CRAZYMILL™ by Mikron Tool Cool

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MILLING TOOLS
CRAZYMILL COOL BALL - Z2

# Type A - Semi-finishing

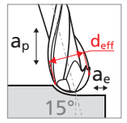
$v_c$ [m/min] | **[SFM]**
$f_z$ [mm] | **[IPT]**
$d_{eff}$ [mm] | **[inch]**

RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended

P N $S_3$ M $S_1$ $H_1$ K $S_2$ $H_2$

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

**Semi-finishing**




- $a_p = 0.25 \times d_1$ (Ød$_1$ ≤ 0.5 mm **|.020"**)
- $a_p = 0.5 \times d_1$ (Ød$_1$ > 0.5 mm **|.020"**)
- $a_e = 0.1 \times d_1$

**Machining angle = 15°**




Ød1

| Materials group | Material | Mat. no. | DIN | AISI/ASTM/UNS | 1/64" 0.3 mm \| .012" | | | 0.4 mm \| .016" | | | 0.5 mm \| .020" | | | 0.6 mm \| .024" | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ |
| P | Unalloyed carbon steel Rm < 800 N/mm² | 1.0301 | C10 | AISI 1010 | 55 | 0.29 | 0.005 | 73 | 0.39 | 0.007 | 92 | 0.48 | 0.010 | 100 | 0.60 | 0.012 |
| | | 1.0401 | C15 | AISI 1015 | **180** | **.011** | **.00020** | **240** | **.015** | **.00028** | **302** | **.019** | **.00039** | **328** | **.024** | **.00047** |
| | | 1.1191 | C45E/CK45 | AISI 1045 | | | | | | | | | | | | |
| | | 1.0044 | S275JR | AISI 1020 | | | | | | | | | | | | |
| | | 1.0715 | 11SMn30 | AISI 1215 | | | | | | | | | | | | |
| | Low alloyed steel Rm > 900 N/mm² | 1.5752 | 15NiCr13 | ASTM 3415 | 55 | 0.29 | 0.004 | 73 | 0.39 | 0.006 | 92 | 0.48 | 0.009 | 100 | 0.60 | 0.011 |
| | | 1.7131 | 16MnCr5 | AISI 5115 | **180** | **.011** | **.00016** | **240** | **.015** | **.00024** | **302** | **.019** | **.00035** | **328** | **.024** | **.00043** |
| | | 1.3505 | 100Cr6 | AISI 52100 | | | | | | | | | | | | |
| | | 1.7225 | 42CrMo4 | AISI 4140 | | | | | | | | | | | | |
| | | 1.2842 | 90MnCrV8 | AISI O2 | | | | | | | | | | | | |
| | High alloyed tool steel Rm<1200N/mm² | 1.2379 | X153CrMoV12 | AISI D2 | 55 | 0.29 | **0.004** | 73 | 0.39 | 0.006 | 92 | 0.48 | 0.008 | 100 | 0.60 | 0.009 |
| | | 1.2436 | X210CrW12 | AISI D4/D6 | **180** | **.011** | **.00016** | **240** | **.015** | **.00024** | **302** | **.019** | **.00031** | **328** | **.024** | **.00035** |
| | | 1.3343 | HS6-5-2C | AISI M2 | | | | | | | | | | | | |
| | | 1.3355 | HS18-0-1 | AISI T1 | | | | | | | | | | | | |
| M | Stainless steel ferritic | 1.4016 | X6Cr17 | AISI 430 | 55 | 0.29 | 0.005 | 73 | 0.39 | 0.007 | 92 | 0.48 | 0.010 | 100 | 0.60 | 0.012 |
| | | 1.4105 | X6CrMoS17 | AISI 430F | **180** | **.011** | **.00020** | **240** | **.015** | **.00028** | **302** | **.019** | **.00039** | **328** | **.024** | **.00047** |
| | Stainless steel martensitic | 1.4034 | X46Cr13 | AISI 420C | 55 | 0.29 | 0.004 | 73 | 0.39 | 0.006 | 92 | 0.48 | 0.009 | 100 | 0.60 | 0.010 |
| | | 1.4112 | X90CrMoV18 | AISI 440B | **180** | **.011** | **.00016** | **240** | **.015** | **.00024** | **302** | **.019** | **.00035** | **328** | **.024** | **.00039** |
| | Stainless steel martensitic – PH | 1.4542 | X5CrNiCuNb 16-4 | AISI 630 | 55 | 0.29 | 0.004 | 73 | 0.39 | 0.006 | 92 | 0.48 | 0.009 | 100 | 0.60 | 0.010 |
| | | 1.4545 | X5CrNiCuNb 15-5 | ASTM 15-5PH | **180** | **.011** | **.00016** | **240** | **.015** | **.00024** | **302** | **.019** | **.00035** | **328** | **.024** | **.00039** |
| | Stainless steel austenitic | 1.4301 | X5CrNi 18-10 | AISI 304 | 55 | 0.29 | 0.004 | 73 | 0.39 | 0.006 | 92 | 0.48 | 0.008 | 100 | 0.60 | 0.010 |
| | | 1.4435 | X2CrNiMo 18-14-3 | AISI 316L | **180** | **.011** | **.00016** | **240** | **.015** | **.00024** | **302** | **.019** | **.00031** | **328** | **.024** | **.00039** |
| | | 1.4441 | X2CrNiMo 18-15-3 | AISI 316LM | | | | | | | | | | | | |
| | | 1.4539 | X1NiCrMoCu25-20-5 | AISI 904L | | | | | | | | | | | | |
| K | Cast iron | 0.6020 | GG20 | ASTM 30 | 55 | 0.29 | 0.003 | 73 | 0.39 | 0.005 | 92 | 0.48 | 0.006 | 100 | 0.60 | 0.008 |
| | | 0.6030 | GG30 | ASTM 40B | **180** | **.011** | **.00012** | **240** | **.015** | **.00020** | **302** | **.019** | **.00024** | **328** | **.024** | **.00030** |
| | | 0.7040 | GGG40 | ASTM60-40-18 | | | | | | | | | | | | |
| | | 0.7060 | GGG60 | ASTM80-60-03 | | | | | | | | | | | | |
| N | Aluminium alloy wrought | 3.2315 | AlMgSi1 | ASTM 6351 | 55 | 0.29 | 0.006 | 73 | 0.39 | 0.008 | 92 | 0.48 | 0.012 | 100 | 0.60 | 0.014 |
| | | 3.4365 | AlZnMgCu1.5 | ASTM 7075 | **180** | **.011** | **.00024** | **240** | **.015** | **.00031** | **302** | **.019** | **.00047** | **328** | **.024** | **.00055** |
| | Aluminium alloy cast | 3.2163 | GD-AlSi9Cu3 | ASTM A380 | 55 | 0.29 | 0.006 | 73 | 0.39 | 0.008 | 92 | 0.48 | 0.012 | 100 | 0.60 | 0.014 |
| | | 3.2381 | GD-AlSi10Mg | UNS A03590 | **180** | **.011** | **.00024** | **240** | **.015** | **.00031** | **302** | **.019** | **.00047** | **328** | **.024** | **.00055** |
| | Copper | 2.004 | Cu-OF / CW008A | UNS C10100 | 55 | 0.29 | 0.006 | 73 | 0.39 | 0.008 | 92 | 0.48 | 0.014 | 100 | 0.60 | 0.016 |
| | | 2.0065 | Cu-ETP / CW004A | UNS C11000 | **180** | **.011** | **.00024** | **240** | **.015** | **.00031** | **302** | **.019** | **.00055** | **328** | **.024** | **.00063** |
| | Brass lead free | 2.0321 | CuZn37 CW508L | UNS C27400 | 55 | 0.29 | 0.006 | 73 | 0.39 | 0.008 | 92 | 0.48 | 0.014 | 100 | 0.60 | 0.016 |
| | | 2.036 | CuZn40 CW509L | UNS C28000 | **180** | **.011** | **.00024** | **240** | **.015** | **.00031** | **302** | **.019** | **.00055** | **328** | **.024** | **.00063** |
| | Brass, Bronze Rm < 400 N/mm² | 2.0401 | CuZn39Pb3 | UNS C38500 | 55 | 0.29 | 0.006 | 73 | 0.39 | 0.008 | 92 | 0.48 | 0.014 | 100 | 0.60 | 0.016 |
| | | 2.102 | CuSn6 | UNS C51900 | **180** | **.011** | **.00024** | **240** | **.015** | **.00031** | **302** | **.019** | **.00055** | **328** | **.024** | **.00063** |
| | Bronze Rm < 600 N/mm² | 2.0966 | CuAl10Ni5Fe4 | UNS C63000 | 55 | 0.29 | 0.006 | 73 | 0.39 | 0.008 | 92 | 0.48 | 0.012 | 100 | 0.60 | 0.014 |
| | | 2.096 | CuAl9Mn2 | UNS C63200 | **180** | **.011** | **.00024** | **240** | **.015** | **.00031** | **302** | **.019** | **.00047** | **328** | **.024** | **.00055** |
| $S_1$ | Super alloys | 2.4856 | | Inconel 625 | 55 | 0.29 | 0.003 | 73 | 0.39 | 0.004 | 92 | 0.48 | 0.004 | 100 | 0.60 | 0.005 |
| | | 2.4668 | | Inconel 718 | **180** | **.011** | **.00012** | **240** | **.015** | **.00016** | **302** | **.019** | **.00016** | **328** | **.024** | **.00020** |
| | | 2.4617 | NiMo28 | Hastelloy B-2 | | | | | | | | | | | | |
| | | 2.4665 | NiCr22Fe18Mo | Hastelloy X | | | | | | | | | | | | |
| $S_2$ | Titanium pure | 3.7035 | Gr.2 | ASTM B348 | 55 | 0.29 | 0.004 | 73 | 0.39 | 0.004 | 92 | 0.48 | 0.008 | 100 | 0.60 | 0.009 |
| | | 3.7065 | Gr.4 | ASTM B348 | **180** | **.011** | **.00016** | **240** | **.015** | **.00016** | **302** | **.019** | **.00031** | **328** | **.024** | **.00035** |
| | Titanium alloys | 3.7165 | TiAl6V4 | ASTM B348 | 55 | 0.29 | 0.004 | 73 | 0.39 | 0.004 | 92 | 0.48 | 0.008 | 100 | 0.60 | 0.009 |
| | | 9.9367 | TiAl6Nb7 | ASTM F1295 | **180** | **.011** | **.00016** | **240** | **.015** | **.00016** | **302** | **.019** | **.00031** | **328** | **.024** | **.00035** |
| $S_3$ | CrCo alloys | 2.4964 | CoCr20W15Ni | Haynes 25 | 55 | 0.29 | 0.003 | 73 | 0.39 | 0.003 | 92 | 0.48 | 0.005 | 100 | 0.60 | 0.005 |
| | | | CrCoMo28 | ASTM F1537 | **180** | **.011** | **.00012** | **240** | **.015** | **.00012** | **302** | **.019** | **.00020** | **328** | **.024** | **.00020** |
| $H_1$ | Hardened steel < 55 HRC | 1.2510 | 100MnCrMoW4 | AISI O1 | 55 | 0.29 | 0.004 | 73 | 0.39 | 0.006 | 92 | 0.48 | 0.007 | 80 | 0.60 | 0.008 |
| | | | | | **180** | **.011** | **.00016** | **240** | **.015** | **.00024** | **302** | **.019** | **.00028** | **262** | **.024** | **.00031** |
| $H_2$ | Hardened steel ≥ 55 HRC | 1.2379 | X153CrMoV12 | AISI D2 | | | | | | | | | | | | |

| Materials group | Material | Mat. no. | DIN | AISI/ASTM/UNS | 1/32" 0.8 mm \| .032" | | | 1.0 mm \| .039" | | | 1.2 mm \| .047" | | | 1/16" 1.5 \| .059" | | | 1.8 mm \| .071" | | | 2.0 mm \| .079" | | | 3/32" 2.5 mm \| .098" | | | 1/8" 3.0 mm \| .118" | | | 5/32" 4.0 mm \| .158" | | | 3/16–7/32–1/4" 6.0 mm \| .236" | | | 8.0 mm \| .315" | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ | $v_c$ | $d_{eff}$ | $f_z$ |
| P | Unalloyed carbon steel Rm < 800 N/mm² | 1.0301 | C10 | AISI 1010 | 100 | 0.80 | 0.014 | 140 | 1.00 | 0.016 | 140 | 1.20 | 0.018 | 200 | 1.50 | 0.024 | 200 | 1.80 | 0.026 | 220 | 2.00 | 0.034 | 220 | 2.50 | 0.036 | 240 | 3.00 | 0.046 | 260 | 4.00 | 0.048 | 260 | 6.00 | 0.048 | 260 | 8.00 | 0.048 |
| | | 1.0401 | C15 | AISI 1015 | **328** | **.032** | **.00055** | **459** | **.039** | **.00063** | **459** | **.047** | **.00071** | **656** | **.059** | **.00094** | **656** | **.071** | **.00102** | **722** | **.079** | **.00134** | **722** | **.098** | **.00142** | **787** | **.118** | **.00181** | **853** | **.158** | **.00189** | **853** | **.236** | **.00189** | **853** | **.315** | **.00189** |
| | | 1.1191 | C45E/CK45 | AISI 1045 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1.0044 | S275JR | AISI 1020 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1.0715 | 11SMn30 | AISI 1215 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Low alloyed steel Rm > 900 N/mm² | 1.5752 | 15NiCr13 | ASTM 3415 | 100 | 0.80 | 0.012 | 140 | 1.00 | 0.014 | 140 | 1.20 | 0.016 | 200 | 1.50 | 0.022 | 200 | 1.80 | 0.024 | 220 | 2.00 | 0.032 | 220 | 2.50 | 0.034 | 240 | 3.00 | 0.046 | 260 | 4.00 | 0.048 | 260 | 6.00 | 0.048 | 260 | 8.00 | 0.048 |
| | | 1.7131 | 16MnCr5 | AISI 5115 | **328** | **.032** | **.00047** | **459** | **.039** | **.00055** | **459** | **.047** | **.00063** | **656** | **.059** | **.00087** | **656** | **.071** | **.00094** | **722** | **.079** | **.00126** | **722** | **.098** | **.00134** | **787** | **.118** | **.00181** | **853** | **.158** | **.00189** | **853** | **.236** | **.00189** | **853** | **.315** | **.00189** |
| | | 1.3505 | 100Cr6 | AISI 52100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1.7225 | 42CrMo4 | AISI 4140 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1.2842 | 90MnCrV8 | AISI O2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | High alloyed tool steel Rm<1200N/mm² | 1.2379 | X153CrMoV12 | AISI D2 | 100 | 0.80 | 0.011 | 140 | 1.00 | 0.011 | 140 | 1.20 | 0.013 | 200 | 1.50 | 0.020 | 200 | 1.80 | 0.022 | 220 | 2.00 | 0.030 | 220 | 2.50 | 0.032 | 240 | 3.00 | 0.042 | 260 | 4.00 | 0.044 | 260 | 6.00 | 0.044 | 260 | 8.00 | 0.044 |
| | | 1.2436 | X210CrW12 | AISI D4/D6 | **328** | **.032** | **.00043** | **459** | **.039** | **.00043** | **459** | **.047** | **.00051** | **656** | **.059** | **.00079** | **656** | **.071** | **.00087** | **722** | **.079** | **.00118** | **722** | **.098** | **.00126** | **787** | **.118** | **.00165** | **853** | **.158** | **.00173** | **853** | **.236** | **.00173** | **853** | **.315** | **.00173** |
| | | 1.3343 | HS6-5-2C | AISI M2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1.3355 | HS18-0-1 | AISI T1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| M | Stainless steel ferritic | 1.4016 | X6Cr17 | AISI 430 | 100 | 0.80 | 0.014 | 140 | 1.00 | 0.016 | 140 | 1.20 | 0.018 | 200 | 1.50 | 0.024 | 200 | 1.80 | 0.026 | 220 | 2.00 | 0.034 | 220 | 2.50 | 0.036 | 240 | 3.00 | 0.046 | 260 | 4.00 | 0.048 | 260 | 6.00 | 0.048 | 260 | 8.00 | 0.048 |
| | | 1.4105 | X6CrMoS17 | AISI 430F | **328** | **.032** | **.00055** | **459** | **.039** | **.00063** | **459** | **.047** | **.00071** | **656** | **.059** | **.00094** | **656** | **.071** | **.00102** | **722** | **.079** | **.00134** | **722** | **.098** | **.00142** | **787** | **.118** | **.00181** | **853** | **.158** | **.00189** | **853** | **.236** | **.00189** | **853** | **.315** | **.00189** |
| | Stainless steel martensitic | 1.4034 | X46Cr13 | AISI 420C | 100 | 0.80 | 0.012 | 140 | 1.00 | 0.015 | 140 | 1.20 | 0.017 | 200 | 1.50 | 0.022 | 200 | 1.80 | 0.024 | 220 | 2.00 | 0.032 | 220 | 2.50 | 0.034 | 240 | 3.00 | 0.044 | 260 | 4.00 | 0.046 | 260 | 6.00 | 0.046 | 260 | 8.00 | 0.046 |
| | | 1.4112 | X90CrMoV18 | AISI 440B | **328** | **.032** | **.00047** | **459** | **.039** | **.00059** | **459** | **.047** | **.00067** | **656** | **.059** | **.00087** | **656** | **.071** | **.00094** | **722** | **.079** | **.00126** | **722** | **.098** | **.00134** | **787** | **.118** | **.00173** | **853** | **.158** | **.00181** | **853** | **.236** | **.00181** | **853** | **.315** | **.00181** |
| | Stainless steel martensitic – PH | 1.4542 | X5CrNiCuNb 16-4 | AISI 630 | 100 | 0.80 | 0.012 | 140 | 1.00 | 0.015 | 140 | 1.20 | 0.017 | 200 | 1.50 | 0.022 | 200 | 1.80 | 0.024 | 220 | 2.00 | 0.032 | 220 | 2.50 | 0.034 | 240 | 3.00 | 0.044 | 260 | 4.00 | 0.046 | 260 | 6.00 | 0.046 | 260 | 8.00 | 0.046 |
| | | 1.4545 | X5CrNiCuNb 15-5 | ASTM 15-5PH | **328** | **.032** | **.00047** | **459** | **.039** | **.00059** | **459** | **.047** | **.00067** | **656** | **.059** | **.00087** | **656** | **.071** | **.00094** | **722** | **.079** | **.00126** | **722** | **.098** | **.00134** | **787** | **.118** | **.00173** | **853** | **.158** | **.00181** | **853** | **.236** | **.00181** | **853** | **.315** | **.00181** |
| | Stainless steel austenitic | 1.4301 | X5CrNi 18-10 | AISI 304 | 100 | 0.80 | 0.011 | 140 | 1.00 | 0.012 | 140 | 1.20 | 0.014 | 200 | 1.50 | 0.016 | 200 | 1.80 | 0.018 | 220 | 2.00 | 0.030 | 220 | 2.50 | 0.032 | 240 | 3.00 | 0.042 | 260 | 4.00 | 0.044 | 260 | 6.00 | 0.044 | 260 | 8.00 | 0.044 |
| | | 1.4435 | X2CrNiMo 18-14-3 | AISI 316L | **328** | **.032** | **.00043** | **459** | **.039** | **.00047** | **459** | **.047** | **.00055** | **656** | **.059** | **.00063** | **656** | **.071** | **.00071** | **722** | **.079** | **.00118** | **722** | **.098** | **.00126** | **787** | **.118** | **.00165** | **853** | **.158** | **.00173** | **853** | **.236** | **.00173** | **853** | **.315** | **.00173** |
| | | 1.4441 | X2CrNiMo 18-15-3 | AISI 316LM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1.4539 | X1NiCrMoCu25-20-5 | AISI 904L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| K | Cast iron | 0.6020 | GG20 | ASTM 30 | 100 | 0.80 | 0.009 | 120 | 1.00 | 0.011 | 120 | 1.20 | 0.022 | 140 | 1.50 | 0.024 | 140 | 1.80 | 0.026 | 160 | 2.00 | 0.028 | 160 | 2.50 | 0.036 | 180 | 3.00 | 0.044 | 200 | 4.00 | 0.055 | 200 | 6.00 | 0.055 | 200 | 8.00 | 0.055 |
| | | 0.6030 | GG30 | ASTM 40B | **328** | **.032** | **.00035** | **394** | **.039** | **.00043** | **394** | **.047** | **.00087** | **459** | **.059** | **.00094** | **459** | **.071** | **.00102** | **525** | **.079** | **.00110** | **525** | **.098** | **.00142** | **591** | **.118** | **.00173** | **656** | **.158** | **.00217** | **656** | **.236** | **.00217** | **656** | **.315** | **.00217** |
| | | 0.7040 | GGG40 | ASTM60-40-18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0.7060 | GGG60 | ASTM80-60-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| N | Aluminium alloy wrought | 3.2315 | AlMgSi1 | ASTM 6351 | 100 | 0.80 | 0.016 | 140 | 1.00 | 0.018 | 140 | 1.20 | 0.020 | 200 | 1.50 | 0.026 | 200 | 1.80 | 0.028 | 220 | 2.00 | 0.036 | 220 | 2.50 | 0.040 | 240 | 3.00 | 0.058 | 260 | 4.00 | 0.060 | 260 | 6.00 | 0.060 | 260 | 8.00 | 0.060 |
| | | 3.4365 | AlZnMgCu1.5 | ASTM 7075 | **328** | **.032** | **.00063** | **459** | **.039** | **.00071** | **459** | **.047** | **.00079** | **656** | **.059** | **.00102** | **656** | **.071** | **.00110** | **722** | **.079** | **.00142** | **722** | **.098** | **.00157** | **787** | **.118** | **.00228** | **853** | **.158** | **.00236** | **853** | **.236** | **.00236** | **853** | **.315** | **.00236** |
| | Aluminium alloy cast | 3.2163 | GD-AlSi9Cu3 | ASTM A380 | 100 | 0.80 | 0.016 | 140 | 1.00 | 0.018 | 140 | 1.20 | 0.020 | 200 | 1.50 | 0.026 | 200 | 1.80 | 0.028 | 220 | 2.00 | 0.036 | 220 | 2.50 | 0.040 | 240 | 3.00 | 0.058 | 260 | 4.00 | 0.060 | 260 | 6.00 | 0.060 | 260 | 8.00 | 0.060 |
| | | 3.2381 | GD-AlSi10Mg | UNS A03590 | **328** | **.032** | **.00063** | **459** | **.039** | **.00071** | **459** | **.047** | **.00079** | **656** | **.059** | **.00102** | **656** | **.071** | **.00110** | **722** | **.079** | **.00142** | **722** | **.098** | **.00157** | **787** | **.118** | **.00228** | **853** | **.158** | **.00236** | **853** | **.236** | **.00236** | **853** | **.315** | **.00236** |
| | Copper | 2.004 | Cu-OF / CW008A | UNS C10100 | 100 | 0.80 | 0.018 | 140 | 1.00 | 0.020 | 140 | 1.20 | 0.022 | 200 | 1.50 | 0.026 | 200 | 1.80 | 0.028 | 220 | 2.00 | 0.036 | 220 | 2.50 | 0.040 | 240 | 3.00 | 0.058 | 260 | 4.00 | 0.060 | 260 | 6.00 | 0.060 | 260 | 8.00 | 0.060 |
| | | 2.0065 | Cu-ETP / CW004A | UNS C11000 | **328** | **.032** | **.00071** | **459** | **.039** | **.00079** | **459** | **.047** | **.00087** | **656** | **.059** | **.00102** | **656** | **.071** | **.00110** | **722** | **.079** | **.00142** | **722** | **.098** | **.00157** | **787** | **.118** | **.00228** | **853** | **.158** | **.00236** | **853** | **.236** | **.00236** | **853** | **.315** | **.00236** |
| | Brass lead free | 2.0321 | CuZn37 CW508L | UNS C27400 | 100 | 0.80 | 0.018 | 140 | 1.00 | 0.020 | 140 | 1.20 | 0.022 | 200 | 1.50 | 0.026 | 200 | 1.80 | 0.028 | 220 | 2.00 | 0.036 | 220 | 2.50 | 0.040 | 240 | 3.00 | 0.058 | 260 | 4.00 | 0.060 | 260 | 6.00 | 0.060 | 260 | 8.00 | 0.060 |
| | | 2.036 | CuZn40 CW509L | UNS C28000 | **328** | **.032** | **.00071** | **459** | **.039** | **.00079** | **459** | **.047** | **.00087** | **656** | **.059** | **.00102** | **656** | **.071** | **.00110** | **722** | **.079** | **.00142** | **722** | **.098** | **.00157** | **787** | **.118** | **.00228** | **853** | **.158** | **.00236** | **853** | **.236** | **.00236** | **853** | **.315** | **.00236** |
| | Brass, Bronze Rm < 400 N/mm² | 2.0401 | CuZn39Pb3 | UNS C38500 | 100 | 0.80 | 0.018 | 140 | 1.00 | 0.020 | 140 | 1.20 | 0.022 | 200 | 1.50 | 0.026 | 200 | 1.80 | 0.028 | 220 | 2.00 | 0.036 | 220 | 2.50 | 0.040 | 240 | 3.00 | 0.058 | 260 | 4.00 | 0.060 | 260 | 6.00 | 0.060 | 260 | 8.00 | 0.060 |
| | | 2.102 | CuSn6 | UNS C51900 | **328** | **.032** | **.00071** | **459** | **.039** | **.00079** | **459** | **.047** | **.00087** | **656** | **.059** | **.00102** | **656** | **.071** | **.00110** | **722** | **.079** | **.00142** | **722** | **.098** | **.00157** | **787** | **.118** | **.00228** | **853** | **.158** | **.00236** | **853** | **.236** | **.00236** | **853** | **.315** | **.00236** |
| | Bronze Rm < 600 N/mm² | 2.0966 | CuAl10Ni5Fe4 | UNS C63000 | 100 | 0.80 | 0.016 | 140 | 1.00 | 0.018 | 140 | 1.20 | 0.020 | 200 | 1.50 | 0.026 | 200 | 1.80 | 0.028 | 220 | 2.00 | 0.036 | 220 | 2.50 | 0.040 | 240 | 3.00 | 0.058 | 260 | 4.00 | 0.060 | 260 | 6.00 | 0.060 | 260 | 8.00 | 0.060 |
| | | 2.096 | CuAl9Mn2 | UNS C63200 | **328** | **.032** | **.00063** | **459** | **.039** | **.00071** | **459** | **.047** | **.00079** | **656** | **.059** | **.00102** | **656** | **.071** | **.00110** | **722** | **.079** | **.00142** | **722** | **.098** | **.00157** | **787** | **.118** | **.00228** | **853** | **.158** | **.00236** | **853** | **.236** | **.00236** | **853** | **.315** | **.00236** |
| $S_1$ | Super alloys | 2.4856 | | Inconel 625 | 100 | 0.80 | 0.006 | 120 | 1.00 | 0.007 | 120 | 1.20 | 0.008 | 130 | 1.50 | 0.009 | 130 | 1.80 | 0.010 | 140 | 2.00 | 0.010 | 140 | 2.50 | 0.012 | 150 | 3.00 | 0.015 | 170 | 4.00 | 0.020 | 170 | 6.00 | 0.020 | 170 | 8.00 | 0.020 |
| | | 2.4668 | | Inconel 718 | **328** | **.032** | **.00024** | **394** | **.039** | **.00028** | **394** | **.047** | **.00031** | **427** | **.059** | **.00035** | **427** | **.071** | **.00039** | **459** | **.079** | **.00039** | **459** | **.098** | **.00047** | **492** | **.118** | **.00059** | **558** | **.158** | **.00079** | **558** | **.236** | **.00079** | **558** | **.315** | **.00079** |
| | | 2.4617 | NiMo28 | Hastelloy B-2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 2.4665 | NiCr22Fe18Mo | Hastelloy X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $S_2$ | Titanium pure | 3.7035 | Gr.2 | ASTM B348 | 100 | 0.80 | 0.011 | 120 | 1.00 | 0.016 | 120 | 1.20 | 0.018 | 130 | 1.50 | 0.020 | 130 | 1.80 | 0.022 | 140 | 2.00 | 0.028 | 140 | 2.50 | 0.030 | 150 | 3.00 | 0.042 | 170 | 4.00 | 0.044 | 170 | 6.00 | 0.044 | 170 | 8.00 | 0.044 |
| | | 3.7065 | Gr.4 | ASTM B348 | **328** | **.032** | **.00043** | **394** | **.039** | **.00063** | **394** | **.047** | **.00071** | **427** | **.059** | **.00079** | **427** | **.071** | **.00087** | **459** | **.079** | **.00110** | **459** | **.098** | **.00118** | **492** | **.118** | **.00165** | **558** | **.158** | **.00173** | **558** | **.236** | **.00173** | **558** | **.315** | **.00173** |
| | Titanium alloys | 3.7165 | TiAl6V4 | ASTM B348 | 100 | 0.80 | 0.011 | 120 | 1.00 | 0.016 | 120 | 1.20 | 0.018 | 130 | 1.50 | 0.020 | 130 | 1.80 | 0.022 | 140 | 2.00 | 0.028 | 140 | 2.50 | 0.030 | 150 | 3.00 | 0.042 | 170 | 4.00 | 0.044 | 170 | 6.00 | 0.044 | 170 | 8.00 | 0.044 |
| | | 9.9367 | TiAl6Nb7 | ASTM F1295 | **328** | **.032** | **.00043** | **394** | **.039** | **.00063** | **394** | **.047** | **.00071** | **427** | **.059** | **.00079** | **427** | **.071** | **.00087** | **459** | **.079** | **.00110** | **459** | **.098** | **.00118** | **492** | **.118** | **.00165** | **558** | **.158** | **.00173** | **558** | **.236** | **.00173** | **558** | **.315** | **.00173** |
| $S_3$ | CrCo alloys | 2.4964 | CoCr20W15Ni | Haynes 25 | 100 | 0.80 | 0.006 | 140 | 1.00 | 0.007 | 140 | 1.20 | 0.008 | 180 | 1.50 | 0.009 | 180 | 1.80 | 0.010 | 200 | 2.00 | 0.010 | 200 | 2.50 | 0.012 | 220 | 3.00 | 0.015 | 240 | 4.00 | 0.020 | 240 | 6.00 | 0.020 | 240 | 8.00 | 0.020 |
| | | | CrCoMo28 | ASTM F1537 | **328** | **.032** | **.00024** | **459** | **.039** | **.00028** | **459** | **.047** | **.00031** | **591** | **.059** | **.00035** | **591** | **.071** | **.00039** | **656** | **.079** | **.00039** | **656** | **.098** | **.00047** | **722** | **.118** | **.00059** | **787** | **.158** | **.00079** | **787** | **.236** | **.00079** | **787** | **.315** | **.00079** |
| $H_1$ | Hardened steel < 55 HRC | 1.2510 | 100MnCrMoW4 | AISI O1 | 80 | 0.80 | 0.009 | 100 | 1.00 | 0.010 | 100 | 1.20 | 0.012 | 140 | 1.50 | 0.014 | 140 | 1.80 | 0.018 | 180 | 2.00 | 0.020 | 180 | 2.50 | 0.026 | 200 | 3.00 | 0.035 | 240 | 4.00 | 0.040 | 240 | 6.00 | 0.040 | 240 | 8.00 | 0.040 |
| | | | | | **262** | **.032** | **.00035** | **328** | **.039** | **.00039** | **328** | **.047** | **.00047** | **459** | **.059** | **.00055** | **459** | **.071** | **.00071** | **591** | **.079** | **.00079** | **591** | **.098** | **.00102** | **656** | **.118** | **.00138** | **787** | **.158** | **.00157** | **787** | **.236** | **.00157** | **787** | **.315** | **.00157** |
| $H_2$ | Hardened steel ≥ 55 HRC | 1.2379 | X153CrMoV12 | AISI D2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |