 | 255 | 0.006 | 4.59 | 0.010 |
| | 2.000 | 50 | 4 | 945 | 0.010 | 37.80 | 0.050 | 515 | 0.010 | 20.60 | 0.030 | 190 | 0.006 | 4.56 | 0.010 |
| | | | 5 | 945 | 0.010 | 47.25 | 0.050 | 515 | 0.010 | 25.75 | 0.030 | 190 | 0.006 | 5.70 | 0.010 |
| | 2.500 | 63 | 4 | 760 | 0.010 | 30.40 | 0.050 | 415 | 0.010 | 16.60 | 0.030 | 155 | 0.006 | 3.72 | 0.010 |
| | | | 6 | 760 | 0.010 | 45.60 | 0.050 | 415 | 0.010 | 24.90 | 0.030 | 155 | 0.006 | 5.58 | 0.010 |
| | 3.000 | 80 | 5 | 630 | 0.010 | 31.50 | 0.050 | 345 | 0.010 | 17.25 | 0.030 | 130 | 0.006 | 3.90 | 0.010 |
| | | | 8 | 630 | 0.010 | 50.40 | 0.050 | 345 | 0.010 | 27.60 | 0.030 | 130 | 0.006 | 6.24 | 0.010 |
| | 4.000 | 100 | 6 | 475 | 0.010 | 28.50 | 0.050 | 260 | 0.010 | 15.60 | 0.030 | 95 | 0.006 | 3.42 | 0.010 |
| | | | 10 | 475 | 0.010 | 47.50 | 0.050 | 260 | 0.010 | 26.00 | 0.030 | 95 | 0.006 | 5.70 | 0.010 |
| 5.000 | 125 | 12 | 380 | 0.010 | 45.60 | 0.050 | 210 | 0.010 | 25.20 | 0.030 | 80 | 0.006 | 5.76 | 0.010 | |
| RPHT16 | 1.500 | 40 | 3 | 1260 | 0.012 | 45.36 | 0.065 | 690 | 0.012 | 24.84 | 0.035 | 255 | 0.008 | 6.12 | 0.010 |
| | 2.000 | 50 | 3 | 945 | 0.012 | 34.02 | 0.065 | 515 | 0.012 | 18.54 | 0.035 | 190 | 0.008 | 4.56 | 0.010 |
| | 2.500 | 63 | 5 | 760 | 0.012 | 45.60 | 0.065 | 415 | 0.012 | 24.90 | 0.035 | 155 | 0.008 | 6.20 | 0.010 |
| | 3.000 | 80 | 6 | 630 | 0.012 | 45.36 | 0.065 | 345 | 0.012 | 24.84 | 0.035 | 130 | 0.008 | 6.24 | 0.010 |
| | 4.000 | 100 | 7 | 475 | 0.012 | 39.90 | 0.065 | 260 | 0.012 | 21.84 | 0.035 | 95 | 0.008 | 5.32 | 0.010 |
| | 5.000 | 125 | 8 | 380 | 0.012 | 36.48 | 0.065 | 210 | 0.012 | 20.16 | 0.035 | 80 | 0.008 | 5.12 | 0.010 |
| 6.000 | 160 | 10 | 315 | 0.012 | 37.80 | 0.065 | 170 | 0.012 | 20.40 | 0.035 | 65 | 0.008 | 5.20 | 0.010 | |

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

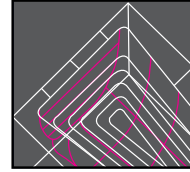
High Speed Machining Guide

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

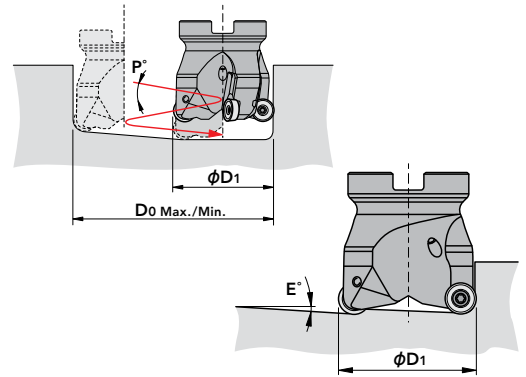
Insert Chipping - early during use means chip load too high, please reduce feed rate in increments of 20% until problem is resolved or shorten the length of the tool.

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.

Maximum Helical Ramping Angle

| Insert Size Diameter (Inch) | RPHT10 | | | | RPHT12 | | | | RPHT16 | | | |
|--------------------------------|---------------|------------------------|--------------------|---------------|---------------|------------------------|--------------------|---------------|---------------|------------------------|--------------------|---------------|
| | Ramping Angle | Helical Milling (Inch) | | Helical Angle | Ramping Angle | Helical Milling (Inch) | | Helical Angle | Ramping Angle | Helical Milling (Inch) | | Helical Angle |
| D1 | E | D ₀ Min | D ₀ Max | P | E | D ₀ Min | D ₀ Max | P | E | D ₀ Min | D ₀ Max | P |
| 1.000 | 2.0° | 1.488 | 1.606 | 1.8° | - | - | - | - | - | - | - | - |
| 1.250 | 3.0° | 1.988 | 2.106 | 1.5° | 4.0° | 1.752 | 2.028 | 1.7° | - | - | - | - |
| 1.500 | 3.3° | 2.488 | 2.606 | 1.1° | 2.8° | 2.252 | 2.528 | 1.4° | 3.0° | 2.016 | 2.370 | 2.0° |
| 2.000 | 2.3° | 3.488 | 3.606 | 0.9° | 2.5° | 3.252 | 3.528 | 1.1° | 4.0° | 3.016 | 3.370 | 1.5° |
| 2.500 | 2.2° | 4.488 | 4.606 | 0.7° | 1.8° | 4.252 | 4.528 | 0.9° | 2.8° | 4.016 | 4.370 | 1.1° |
| 3.000 | - | - | - | - | 1.3° | 5.252 | 5.528 | 0.7° | 2.0° | 5.016 | 5.370 | 0.9° |
| 4.000 | - | - | - | - | 0.9° | 7.252 | 7.528 | 0.5° | 1.5° | 7.016 | 7.370 | 0.7° |
| 5.000 | - | - | - | - | 1.0° | 9.252 | 9.528 | 0.4° | 1.1° | 9.016 | 9.370 | 0.45° |
| 6.000 | - | - | - | - | - | - | - | - | 1.0° | 11.016 | 11.370 | 0.4° |



Recommended Materials by Application

| Insert Grade | Chip Breaker | Coolant | Carbon Steels | Stainless St | Cast Irons | Non-Ferrous | Hi-Temp Alloys | Hardened Steels |
|--------------|--------------|---------|---------------|--------------|------------|-------------|----------------|-----------------|
| | | | P | M | K | N | S | H |
| CK010 | NM | Yes | | | | ⊙ | | |
| XC3030 | - / GL / GM | - | ⊙ | | ⊙ | | | |
| XP3035 | - | - | ⊙ | ⊙ | ⊙ | | | |
| XP2025 | GL | Yes | ⊙ | ⊙ | | | ⊙ | |
| XP2040 | GL | - | ⊙ | | | | | ⊙ |
| XP2040 | GL | Yes | | ⊙ | | | ⊙ | |
| XC1015 | GM | - | | | ⊙ | | | |
| XC5035 | SM | - | | ⊙ | | | | ⊙ |
| XC5035 | SM | Yes | | ⊙ | | | ⊙ | |
| XC5040 | SM | Yes | | ⊙ | | | ⊙ | ⊙ |
| XP6015 | HR | - | ⊙ | | ⊙ | | | ⊙ |

GL: Light Cutting GM: Medium Cutting NM: Aluminum SM: Heat Resistant Alloy HR: Hardened Steel

⊙ good ⊙ best

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