## GARR TOOL General Purpose Milling Guide

|  | ISO Material | HRC | SFM <br> (Vc) | CHIPLOAD PER TOOTH (Fz) |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | 1/16" | 1/8" | 3/16" | 1/4" | 5/16" | 3/8" | 1/2" | 5/8" | 3/4" | $1 "$ |
| S | COBALT BASE ALLOYS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605 | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{aligned} & 60-90 \\ & 50-80 \end{aligned}$ | $\begin{array}{\|l\|} \hline .0004^{\prime \prime}-.0008^{\prime \prime} \\ .0003^{\prime \prime} \end{array}$ | $\begin{aligned} & .0004^{" .0008 " ~} \\ & .0003^{\prime \prime} .0006^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0004^{\prime \prime}-.0008^{\prime \prime} \\ & .0003^{\prime \prime} .0006^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0005^{" ~}-.0010^{\prime \prime} \\ & .003^{\prime} .0008^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0008^{" .0015 " ~ " ~ " 0010 " ~} \\ & .0005 \end{aligned}$ | $\begin{aligned} & .00100^{"-0018 " ~} \\ & .0008^{\prime \prime}-0015^{\prime \prime} \end{aligned}$ |  |  | $\begin{aligned} & .0025 "-.0035^{\prime \prime} \\ & .00155^{\prime \prime}-.00200^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0025^{"-.0035 " ~} \\ & .0015^{\prime \prime}-.0020^{\prime \prime} \end{aligned}$ |
|  | NICKEL BASE ALLOYS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286 | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{array}{r} 55-90 \\ 45-80 \end{array}$ | $\begin{array}{\|l\|l\|} \hline .0004 "^{\prime \prime}-.0008^{\prime \prime} \\ .0003^{\prime \prime}-.006 \end{array}$ | $\begin{aligned} & .0004^{\prime \prime}-.0008^{\prime \prime} \\ & .0003^{\prime \prime} .0006^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0004^{\prime \prime}-.0008^{\prime \prime} \\ & .0003^{\prime \prime} .0006^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0005^{"-.0010 " 1} \\ & .0003^{\prime \prime} .00088^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0008^{\prime \prime} .0015^{\prime \prime} \\ & .0005^{-} .0010^{\prime \prime} \end{aligned}$ | "0010"0.0018" ".0008" . | $\begin{array}{\|l\|l\|} \hline .0015 "-.0030 " 10 \\ .0010^{\prime \prime}-.0015 " \\ \hline \end{array}$ | $\begin{aligned} & .00200^{\prime \prime}-.0030 " \\ & .00155^{\prime \prime}-.0025^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0025 "-.0035^{\prime \prime} \\ & .00155^{\prime \prime}-.00200^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0025^{\prime \prime}-.0035^{\prime \prime} \\ & .0015^{\prime-} .0020^{\prime \prime} \end{aligned}$ |
|  | IRON BASE ALLOYS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3 | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{aligned} & 55-90 \\ & 50-80 \end{aligned}$ | $\begin{array}{\|l\|} \hline .0004^{\prime \prime}-.0008^{\prime \prime} \\ .0006^{\prime \prime} \end{array}$ | $\begin{aligned} & .0004^{" .0008 " ~ " ~} 0.0006^{\prime \prime} \\ & \hline \end{aligned}$ | $\begin{aligned} & .0004^{\prime \prime} .0008^{\prime \prime} \\ & .0003^{\prime \prime} .0006^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0005^{"-.0010 " ~} \\ & .0003^{\prime \prime} .00088^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0008^{\prime \prime} .0015^{\prime \prime} \\ & .0005^{-0} .0010^{\prime \prime} \end{aligned}$ | .0010" ".00018" ".0008" | $\begin{array}{\|l\|l\|} \hline .0015^{\prime \prime}-.0030^{\prime \prime} \\ .00015^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline .00200^{\prime \prime}-.0030 " 1 \\ .0015^{\prime \prime}-.0025^{\prime \prime} \\ \hline \end{array}$ | $\begin{aligned} & .0025 "-.0035^{\prime \prime} \\ & .00155^{\prime \prime}-.00200^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0025^{\prime \prime}-.0035^{\prime \prime} \\ & .0015^{\prime-} .0020^{\prime \prime} \end{aligned}$ |
|  | MONEL |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Monel - 65\% Nickel |  | 50-80 | .0003"-.0008" | .0003"-.0008" | .0005"-.0012" | .0005"-.0012" | .0008" - 00015 " | .0010"-.0015" | .0013"-.0020" | .0018"-.0025" | .0020"-.0030" | .0025"-.0035" |
|  | TITANIUM ALLOYS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Commercially Pure, 6Al-4V, Astm 1/2/3,6Al-25N-4Zr-2Mo-Si |  | 100-150 | .0003" -.0008" | .0003"-.0008" | .0005"-.0012" | .0005" -.0012" | .0008" - 0015" | .0010" - .0015" | .0013" -.0020" | .0018" - .0025" | .0020" - .033" | .0025" - .0035" |
|  | 5553/Beta Titanium |  | 90-120 | .0003"-.0008" | .0003"-.0008" | .0004"-.0010" | .0004"- $00010^{\prime \prime}$ | .0005"-.0012" | .0008" - .0014" | .0010"-.0016" | .0010" - .0020" | .0015"-.0025" | .0015"-.0025" |
| M | STAINLESS STEELS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 13/8, 15/5, 17-4, pHTypes | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{array}{\|c\|} \hline 150-150 \\ 80-100 \end{array}$ | .0002" -.0005" ".0004" | $\begin{aligned} & .0003^{"-.0006 " ~} \\ & .0002^{-}-.0004^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0003^{"-}-0007^{\prime \prime} \\ & 0007)^{-0}-0066^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0006^{\prime \prime} .0009^{\prime \prime} \\ & .0003^{\prime \prime}-.0007^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0008^{" .0012^{\prime \prime}} \\ & .00044^{-0008^{\prime \prime}} \end{aligned}$ | "0013" "00018" ".0012" | $\begin{aligned} & .001010-.0020 " 1 \\ & .00088^{\prime \prime}-.00155^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .00122^{"-.0025 " ~} \\ & .00100^{\prime \prime}-.00166^{\prime \prime} \end{aligned}$ |  | $\text { .002001" -0028" } 0.0020$ |
|  | 200 Series, 300 Series | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{aligned} & 150-225 \\ & 125-720 \end{aligned}$ | .0002" -.0005" ".0004" | $\begin{aligned} & .00022^{" .0006 " ~} \\ & .0003^{\prime \prime}-.0005^{\prime \prime} \end{aligned}$ | $\text { .0005"-.0008" } .0000^{\prime \prime} \text { ".0007" }$ | .0008" ".0015" | $\begin{aligned} & .0010 "-.0018^{\prime \prime} \\ & .00088^{\prime \prime}-.0012^{\prime \prime} \end{aligned}$ | .0010"-.0018" ".0009" | $\begin{aligned} & .0015 "-.0025^{\prime \prime} \\ & .0013^{\prime \prime}-.0018^{\prime \prime} \end{aligned}$ | .0018" -.0028" | $\begin{aligned} & .0022 "-.0032 " 1 " \\ & .00177^{\prime \prime} .00255^{\prime \prime} \end{aligned}$ | $\text { .0025" -.0040" } .0022^{\prime \prime} \text { " } 0032$ |
|  | 304L, 316L, Nitronic 50 | $\begin{aligned} <40 \\ >40 \end{aligned}$ | $\begin{aligned} & 100-150 \\ & 80-150 \end{aligned}$ | $\begin{aligned} & .0003^{" ~}-.0006^{\prime \prime} \\ & .0002^{\prime \prime} .00044^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0003 "-.0007 " \\ & .00022^{-0}-.0055^{\prime \prime} \end{aligned}$ | $\text { .0005" -.0010" } .0000^{\prime \prime} \text { ".0007 }$ | "0008" ".0015" ".0010" | $\begin{aligned} & .0009 "-.0013^{" ~} \\ & .00055^{-0010}{ }^{\prime \prime} \end{aligned}$ | $\text { "0010" ".0018" } 0.0010$ | $\begin{aligned} & .0015 "-.0020 " \\ & .00099^{"-.0015 "} \end{aligned}$ | $\begin{aligned} & .0018^{\prime \prime}-.0022^{\prime \prime} \\ & .0012^{\prime \prime} .0018^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0018 "^{\prime \prime}-.0035^{\prime \prime} \\ & \hline .00155^{\prime \prime}-.00 \end{aligned}$ | $.0022^{4} .0036^{\prime \prime} .0000000$ |
|  | 400 Series | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{aligned} & 150-200 \\ & 100-150 \end{aligned}$ | .0005"-.0008" ".0007" |  | .0009" "00015" ".0010" | "0009" ".0014" ".0011" | $\text { "0011" -0015" } 0.0008 "^{\prime \prime} .$ |  | $\begin{aligned} & .0015^{\prime \prime}-.0025^{\prime \prime} \\ & .0012^{\prime \prime}-.0020^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .00200^{\prime \prime} .0035^{" 1} \\ & .0018^{\prime \prime}-.0030^{\prime \prime} \end{aligned}$ | "0022" -0040" | .0030" -.0046" |
| P | HIGH STRENGTH TOOL STEELS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | A2, D2, P20, H13, S7, 01 | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{aligned} & 150-200 \\ & 100-150 \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline .0003^{\prime \prime}-.0008^{\prime \prime} \\ .0003^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline .0003^{\prime \prime}-.0008^{\prime \prime} \\ .0003^{\prime \prime}-.0005^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline .0005 "^{\prime \prime}-.001010 " \\ .0003^{\prime \prime}-.0000^{\prime \prime} \\ \hline \end{array}$ | $\begin{aligned} & .0010^{\prime \prime} .0015^{\prime \prime} \\ & .005^{\prime \prime} .0010^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0012^{" ~}-0020^{\prime \prime} \\ & .00055^{-0010 " ~} . \end{aligned}$ | $\begin{array}{\|l\|} \hline .0012^{\prime \prime}-.0020^{\prime \prime} \\ .00055^{\prime \prime} .0010^{\prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline .0014^{\prime \prime}-.0024^{\prime \prime} \\ .00015^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline .0018^{\prime \prime}-0026^{\prime \prime \prime} \\ .0012^{\prime \prime} .0018^{\prime \prime} \\ \hline \end{array}$ | $\begin{aligned} & .00200^{\prime \prime} .0028^{\prime \prime} \\ & .0014^{\prime \prime}-.0020^{\prime \prime} \end{aligned}$ | $\begin{array}{\|l\|} \hline .0022^{\prime \prime}-.0030^{\prime \prime} \\ .0015^{\prime \prime}-.0022^{\prime \prime} \\ \hline \end{array}$ |
|  | MEDIUM ALLOY TOOL STEELS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4140, 4340, 52100, 6150,8620 | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{aligned} & 150-200 \\ & 100-150 \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline .0003^{\prime \prime}-.0008^{\prime \prime} \\ .0003^{\prime \prime}-.005^{\prime \prime} \end{array}$ | $\begin{array}{\|l\|} \hline .0003^{\prime \prime}-0008^{\prime \prime} \\ .0003^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline .0005 "^{\prime \prime}-.0010^{\prime \prime} \\ .0003^{\prime}-.0008^{\prime \prime} \\ \hline \end{array}$ | $\begin{aligned} & .0010^{\prime \prime} .0015^{\prime \prime} \\ & .005^{\prime \prime} .0010^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0012^{\prime \prime} .0020^{\prime \prime} \\ & .0005^{\prime}-0010^{\prime \prime} \\ & \hline \end{aligned}$ | $\begin{array}{\|l\|} \hline .0012^{\prime \prime}-.0020^{\prime \prime} \\ .00055^{\prime 0} .010^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline .0014^{\prime \prime}-.0024^{\prime \prime} \\ .0010^{\prime \prime} .0015^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline .0018^{\prime \prime}-.0026^{\prime \prime} \\ .0012^{\prime \prime} .0018^{\prime \prime} \\ \hline \end{array}$ | $\begin{aligned} & .0020^{\prime \prime}-.0028^{\prime \prime} \\ & .0014^{\prime \prime}-.0020^{\prime \prime} \end{aligned}$ | $\begin{aligned} & .0022^{\prime \prime}-.0030^{\prime \prime} \\ & .0015^{\prime-}-.0022^{\prime \prime} \end{aligned}$ |
|  | CARBON STEELS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1000's - 1018, 1020, 12 L14 | $\begin{aligned} & <40 \\ & >40 \end{aligned}$ | $\begin{aligned} & 150-200 \\ & 100-150 \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline .0003^{\prime \prime}-.0008^{\prime \prime} \\ .0003^{\prime \prime}-.0005^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline .0003 "-.000 "^{\prime \prime} \\ .0003^{\prime \prime}-.0005 "^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline .0005 "-.0010 " 10 \\ .0003^{\prime \prime}-.0008^{\prime \prime} \\ \hline \end{array}$ | $\begin{aligned} & .0010^{\prime \prime}-0015^{\prime \prime} \\ & .0005^{\prime-.0010^{\prime \prime}} \end{aligned}$ | $\begin{aligned} & .0012^{\prime \prime} \text { ".0020" } \\ & .00055^{-0010 " ~} .01 \end{aligned}$ | $\begin{array}{\|l\|} \hline .0012^{\prime \prime}-.0020^{\prime \prime} \\ .00055^{\prime \prime} .0010^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline .0014^{\prime \prime}-.0024^{\prime \prime} \\ .0010^{\prime \prime}-.015^{\prime \prime} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline .0018^{\prime \prime}-0026^{\prime \prime} \\ .0012^{\prime \prime}-.0018^{\prime \prime} \\ \hline \end{array}$ | $\begin{aligned} & .00200^{\prime \prime}-.0028^{\prime \prime} \\ & .0014^{\prime \prime}-.0020^{\prime \prime} \end{aligned}$ | $\begin{array}{\|l\|} \hline .0022^{\prime \prime}-.0030^{\prime \prime} \\ .0015^{\prime \prime}-.0022^{\prime \prime} \\ \hline \end{array}$ |
|  | CAST STEELS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Steel |  | 125-175 | .0003"-.0008" | .0003"-.0008" | .0005"-.0010" | .0010" - .0018" | .0010" - 0018" | .0012"-.0020" | .0015" -.0025" | .0024" -.0032" | .0026"-.0034" | .0030"-.0040" |
| K | CAST MATERIAL |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Ductile Iron |  | 175-225 | .0005"-.0008" | .0008" - .0012" | .0010"-.0015" | .0015" -.0025" | .0015" - .0025" | .0020" - .0030" | .0025" -.0035" | .0035" -.0045" | .0035"-.0045" | .0045"-.005" ${ }^{\prime \prime}$ |
|  | Gray Iron |  | 175-225 | .0005" - .0008" | .0008"-.0012" | .0010"-.0015" | .0015"-.0025" | .0015"-.0025" | .0020"-.0030" | .0025"-.0035" | .0035" - .0045" | .0035"-.0045" | .0045"-.005" |
| N | NON-FERROUS |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Aluminum |  | 300-500 | .0003" - .0005" | .0006"-.0010" | .0008" - 0014 | .0012"-.0020" | .0014"-.0028" | .0020" - .0030" | .0035"-.0048" | .0050"-.0060" | .0058" - .0070" | .0068 " - 0090" |
|  | Magnesium |  | 300-500 | .0003" - .0005" | .0006" - $0010^{\prime \prime}$ | .0008" - 0014 | .0012"-0020" | .0014"-.0028" | .0020" - 00301 | .0035"-.0048" | .0050" - .0060" | .0058" -0070" | .0068" - .0090" |
|  | Copper |  | 250-450 | .0003" -.0005" | .0006" - 0010 " | .0008"-.0014" | .0012" - .0020" | .0014" -0028" | .0020" - .0030" | .0035" -.0048 | .0050" - .0060" | .0058"-0070" | .0068 " - 0090" |
|  | Brass, Bronze |  | 200-400 | .0003" -.0005" | .0006" -.0010" | .0008"-.0014" | .0012" - .0020" | .0014" -0028" | .0020" - .0030" | .0035" . 0048 | .0050" - .0060" | .0058" - 0070" | .0068" - 0090" |
| 0 | COMPOSITE (non-ISO) |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Fiberglass, Plastics |  | 200-400 | .0003" -.0005" | .0006" - .0010" | .0008" -.0014" | .0012"-.0020" | .0014" - 0028" | .0020"-.0030" | .0035"-.0048" | .0050" - .0060" | .0058" - 0070" | .0068" - .0090" |
|  | Graphite, G10 | (See Graphite Chart - page 311) |  |  |  |  |  |  |  |  |  |  |  |

When plunging into a solid, drop feed by approximately $50 \% .20 \%$ of diameter for basic engagement parameters.
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

