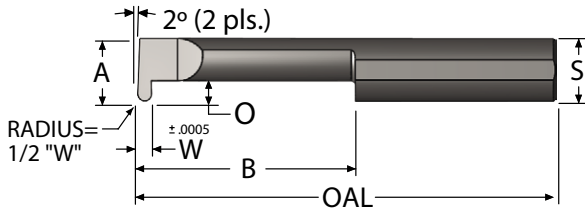


# GROOVE TOOLS - FULL RADIUS - SOLID CARBIDE



- ALTiN+ coating for higher Surface Feet per Minute
- Elliptically ground for maximum strength
- Polished flute face for optimum performance

| "A"<br>MIN<br>BORE | "W"<br>TOOL<br>WIDTH | "B"<br>MAX<br>DEPTH | "O"<br>OFF<br>SET | "S"<br>SHANK<br>DIA. | OAL  | ORDER #    |             | EDP #    |        |
|--------------------|----------------------|---------------------|-------------------|----------------------|------|------------|-------------|----------|--------|
|                    |                      |                     |                   |                      |      | UNCOATED   | ALTiN+      | UNCOATED | ALTiN+ |
| 0.187              | 0.0175               | 0.250               | 0.050             | 0.1875               | 2.00 | GFR017K-4  | GFR017K-4A  | 221804   | 221876 |
| 0.187              | 0.0175               | 0.375               | 0.050             | 0.1875               | 2.00 | GFR017K-6  | GFR017K-6A  | 221807   | 221879 |
| 0.187              | 0.0175               | 0.500               | 0.050             | 0.1875               | 2.00 | GFR017K-8  | GFR017K-8A  | 221810   | 221882 |
| 0.187              | 0.0175               | 0.625               | 0.050             | 0.1875               | 2.00 | GFR017K-10 | GFR017K-10A | 221801   | 221873 |
| 0.187              | 0.0255               | 0.250               | 0.050             | 0.1875               | 2.00 | GFR025K-4  | GFR025K-4A  | 221816   | 221888 |
| 0.187              | 0.0255               | 0.375               | 0.050             | 0.1875               | 2.00 | GFR025K-6  | GFR025K-6A  | 221819   | 221891 |
| 0.187              | 0.0255               | 0.500               | 0.050             | 0.1875               | 2.00 | GFR025K-8  | GFR025K-8A  | 221822   | 221894 |
| 0.187              | 0.0255               | 0.625               | 0.050             | 0.1875               | 2.00 | GFR025K-10 | GFR025K-10A | 221813   | 221885 |
| 0.187              | 0.0305               | 0.250               | 0.050             | 0.1875               | 2.00 | GFR030K-4  | GFR030K-4A  | 221828   | 221900 |
| 0.187              | 0.0305               | 0.375               | 0.050             | 0.1875               | 2.00 | GFR030K-6  | GFR030K-6A  | 221831   | 221903 |
| 0.187              | 0.0305               | 0.500               | 0.050             | 0.1875               | 2.00 | GFR030K-8  | GFR030K-8A  | 221834   | 221906 |
| 0.187              | 0.0305               | 0.625               | 0.050             | 0.1875               | 2.00 | GFR030K-10 | GFR030K-10A | 221825   | 221897 |
| 0.250              | 0.0175               | 0.250               | 0.060             | 0.250                | 2.50 | GFR017Q-4  | GFR017Q-4A  | 221912   | 221984 |
| 0.250              | 0.0175               | 0.375               | 0.060             | 0.250                | 2.50 | GFR017Q-6  | GFR017Q-6A  | 221915   | 221987 |
| 0.250              | 0.0175               | 0.500               | 0.060             | 0.250                | 2.50 | GFR017Q-8  | GFR017Q-8A  | 221918   | 221990 |
| 0.250              | 0.0175               | 0.625               | 0.060             | 0.250                | 2.50 | GFR017Q-10 | GFR017Q-10A | 221909   | 221981 |
| 0.250              | 0.0255               | 0.250               | 0.060             | 0.250                | 2.50 | GFR025Q-4  | GFR025Q-4A  | 221924   | 221996 |
| 0.250              | 0.0255               | 0.375               | 0.060             | 0.250                | 2.50 | GFR025Q-6  | GFR025Q-6A  | 221927   | 221999 |
| 0.250              | 0.0255               | 0.500               | 0.060             | 0.250                | 2.50 | GFR025Q-8  | GFR025Q-8A  | 221930   | 222002 |
| 0.250              | 0.0255               | 0.625               | 0.060             | 0.250                | 2.50 | GFR025Q-10 | GFR025Q-10A | 221921   | 221993 |
| 0.250              | 0.0305               | 0.250               | 0.060             | 0.250                | 2.50 | GFR030Q-4  | GFR030Q-4A  | 221936   | 222008 |
| 0.250              | 0.0305               | 0.375               | 0.060             | 0.250                | 2.50 | GFR030Q-6  | GFR030Q-6A  | 221939   | 222011 |
| 0.250              | 0.0305               | 0.500               | 0.060             | 0.250                | 2.50 | GFR030Q-8  | GFR030Q-8A  | 221942   | 222014 |
| 0.250              | 0.0305               | 0.625               | 0.060             | 0.250                | 2.50 | GFR030Q-10 | GFR030Q-10A | 221933   | 222005 |
| 0.312              | 0.0335               | 0.250               | 0.110             | 0.3125               | 2.50 | GFR033-4   | GFR033-4A   | 222020   | 222068 |
| 0.312              | 0.0335               | 0.375               | 0.110             | 0.3125               | 2.50 | GFR033-6   | GFR033-6A   | 222023   | 222071 |
| 0.312              | 0.0335               | 0.500               | 0.110             | 0.3125               | 2.50 | GFR033-8   | GFR033-8A   | 222026   | 222074 |
| 0.312              | 0.0335               | 0.750               | 0.110             | 0.3125               | 2.50 | GFR033-12  | GFR033-12A  | 222017   | 222065 |
| 0.312              | 0.0385               | 0.250               | 0.110             | 0.3125               | 2.50 | GFR038-4   | GFR038-4A   | 222032   | 222080 |
| 0.312              | 0.0385               | 0.375               | 0.110             | 0.3125               | 2.50 | GFR038-6   | GFR038-6A   | 222035   | 222083 |
| 0.312              | 0.0385               | 0.500               | 0.110             | 0.3125               | 2.50 | GFR038-8   | GFR038-8A   | 222038   | 222086 |
| 0.312              | 0.0385               | 0.750               | 0.110             | 0.3125               | 2.50 | GFR038-12  | GFR038-12A  | 222029   | 222077 |
| 0.375              | 0.040                | 0.250               | 0.110             | 0.375                | 2.50 | GFR039-4   | GFR039-4A   | 222098   | 222344 |
| 0.375              | 0.040                | 0.375               | 0.110             | 0.375                | 2.50 | GFR039-6   | GFR039-6A   | 222101   | 222347 |
| 0.375              | 0.040                | 0.500               | 0.110             | 0.375                | 2.50 | GFR039-8   | GFR039-8A   | 222104   | 222350 |
| 0.375              | 0.040                | 0.750               | 0.110             | 0.375                | 2.50 | GFR039-12  | GFR039-12A  | 222089   | 222335 |
| 0.375              | 0.040                | 1.000               | 0.110             | 0.375                | 2.50 | GFR039-16  | GFR039-16A  | 222092   | 222338 |
| 0.375              | 0.040                | 1.250               | 0.110             | 0.375                | 2.50 | GFR039-20  | GFR039-20A  | 222095   | 222341 |
| 0.375              | 0.047                | 0.250               | 0.110             | 0.375                | 2.50 | GFR046-4   | GFR046-4A   | 222116   | 222362 |
| 0.375              | 0.047                | 0.375               | 0.110             | 0.375                | 2.50 | GFR046-6   | GFR046-6A   | 222119   | 222365 |
| 0.375              | 0.047                | 0.500               | 0.110             | 0.375                | 2.50 | GFR046-8   | GFR046-8A   | 222122   | 222368 |
| 0.375              | 0.047                | 0.750               | 0.110             | 0.375                | 2.50 | GFR046-12  | GFR046-12A  | 222107   | 222353 |
| 0.375              | 0.047                | 1.000               | 0.110             | 0.375                | 2.50 | GFR046-16  | GFR046-16A  | 222110   | 222356 |
| 0.375              | 0.047                | 1.250               | 0.110             | 0.375                | 2.50 | GFR046-20  | GFR046-20A  | 222113   | 222359 |
| 0.375              | 0.056                | 0.250               | 0.110             | 0.375                | 2.50 | GFR055-4   | GFR055-4A   | 222134   | 222380 |
| 0.375              | 0.056                | 0.375               | 0.110             | 0.375                | 2.50 | GFR055-6   | GFR055-6A   | 222137   | 222383 |
| 0.375              | 0.056                | 0.500               | 0.110             | 0.375                | 2.50 | GFR055-8   | GFR055-8A   | 222140   | 222386 |
| 0.375              | 0.056                | 0.750               | 0.110             | 0.375                | 2.50 | GFR055-12  | GFR055-12A  | 222125   | 222371 |
| 0.375              | 0.056                | 1.000               | 0.110             | 0.375                | 2.50 | GFR055-16  | GFR055-16A  | 222128   | 222374 |
| 0.375              | 0.056                | 1.250               | 0.110             | 0.375                | 2.50 | GFR055-20  | GFR055-20A  | 222131   | 222377 |

THREAD MILLS

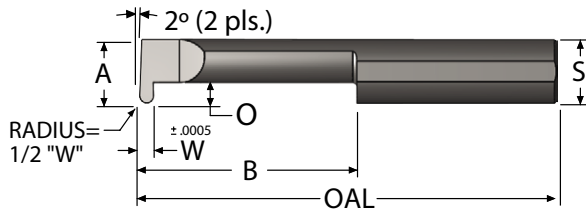
SINGLE POINT TOOLS  
GROOVING

INDEXABLE TOOLS

PORT - CAVITY

SPECIALTY

# GROOVE TOOLS - FULL RADIUS - SOLID CARBIDE



- ALTiN+ coating extends tool life
- Made with premium submicron grade carbide
- Precision ground shank flat for guaranteed tool orientation

| "A"<br>MIN<br>BORE | "W"<br>TOOL<br>WIDTH | "B"<br>MAX<br>DEPTH | "O"<br>OFF<br>SET | "S"<br>SHANK<br>DIA. | OAL  | ORDER #   |            | EDP #    |        |
|--------------------|----------------------|---------------------|-------------------|----------------------|------|-----------|------------|----------|--------|
|                    |                      |                     |                   |                      |      | UNCOATED  | ALTiN+     | UNCOATED | ALTiN+ |
| 0.375              | 0.063                | 0.250               | 0.110             | 0.375                | 2.50 | GFR062-4  | GFR062-4A  | 222152   | 222398 |
| 0.375              | 0.063                | 0.375               | 0.110             | 0.375                | 2.50 | GFR062-6  | GFR062-6A  | 222155   | 222401 |
| 0.375              | 0.063                | 0.500               | 0.110             | 0.375                | 2.50 | GFR062-8  | GFR062-8A  | 222158   | 222404 |
| 0.375              | 0.063                | 0.750               | 0.110             | 0.375                | 2.50 | GFR062-12 | GFR062-12A | 222143   | 222389 |
| 0.375              | 0.063                | 1.000               | 0.110             | 0.375                | 2.50 | GFR062-16 | GFR062-16A | 222146   | 222392 |
| 0.375              | 0.063                | 1.250               | 0.110             | 0.375                | 2.50 | GFR062-20 | GFR062-20A | 222149   | 222395 |
| 0.375              | 0.070                | 0.250               | 0.110             | 0.375                | 2.50 | GFR069-4  | GFR069-4A  | 222170   | 222416 |
| 0.375              | 0.070                | 0.375               | 0.110             | 0.375                | 2.50 | GFR069-6  | GFR069-6A  | 222173   | 222419 |
| 0.375              | 0.070                | 0.500               | 0.110             | 0.375                | 2.50 | GFR069-8  | GFR069-8A  | 222176   | 222422 |
| 0.375              | 0.070                | 0.750               | 0.110             | 0.375                | 2.50 | GFR069-12 | GFR069-12A | 222161   | 222407 |
| 0.375              | 0.070                | 1.000               | 0.110             | 0.375                | 2.50 | GFR069-16 | GFR069-16A | 222164   | 222410 |
| 0.375              | 0.070                | 1.250               | 0.110             | 0.375                | 2.50 | GFR069-20 | GFR069-20A | 222167   | 222413 |
| 0.375              | 0.088                | 0.250               | 0.110             | 0.375                | 2.50 | GFR087-4  | GFR087-4A  | 222188   | 222434 |
| 0.375              | 0.088                | 0.375               | 0.110             | 0.375                | 2.50 | GFR087-6  | GFR087-6A  | 222191   | 222437 |
| 0.375              | 0.088                | 0.500               | 0.110             | 0.375                | 2.50 | GFR087-8  | GFR087-8A  | 222194   | 222440 |
| 0.375              | 0.088                | 0.750               | 0.110             | 0.375                | 2.50 | GFR087-12 | GFR087-12A | 222179   | 222425 |
| 0.375              | 0.088                | 1.000               | 0.110             | 0.375                | 2.50 | GFR087-16 | GFR087-16A | 222182   | 222428 |
| 0.375              | 0.088                | 1.250               | 0.110             | 0.375                | 2.50 | GFR087-20 | GFR087-20A | 222185   | 222431 |
| 0.375              | 0.125                | 0.500               | 0.110             | 0.375                | 2.50 | GFR124-8  | GFR124-8A  | 222209   | 222455 |
| 0.375              | 0.125                | 0.750               | 0.110             | 0.375                | 2.50 | GFR124-12 | GFR124-12A | 222197   | 222443 |
| 0.375              | 0.125                | 1.000               | 0.110             | 0.375                | 2.50 | GFR124-16 | GFR124-16A | 222200   | 222446 |
| 0.375              | 0.125                | 1.250               | 0.110             | 0.375                | 2.50 | GFR124-20 | GFR124-20A | 222203   | 222449 |
| 0.500              | 0.094                | 0.500               | 0.160             | 0.500                | 3.00 | GFR093-8  | GFR093-8A  | 222470   | 222620 |
| 0.500              | 0.094                | 0.750               | 0.160             | 0.500                | 3.00 | GFR093-12 | GFR093-12A | 222458   | 222608 |
| 0.500              | 0.094                | 1.000               | 0.160             | 0.500                | 3.00 | GFR093-16 | GFR093-16A | 222461   | 222611 |
| 0.500              | 0.094                | 1.250               | 0.160             | 0.500                | 3.00 | GFR093-20 | GFR093-20A | 222464   | 222614 |
| 0.500              | 0.094                | 1.500               | 0.160             | 0.500                | 3.00 | GFR093-24 | GFR093-24A | 222467   | 222617 |
| 0.500              | 0.126                | 0.500               | 0.160             | 0.500                | 3.00 | GFR125-8  | GFR125-8A  | 222485   | 222635 |
| 0.500              | 0.126                | 0.750               | 0.160             | 0.500                | 3.00 | GFR125-12 | GFR125-12A | 222473   | 222623 |
| 0.500              | 0.126                | 1.000               | 0.160             | 0.500                | 3.00 | GFR125-16 | GFR125-16A | 222476   | 222626 |
| 0.500              | 0.126                | 1.250               | 0.160             | 0.500                | 3.00 | GFR125-20 | GFR125-20A | 222479   | 222629 |
| 0.500              | 0.126                | 1.500               | 0.160             | 0.500                | 3.00 | GFR125-24 | GFR125-24A | 222482   | 222632 |
| 0.500              | 0.157                | 0.500               | 0.160             | 0.500                | 3.00 | GFR156-8  | GFR156-8A  | 222500   | 222650 |
| 0.500              | 0.157                | 0.750               | 0.160             | 0.500                | 3.00 | GFR156-12 | GFR156-12A | 222488   | 222638 |
| 0.500              | 0.157                | 1.000               | 0.160             | 0.500                | 3.00 | GFR156-16 | GFR156-16A | 222491   | 222641 |
| 0.500              | 0.157                | 1.250               | 0.160             | 0.500                | 3.00 | GFR156-20 | GFR156-20A | 222494   | 222644 |
| 0.500              | 0.157                | 1.500               | 0.160             | 0.500                | 3.00 | GFR156-24 | GFR156-24A | 222497   | 222647 |
| 0.500              | 0.188                | 0.500               | 0.160             | 0.500                | 3.00 | GFR187-8  | GFR187-8A  | 222515   | 222665 |
| 0.500              | 0.188                | 0.750               | 0.160             | 0.500                | 3.00 | GFR187-12 | GFR187-12A | 222503   | 222653 |
| 0.500              | 0.188                | 1.000               | 0.160             | 0.500                | 3.00 | GFR187-16 | GFR187-16A | 222506   | 222656 |
| 0.500              | 0.188                | 1.250               | 0.160             | 0.500                | 3.00 | GFR187-20 | GFR187-20A | 222509   | 222659 |
| 0.500              | 0.188                | 1.500               | 0.160             | 0.500                | 3.00 | GFR187-24 | GFR187-24A | 222512   | 222662 |
| 0.500              | 0.251                | 0.500               | 0.160             | 0.500                | 3.00 | GFR250-8  | GFR250-8A  | 222530   | 222680 |
| 0.500              | 0.251                | 0.750               | 0.160             | 0.500                | 3.00 | GFR250-12 | GFR250-12A | 222518   | 222668 |
| 0.500              | 0.251                | 1.000               | 0.160             | 0.500                | 3.00 | GFR250-16 | GFR250-16A | 222521   | 222671 |
| 0.500              | 0.251                | 1.250               | 0.160             | 0.500                | 3.00 | GFR250-20 | GFR250-20A | 222524   | 222674 |
| 0.500              | 0.251                | 1.500               | 0.160             | 0.500                | 3.00 | GFR250-24 | GFR250-24A | 222527   | 222677 |

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

# SOLID CARBIDE BORING BAR FEED AND SPEED CHART

| MATERIAL                       | HB/Rc  | SPEED (SFM) |         | FEED IPR   | CUTTING CONDITIONS   |                      |                      |                      |                      |                  |
|--------------------------------|--------|-------------|---------|------------|----------------------|----------------------|----------------------|----------------------|----------------------|------------------|
|                                |        | UNCOATED    | ALTiN+  |            | TOOL DIAMETER        |                      |                      |                      |                      |                  |
|                                |        |             |         |            | .015-.045<br>MAX DOC | .050-.100<br>MAX DOC | .110-.160<br>MAX DOC | .180-.230<br>MAX DOC | .290-.320<br>MAX DOC | .360+<br>MAX DOC |
| CAST IRON                      | 160 HB | 75-200      | 200-550 | .0005-.010 | 0.006                | 0.008                | 0.010                | 0.014                | 0.020                | 0.031            |
| CARBON STEEL                   | 18 Rc  | 75-200      | 200-450 | .0005-.007 | 0.003                | 0.005                | 0.006                | 0.008                | 0.012                | 0.017            |
| ALLOY STEEL                    | 20 Rc  | 75-200      | 200-425 | .0005-.007 | 0.003                | 0.004                | 0.005                | 0.007                | 0.010                | 0.015            |
| TOOL STEEL                     | 25 Rc  | 75-175      | 175-300 | .0005-.005 | 0.002                | 0.003                | 0.004                | 0.006                | 0.008                | 0.012            |
| 300 STAINLESS STEEL            | 150 HB | 75-175      | 175-350 | .0005-.005 | 0.003                | 0.003                | 0.004                | 0.006                | 0.008                | 0.013            |
| 400 STAINLESS STEEL            | 195 HB | 75-210      | 130-420 | .0005-.005 | 0.002                | 0.003                | 0.004                | 0.006                | 0.008                | 0.012            |
| HIGH TEMP ALLOY (Ni & Co BASE) | 20 Rc  | 50-130      | 130-300 | .0005-.004 | 0.002                | 0.003                | 0.003                | 0.005                | 0.007                | 0.010            |
| TITANIUM                       | 25 Rc  | 50-120      | 120-275 | .0005-.005 | 0.003                | 0.004                | 0.005                | 0.006                | 0.009                | 0.014            |
| HEAT TREATED ALLOYS (38-45Rc)  | 40 Rc  | 50-100      | 100-200 | .0005-.005 | 0.002                | 0.002                | 0.003                | 0.004                | 0.006                | 0.009            |
| ALUMINUM                       | 100 HB | 75-250      | 250-750 | .0005-.015 | 0.011                | 0.015                | 0.019                | 0.026                | 0.038                | 0.056            |
| BRASS, ZINC                    | 80 HB  | 75-300      | 250-650 | .001-.010  | 0.009                | 0.012                | 0.015                | 0.021                | 0.030                | 0.045            |

SFM = Surface Feet Per Minute    DOC = Depth of Cut    IPR = Inches Per Revolution

Starting parameters only. Length-to-diameter ratios, setup, and machine rigidity may affect performance.

$$\begin{aligned} \text{SFM} &= .262 \times \text{DIAMETER} \times \text{RPM} \\ \text{RPM} &= 3.82 \times \text{SFM} \div \text{DIAMETER} \\ \text{IPM} &= \text{FPT} \times \text{Number of Teeth} \times \text{RPM} \end{aligned}$$

$$\begin{aligned} \text{Meters/Min} &= \text{SFM} \times .3048 \\ \text{Millimeters/Rev} &= \text{IPR} \times 25.40 \end{aligned}$$

# SOLID CARBIDE BORING TROUBLESHOOTING

| PROBLEM               | CAUSE              | SOLUTION  |
|-----------------------|--------------------|---|
| RAPID FLANK WEAR      | CUTTING CONDITIONS | Check for excessive speed and feed - See chart.   |
|                       | TOOL               | Select a coated tool.   |
|                       | PART               | Make sure prior operation did not work harden the metal.  |
| BUILT-UP EDGE         | TOOL               | Select a coated tool.   |
|                       | CUTTING FORCE      | Check for excessive feed rate (IPR) - See chart.  |
|                       | HEAT               | Use the SCT coolant holder. If coolant is not available, use shop air and a coated tool.  |
| CORNER BREAKAGE       | CUTTING CONDITIONS | Check for excessive feed and speed and depth of cut - see chart.  |
|                       | TOOL               | Select a tool with a radius. A radius is stronger than a sharp corner.  |
|                       | PART               | Check the drilled hole.   |
| SURFACE TOO ROUGH     | CUTTING CONDITIONS | Check for excessive feed rate (IPR) - See chart.  |
|                       | BUILT-UP EDGE      | See above (Built-Up Edge).  |
| CHATTER               | SET UP             | Set tool above center. Reduce the overhang ratio. Clamping length should be at least 3x the boring bar diameter. Change the speed of the machine. Speed change may break up harmonics and reduce chatter. |
|                       | BORING BAR         | Select the largest diameter boring bar that will bore the required diameter.  |
| TAPER SMALLER IN BACK | CHIP PACKING       | If the boring bar is too large to allow chips to evacuate, then the chips may pack on the tool and cause the bar to deflect away from the bore.   |
|                       | PROGRAM            | If the taper is consistent, then the program can be altered to bore a taper in opposite direction resulting in a straight hole.   |
| TAPER BIGGER IN BACK  | CUTTING FORCES     | Reduce forces. Deflecting bar below center causes hole to become larger.  |
|                       | BUILT-UP EDGE      | Built-up edge will cause the hole to become larger until the built edge breaks off, then the hole becomes smaller.  |
|                       | PROGRAM            | If taper is consistent, then the program can be altered to bore a taper in the opposite direction resulting in a straight hole.   |

# GROOVING TOOL FEED AND SPEED CHART

| MATERIAL                                  | HB/Rc  | SPEED (SFM) |         | CUTTING CONDITIONS |            |         |           |         |
|---|--------|-------------|---------|--------------------|------------|---------|-----------|---------|
|   |        |             |         | TOOL DIAMETER      |            |         |           |         |
|   |        | UNCOATED    | ALTiN+  | .060 -0.080        | .090 -.120 | .187    | .250-.312 | .375+   |
|   |        |             |         | MAX FPR            | MAX FPR    | MAX FPR | MAX FPR   | MAX FPR |
| CAST IRON                                 | 160 HB | 75-200      | 200-550 | 0.0010             | 0.0012     | 0.0017  | 0.0031    | 0.0044  |
| CARBON STEEL                              | 18 Rc  | 75-200      | 200-450 | 0.0007             | 0.0008     | 0.0011  | 0.0022    | 0.0030  |
| ALLOY STEEL                               | 20 Rc  | 75-200      | 200-425 | 0.0006             | 0.0007     | 0.0010  | 0.0019    | 0.0026  |
| TOOL STEEL                                | 25 Rc  | 75-175      | 175-300 | 0.0005             | 0.0006     | 0.0008  | 0.0015    | 0.0022  |
| 300 STAINLESS STEEL                       | 150 HB | 75-175      | 75-350  | 0.0006             | 0.0007     | 0.0010  | 0.0019    | 0.0026  |
| 400 STAINLESS STEEL                       | 195 HB | 75-210      | 130-420 | 0.0005             | 0.0006     | 0.0008  | 0.0016    | 0.0023  |
| HIGH TEMP ALLOY<br>(NICKEL & COBALT BASE) | 20 Rc  | 50-130      | 130-300 | 0.0004             | 0.0005     | 0.0007  | 0.0013    | 0.0017  |
| TITANIUM                                  | 25 Rc  | 50-120      | 120-275 | 0.0005             | 0.0006     | 0.0008  | 0.0016    | 0.0022  |
| HEAT TREATED ALLOYS<br>(38-45Rc)          | 40 Rc  | 50-100      | 100-200 | 0.0004             | 0.0004     | 0.0006  | 0.0011    | 0.0016  |
| ALUMINUM                                  | 100 HB | 75-250      | 250-750 | 0.0022             | 0.0026     | 0.0037  | 0.0065    | 0.0085  |
| BRASS, ZINC                               | 80 HB  | 250-300     | 250-650 | 0.0018             | 0.0021     | 0.0030  | 0.0053    | 0.0079  |

SFM = Surface Feet Per Minute

FPR = Feed Per Revolution

Starting parameters only. Length-to-diameter ratios, setup, and machine rigidity may affect performance.

## GROOVING TOOL TROUBLESHOOTING

| PROBLEM          | CAUSE              | SOLUTION  |
|------------------|--------------------|---|
| RAPID FLANK WEAR | CUTTING CONDITIONS | Check for excessive speed - see chart.  |
|                  | TOOL               | Select a coated tool.   |
|                  | PART               | Make sure prior operation did not work harden the material.   |
| BUILT-UP EDGE    | TOOL               | Select a coated tool.   |
|                  | CUTTING FORCE      | Check for excessive speed rate (IPR) - see chart.   |
|                  | HEAT               | Use the SCT coolant holder. If coolant is not available, use shop air and a coated tool.                      |
| CHATTER          | CUTTING CONDITIONS | Reduce RPM and increase feed rate within the feed and speed chart parameters.                                 |
|                  | CLAMPING           | Clamping length should be a minimum of 3x the shank diameter in the tool holder. Check tool holding rigidity. |
|                  | TOOL               | Hone cutting edge.<br>A light hone (0.0001-0.0003 inch) will help keep force constant.                        |
| TOOL BREAKAGE    | CUTTING CONDITIONS | Check for excessive feed rate (IPR) - see chart.  |
|                  | CHIP PACKING       | Stagger - Peck grooving.  |

# SINGLE POINT THREADING TECHNICAL CHART

| MATERIAL                                  | HB/Rc  | SPEED (SFM) |         | FIRST PASS DEPTH |           |           |           |           |       |
|---|--------|-------------|---------|------------------|-----------|-----------|-----------|-----------|-------|
|   |        | UNCOATED    | ALTiN+  | TOOL DIAMETER    |           |           |           |           |       |
|   |        |             |         | .040-.050        | .060-.092 | .120-.152 | .180-.232 | .290-.362 | .373+ |
| CAST IRON                                 | 160 HB | 75-200      | 200-550 | 0.003            | 0.004     | 0.005     | 0.007     | 0.008     | 0.009 |
| CARBON STEEL                              | 18 Rc  | 75-200      | 200-450 | 0.003            | 0.005     | 0.006     | 0.007     | 0.008     | 0.009 |
| ALLOY STEEL                               | 20 Rc  | 75-200      | 200-425 | 0.003            | 0.004     | 0.005     | 0.006     | 0.007     | 0.008 |
| TOOL STEEL                                | 25 Rc  | 75-175      | 175-300 | 0.002            | 0.003     | 0.004     | 0.005     | 0.006     | 0.007 |
| 300 STAINLESS STEEL                       | 150 HB | 75-175      | 175-350 | 0.003            | 0.003     | 0.004     | 0.005     | 0.006     | 0.007 |
| 400 STAINLESS STEEL                       | 195 HB | 75-210      | 130-420 | 0.003            | 0.004     | 0.005     | 0.006     | 0.006     | 0.007 |
| HIGH TEMP ALLOY<br>(NICKEL & COBALT BASE) | 20 Rc  | 50-130      | 130-300 | 0.002            | 0.003     | 0.003     | 0.004     | 0.005     | 0.005 |
| TITANIUM                                  | 25 Rc  | 50-100      | 120-275 | 0.003            | 0.003     | 0.004     | 0.005     | 0.006     | 0.007 |
| HEAT TREATED ALLOYS<br>(38-45Rc)          | 40 Rc  | 50-100      | 100-200 | 0.002            | 0.002     | 0.003     | 0.004     | 0.004     | 0.005 |
| ALUMINUM                                  | 100 HB | 75-250      | 200-750 | 0.004            | 0.005     | 0.007     | 0.008     | 0.010     | 0.011 |
| BRASS, ZINC                               | 80 HB  | 75-300      | 250-650 | 0.003            | 0.005     | 0.006     | 0.007     | 0.008     | 0.009 |

Parameters are a starting point based on machinability rating at hardness listed.  
Check machinability rating of the material to be machined and adjust First Pass Depth.

## Helpful Formulas and Information

$$\text{PITCH} = \frac{1}{\text{TPI}}$$

TPI = Threads Per Inch

ACME Thread Depth = Pitch × 0.5

Stub ACME Thread Depth = Pitch × 0.3

NPT Pipe Thread Depth = Pitch × 0.76

Internal 60° Thread Depth = Pitch × 0.54

Feed Rate = Pitch × Number of Thread Starts

Minimum Depth per Pass should not be less than 0.0003

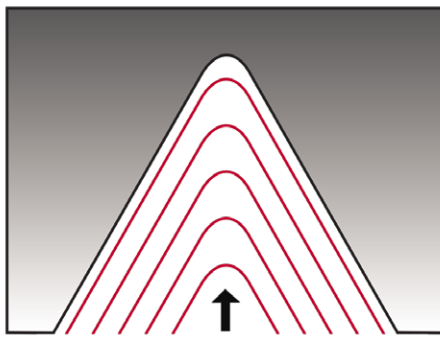
Threads not ending in a relief need at least one thread pitch length of pullout

Make sure feed rate calculation does not exceed the maximum feed rate of the machine

# SINGLE POINT THREADING TROUBLESHOOTING

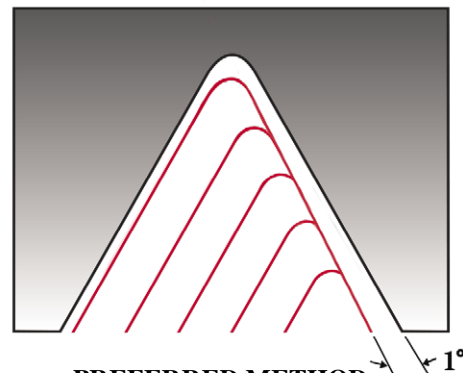
| PROBLEM                    | CAUSE              | SOLUTION   |
|----------------------------|--------------------|--|
| RAPID FLANK WEAR           | CUTTING CONDITIONS | Check for excessive speed - see chart.   |
|                            | PART               | Make sure prior operation did not work harden the material.                              |
|                            | TOOL               | Select a coated tool.  |
| BUILT-UP EDGE              | TOOL               | Select a coated tool.  |
|                            | CUTTING FORCE      | Increase the number of passes.   |
|                            | HEAT               | Use the SCT coolant holder. If coolant is not available, use shop air and a coated tool. |
| CORNER BREAKAGE            | CUTTING CONDITIONS | Reduce the depth-of-cut on the first pass.   |
|                            | PROGRAM            | If there is no thread relief, withdraw the tool on an angle.                             |
|                            | PART               | End in thread relief.  |
| CHIPS WRAPPING AROUND TOOL | TOOL               | Use a tool that is at least 30% smaller than the hole diameter.                          |

## RADIAL INFEEED



NOT RECOMMENDED

## MODIFIED FLANK



PREFERRED METHOD

Radial Infeed is not recommended. Modified flank at 1° is recommended.

For unfavorable length-to-diameter ratios or difficult-to-machine materials, the number of passes will need to be increased up to 40% more.

Depth of cut per pass should not be less than 0.0003 inch.

# SINGLE POINT CBN & PCD TECHNICAL & APPLICATION

## PCD TIPPED TOOL INFORMATION

SCT PCD tools and inserts are excellent for continuous cutting of a wide range of non-ferrous and non-metal materials. The products are precision ground for machining to sub-micron finishes with maximum tool life. PCD allows for higher cutting speeds with longer tool life.

SINGLE POINT TOOLS  
TECH INFO

| MATERIAL                     | BHN/Rc      | SPEED RANGE (SFM) | FEED IPR  | SINGLE POINT PCD TIPPED BARS |                      |                      |                  |
|------------------------------|-------------|-------------------|-----------|------------------------------|----------------------|----------------------|------------------|
|                              |             |                   |           | TOOL DIAMETER                |                      |                      |                  |
|                              |             |                   |           | .120-160<br>MAX DOC          | .180-.230<br>MAX DOC | .290-.320<br>MAX DOC | .360+<br>MAX DOC |
| LOW SILICON ALUMINUM         | 225-350 BHN | 1000-5000         | .001-.007 | 0.015                        | 0.021                | 0.03                 | 0.045            |
| HIGH SILICON ALUMINUM        | 270-425 BHN | 600-3000          | .001-.007 | 0.015                        | 0.021                | 0.03                 | 0.045            |
| METAL MATRIX COMPOSITIES     | N/A         | 500-2000          | .001-.007 | 0.008                        | 0.012                | 0.02                 | 0.03             |
| COPPER ALLOYS, BRASS, BRONZE | 80-120 BHN  | 750-3500          | .001-.007 | 0.015                        | 0.021                | 0.03                 | 0.045            |
| PRESINTERED TUNGSTEN CARBIDE | 140-300 BHN | 100-350           | .001-.005 | 0.003                        | 0.005                | 0.007                | 0.012            |
| ACRYLICS                     | N/A         | 700-1500          | .001-.007 | 0.015                        | 0.021                | 0.03                 | 0.045            |
| FIBERGLASS                   | N/A         | 600-1000          | .001-.007 | 0.012                        | 0.02                 | 0.03                 | 0.045            |
| GRAPHITES                    | N/A         | 600-1000          | .001-.007 | 0.015                        | 0.021                | 0.03                 | 0.045            |
| NYLON, PLASTIC               | N/A         | 700-1500          | .001-.007 | 0.015                        | 0.021                | 0.03                 | 0.045            |
| HARD RUBBER                  | N/A         | 500-2500          | .001-.007 | 0.015                        | 0.021                | 0.03                 | 0.045            |

| APPLICATION GUIDELINES  |
|---|
| Make sure the machine and setup is rigid and solid. Chatter will cause chipping.                      |
| Tool height when boring should be slightly above center. Tool deflection will put the tool on center. |
| Do not stop the machine with the tool in cut. This will result in tool breakage.                      |
| Use of coolant will reduce heat and improve surface finish.   |
| Do not contact the tool to a hard surface prior to the machining process- this will cause chipping.   |
| Higher speeds minimize tool buildup.  |
| Depth of cut should not exceed 70% of PCD tip length.   |

As the DOC decreases the feed rate can increase DOC = Depth of Cut SFM = Surface Feet per Minute

## CBN TIPPED TOOL INFORMATION

SCT CBN tools and inserts are excellent for continuous cutting of a wide range of hardened steels, powdered metals, cast irons and super alloys. The products are precision ground with hones for machining to sub-micron finishes with maximum tool life. CBN tipped tools and inserts can take the place of grinding.

| MATERIAL                     | BHN/Rc      | SPEED RANGE (SFM) | FEED IPR  | SINGLE POINT CBN TIPPED BARS |                      |                      |                  |
|------------------------------|-------------|-------------------|-----------|------------------------------|----------------------|----------------------|------------------|
|                              |             |                   |           | TOOL DIAMETER                |                      |                      |                  |
|                              |             |                   |           | .120-160<br>MAX DOC          | .180-.230<br>MAX DOC | .290-.320<br>MAX DOC | .360+<br>MAX DOC |
| HEAT TREATED ALLOY           | 45-60Rc     | 200-600           | .001-.005 | 0.003                        | 0.004                | 0.006                | 0.009            |
| TOOL STEEL                   | 45-60Rc     | 200-600           | .001-.005 | 0.003                        | 0.004                | 0.006                | 0.009            |
| NODULAR IRON                 | N/A         | 600-1500          | .001-.005 | 0.006                        | 0.01                 | 0.02                 | 0.03             |
| PEARLITIC IRON               | 220-240BHN  | 600-2500          | .001-.007 | 0.006                        | 0.01                 | 0.02                 | 0.03             |
| WHITE/CHILLED IRON           | 54-60Rc     | 200-500           | .001-.005 | 0.005                        | 0.008                | 0.012                | 0.015            |
| SUPER ALLOY Ni BASE          | 240-475 BHN | 200-800           | .001-.005 | 0.003                        | 0.004                | 0.006                | 0.025            |
| COBOLT BASED ALLOY, STELLITE | 45-55Rc     | 200-500           | .001-.005 | 0.003                        | 0.004                | 0.006                | 0.009            |
| INCONELS                     | 45-55Rc     | 200-500           | .001-.005 | 0.003                        | 0.004                | 0.006                | 0.009            |

| APPLICATION GUIDELINES  |
|---|
| Make sure the machine and setup is rigid and solid. Chatter will cause chipping                       |
| Tool height when boring should be slightly above center. Tool deflection will put the tool on center. |
| Do not stop the machine with the tool in cut. This will result in tool breakage.                      |
| Coolant use is not advised as it could cause thermal cracking.  |
| Do not contact the tool to a hard surface prior to the machining process. This will cause chipping.   |
| Depth of cut should not exceed 30% of CBN tip length.   |

As the DOC decreases the feed rate can increase DOC = Depth of Cut SFM = Surface Feet per Minute