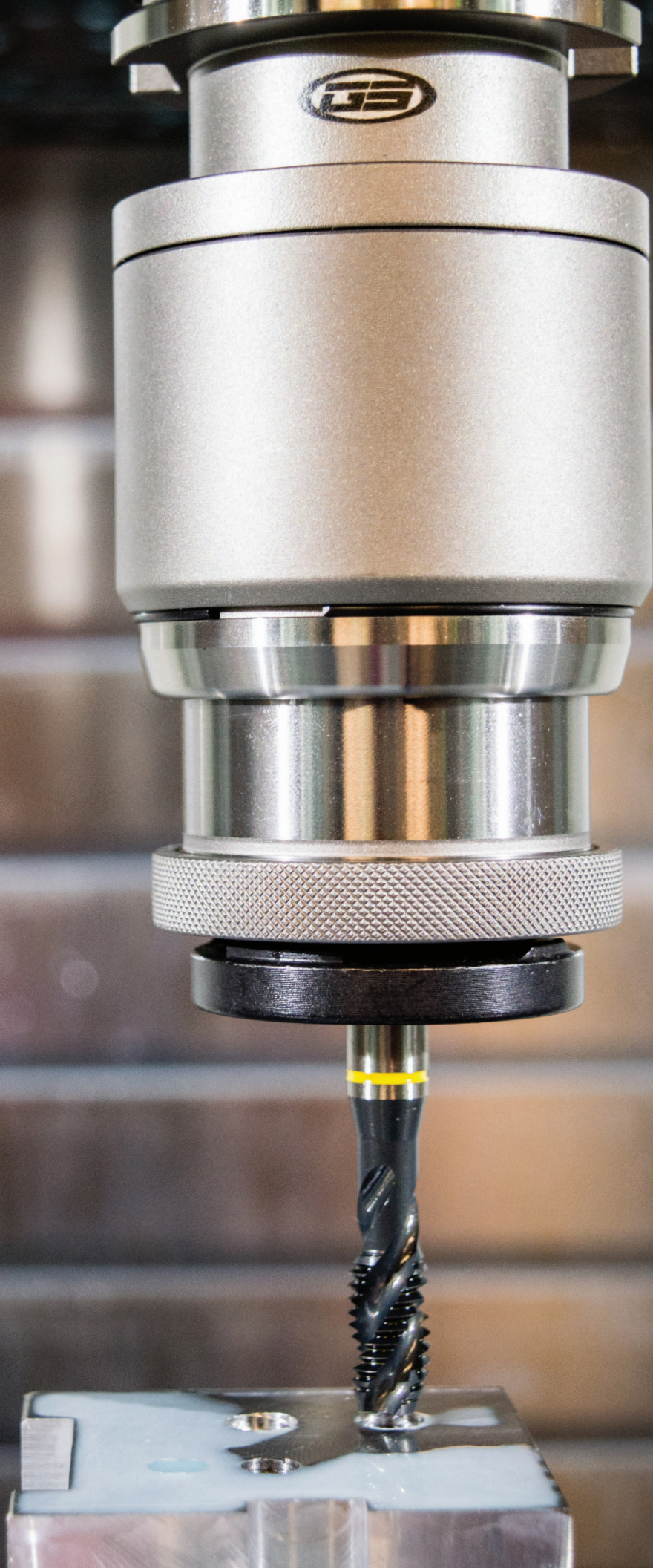


Threading & Tapping Speeds & Feeds



Threading & Tapping Speeds & Feeds

Tapping Speed Guide

Tapping Speed Guide

Proper tapping speeds are very important in obtaining efficient tapping results. There are many factors which affect proper tapping speeds, some of which are listed below.

Material Factors:

- Thermo-conductivity of the material and wall thickness as it affects heat dispersion
- Variations in carbon content of steel
- Hard spots in material
- Depth of hole to be tapped
- Percentage of full thread to be tapped

Tap Factors:

- Major diameters, pitch and lead
- Style of tap
- Width of lands
- Amount of hook or rake
- Length of chamfer
- Bottoming taps normally require slower speeds than plug chamfered taps

| Materials | | | Speed Feet/Minute |
|---------------------------------|--|--------------------|----------------------|
| HSSE-V3 BLUE RING | | | |
| Low Carbon | 1018, 1010, 1035 | Normalized | 20-50 |
| Medium Carbon | 1045, 1050, 1065 | Normalized | 20-40 |
| Aluminum | Unalloyed, Cast | – | 30-80 |
| Brass/Bronze | – | – | 30-80 |
| Copper | – | – | 25-60 |
| Cast Iron | – | As Cast | 20-40 |
| HSSE-V3 | | | |
| Stainless Steel | 200 Series, | Annealed | 20-35 |
| | 300 Series, 17-4, 15-5 | Annealed | 20-35 |
| | AM286 | Annealed | 15-25 |
| | 400 Series | Annealed | 20-35 |
| Tool Steels | 01, A-2, D-2, H-13, P-20 | Annealed | 15-25 |
| Medium Carbon | 1030, 1035, 1038, 1040, 1045, 1050 | Normalized | 20-40 |
| Alloyed High Carbon | 1065, 1070, 1080, 1090, 1095, 1561, 1572 | Normalized | 20-30 |
| High Strength | 4140, 4340 | Normalized | 20-30 |
| Titanium | Commercially Pure | Annealed | 15-30 |
| Aluminum | Cast, Wrought | – | 30-90 |
| P-HSS | | | |
| Stainless Steel | 17-4PH, 15-5, 17-7PH, AM350 | Hardened | 12-20 |
| Tool Steels | 01, A-2, D-2, H-13, P-20, | Hardened | 10-20 |
| High Strength | 4140, 4340, 50100 | Hardened | 15-20 |
| Nickel Alloys | Inconel, Hastaloy, Waspaloy, Astraloy, Rene, Monel | Annealed/Hardened | 5-20 |
| Titanium | 6 AL 4 | Annealed/ Hardened | 8-15 |
| ALUMINUM | | | |
| Aluminum | | | 25-60 |
| Die Cast Aluminum | | | 30-80 |
| ROLL FORM | | | |
| Steels | Sheet, Low/Medium Carbon/Stainless Steels | Hardened | 20-50 |
| Aluminum/Copper | Pure/Low Alloyed | | 30-60 |
| Aluminum Cast, Copper Alloys | Die Cast, Zinc Die Cast, Brass, Bronze | | 30-80 |

Conversion Table, Surface Feet Per Minute to Revolutions Per Minute

Proper tapping speeds are determined best by experiment. In the table below, speeds shown should be used as a guide only, and the suggested surface feet per minute adjusted upward or downward until the best results are obtained.

| Surface Feet Per Minute | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
|-------------------------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Tap Size | RPM | | | | | | | | | | | | | | |
| 0 | 1273 | 1592 | 1910 | 2546 | 3183 | 3820 | 4456 | 5093 | 5730 | 6366 | 7003 | 7639 | 8276 | 8913 | 9549 |
| 1 | 1047 | 1308 | 1570 | 2093 | 2617 | 3140 | 3663 | 4186 | 4710 | 5233 | 5756 | 6279 | 6808 | 7326 | 7849 |
| 2 | 888 | 1110 | 1333 | 1777 | 2221 | 2665 | 3109 | 3554 | 3999 | 4442 | 4886 | 5330 | 5774 | 6218 | 6662 |
| 3 | 772 | 964 | 1157 | 1543 | 1929 | 2315 | 2701 | 3086 | 3472 | 3858 | 4244 | 4629 | 5015 | 5401 | 5787 |
| 4 | 682 | 853 | 1023 | 1364 | 1705 | 2046 | 2387 | 2728 | 3069 | 3411 | 3751 | 4092 | 4434 | 4775 | 5116 |
| 5 | 611 | 764 | 917 | 1222 | 1528 | 1833 | 2139 | 2445 | 2750 | 3056 | 3361 | 3667 | 3973 | 4278 | 4584 |
| 6 | 553 | 691 | 829 | 1106 | 1382 | 1658 | 1934 | 2211 | 2487 | 2764 | 3040 | 3316 | 3592 | 3869 | 4145 |
| 8 | 466 | 583 | 699 | 932 | 1165 | 1387 | 1631 | 1864 | 2097 | 2330 | 2563 | 2796 | 3029 | 3262 | 3495 |
| 10 | 402 | 502 | 603 | 804 | 1005 | 1208 | 1406 | 1607 | 1808 | 2009 | 2210 | 2411 | 2612 | 2813 | 3014 |
| 12 | 354 | 442 | 531 | 707 | 884 | 1061 | 1238 | 1415 | 1592 | 1769 | 1945 | 2122 | 2300 | 2476 | 2653 |
| 1/4 | 306 | 382 | 458 | 611 | 764 | 917 | 1070 | 1222 | 1375 | 1528 | 1681 | 1833 | 1986 | 2139 | 2292 |
| 5/16 | 245 | 306 | 367 | 489 | 611 | 733 | 856 | 978 | 1100 | 1222 | 1345 | 1467 | 1589 | 1711 | 1833 |
| 3/8 | 204 | 255 | 306 | 407 | 509 | 611 | 713 | 815 | 917 | 1019 | 1120 | 1222 | 1324 | 1426 | 1528 |
| 7/16 | 175 | 219 | 262 | 349 | 437 | 524 | 611 | 698 | 786 | 872 | 960 | 1048 | 1135 | 1222 | 1310 |
| 1/2 | 153 | 191 | 229 | 306 | 382 | 458 | 535 | 611 | 688 | 764 | 840 | 917 | 993 | 1070 | 1146 |
| 9/16 | 137 | 172 | 206 | 275 | 344 | 412 | 481 | 550 | 619 | 687 | 756 | 825 | 893 | 963 | 1031 |
| 5/8 | 122 | 153 | 183 | 244 | 306 | 367 | 428 | 489 | 550 | 611 | 672 | 733 | 794 | 856 | 917 |
| 3/4 | 102 | 128 | 153 | 203 | 255 | 306 | 357 | 407 | 458 | 509 | 560 | 611 | 662 | 713 | 764 |
| 7/8 | 87 | 109 | 131 | 175 | 218 | 262 | 306 | 350 | 392 | 437 | 480 | 524 | 568 | 611 | 655 |
| 1 | 76 | 96 | 115 | 153 | 191 | 230 | 268 | 306 | 344 | 382 | 420 | 458 | 497 | 535 | 573 |

Mechanical Factors:

- Type of tapping machine and holder; speeds for small diameter taps are often governed by the limitations of the machine
- Condition of tapping machine and spindle
- Type of fixture; vertical or horizontal tapping (faster speeds for vertical tapping)
- Method of feeding the tap
- Cutting fluid used and method of application
- The optimum speed for tapping is the highest speed that conditions permit, consistent with economic tool life

Threading & Tapping Speeds & Feeds

ANSI Tap Dimensions

| Mach. Screw Size No. | Nominal Fractional Diameter (in.) | Nominal Metric Diameter (mm) | Tap Dimensions — Inches | | | | |
|----------------------|-----------------------------------|------------------------------|-------------------------|---------------|---------------|----------------|----------------|
| | | | Overall Length | Thread Length | Square Length | Shank Diameter | Size of Square |
| 0 | 1/16 | M1.6 | 1-5/8 | 5/16 | 3/16 | 0.141 | 0.110 |
| 1 | | M1.8 | 1-11/16 | 3/8 | 3/16 | 0.141 | 0.110 |
| 2 | | M2, M2.2 | 1-3/4 | 7/16 | 3/16 | 0.141 | 0.110 |
| 3 | 3/32 | M2.5 | 1-13/16 | 1/2 | 3/16 | 0.141 | 0.110 |
| 4 | | | 1-7/8 | 9/16 | 3/16 | 0.141 | 0.110 |
| 5 | 1/8 | M3, M3.15 | 1-15/16 | 5/8 | 3/16 | 0.141 | 0.110 |
| 6 | | M3.5 | 2 | 11/16 | 3/16 | 0.141 | 0.110 |
| 8 | 5/32 | M4 | 2-1/8 | 3/4 | 1/4 | 0.168 | 0.131 |
| 10 | 3/16 | M4.5, M5 | 2-3/8 | 7/8 | 1/4 | 0.194 | 0.152 |
| 12 | 7/32 | | 2-3/8 | 15/16 | 9/32 | 0.220 | 0.165 |
| 14 | 1/4 | M6, M6.3 | 2-1/2 | 1 | 5/16 | 0.255 | 0.191 |
| | 5/16 | M7, M8 | 2-23/32 | 1-1/8 | 3/8 | 0.318 | 0.238 |
| | 3/8 | M10 | 2-15/16 | 1-1/4 | 7/16 | 0.381 | 0.286 |
| | 7/16 | | 3-5/32 | 1-7/16 | 13/32 | 0.323 | 0.242 |
| | 1/2 | M12, 12.5 | 3-3/8 | 1-21/32 | 7/16 | 0.367 | 0.275 |
| | 9/16 | M14 | 3-19/32 | 1-21/32 | 1/2 | 0.429 | 0.322 |
| | 5/8 | M16 | 3-13/16 | 1-13/16 | 9/16 | 0.480 | 0.360 |
| | 11/16 | M18 | 4-1/32 | 1-13/16 | 5/8 | 0.542 | 0.406 |
| | 3/4 | | 4-1/4 | 2 | 11/16 | 0.590 | 0.442 |
| | 13/16 | M20 | 4-15/32 | 2 | 11/16 | 0.652 | 0.489 |
| | 7/8 | M22 | 4-11/16 | 2-7/32 | 3/4 | 0.697 | 0.523 |
| | 15/16 | M24 | 4-29/32 | 2-7/32 | 3/4 | 0.760 | 0.570 |
| | 1 | M25 | 5-1/8 | 2-1/2 | 13/16 | 0.800 | 0.600 |
| | 1-1/16 | M27 | 5-1/8 | 2-1/2 | 7/8 | 0.895 | 0.672 |
| | 1-1/8 | | 5-7/16 | 2-9/16 | 7/8 | 0.896 | 0.672 |
| | 1-3/16 | M30 | 5-7/16 | 2-9/16 | 1 | 1.021 | 0.766 |
| | 1-1/4 | | 5-3/4 | 2-9/16 | 1 | 1.021 | 0.766 |
| | 1-5/16 | M33 | 5-3/4 | 2-9/16 | 1-1/16 | 1.108 | 0.831 |
| | 1-3/8 | | 6-1/16 | 3 | 1-1/16 | 1.108 | 0.831 |
| | 1-7/16 | M36 | 6-1/16 | 3 | 1-1/8 | 1.233 | 0.925 |
| | 1-1/2 | | 6-3/8 | 3 | 1-1/8 | 1.233 | 0.925 |
| | 1-5/8 | M39 | 6-11/16 | 3-3/16 | 1-1/8 | 1.305 | 0.979 |
| | 1-3/4 | M42 | 7 | 3-3/16 | 1-1/4 | 1.430 | 1.072 |
| | 1-7/8 | | 7-5/16 | 3-9/16 | 1-1/4 | 1.519 | 1.139 |
| | 2 | M48 | 7-5/8 | 3-9/16 | 1-3/8 | 1.644 | 1.233 |

| Nominal Size Inches | NPT Dimensions — Inches | | | | |
|---------------------|-------------------------|---------------|---------------|----------------|----------------|
| | Overall Length | Thread Length | Square Length | Shank Diameter | Size of Square |
| 1/16 | 2-1/8 | 11/16 | 3/8 | 0.3125 | 0.234 |
| 1/8 | 2-1/8 | 3/4 | 3/8 | 0.3125 | 0.234 |
| 1/8 | 2-1/8 | 3/4 | 3/8 | 0.4375 | 0.328 |
| 1/4 | 2-7/16 | 1-1/16 | 7/16 | 0.5625 | 0.421 |
| 3/8 | 2-9/16 | 1-1/16 | 1/2 | 0.7000 | 0.531 |
| 1/2 | 3-1/8 | 1-3/8 | 5/8 | 0.6875 | 0.515 |
| 3/4 | 3-1/4 | 1-3/8 | 11/16 | 0.9063 | 0.679 |
| 1 | 3-3/4 | 1-3/4 | 13/16 | 1.1250 | 0.843 |
| 1-1/4 | 4 | 1-3/4 | 15/16 | 1.3125 | 0.984 |
| 1-1/2 | 4-1/4 | 1-3/4 | 1 | 1.5000 | 1.125 |
| 2 | 4-1/2 | 1-3/4 | 1-1/8 | 1.8750 | 1.406 |

Threading & Tapping Speeds & Feeds

Tap/Drill Chart — Inch

To minimize tapping problems and lengthen tool life, use the largest drill possible to produce a minor diameter that will result in the lowest percentage of full thread consistent with adequate strength. A minor diameter that provides a 55% to 65% thread is sufficient for most requirements, but in some cases a higher percentage of thread may be necessary to conform with the minor diameter limits of the thread class specified.

Tap Drill Sizes

Drills generally cut holes larger than their diameters. In the table to the right, the probable percentages of full thread were determined by the average amount oversize the various drills are expected to cut.

SUGGESTED PIPE TAP DRILL SIZES

| Tap Size | Pipe Tap Drill Size | |
|----------|---------------------|----------|
| | Taper | Straight |
| 1/16 | D | — |
| 1/8 | R | S |
| 1/4 | 7/16 | 29/64 |
| 3/8 | 37/64 | 19/32 |
| 1/2 | 23/32 | 47/64 |
| 3/4 | 59/64 | 15/16 |
| 1 | 1-5/32 | 1-3/16 |
| 1-1/4 | 1-1/2 | 1-33/64 |
| 1-1/2 | 1-47/64 | 1-3/4 |
| 2 | 2-7/32 | 2-7/32 |
| 2-1/2 | 2-5/8 | — |
| 3 | 3-1/4 | — |

* Sizes given permit direct tapping without reaming the hole, but only give a full thread for the first two or three threads

† For Dryseal Straight Pipe Threads suggested drill sizes are as shown, except; 1/4" pipe, use 0.444 drill size

TAP/DRILL SELECTION

| Tap | Tap Drill | Decimal Equiv. of Tap Drill | Theo. Oversize Mean (%) | Probable Oversize Mean | Probable Hole Size | % of Threads |
|-------|-----------|-----------------------------|-------------------------|------------------------|--------------------|--------------|
| 0-80 | 56 | 0.0465 | 83 | 0.0015 | 0.0480 | 74 |
| | 3/64 | 0.0469 | 81 | 0.0015 | 0.0484 | 71 |
| 1-64 | 54 | 0.0550 | 89 | 0.0015 | 0.0565 | 81 |
| | 53 | 0.0595 | 67 | 0.0015 | 0.0610 | 59 |
| 1-72 | 53 | 0.0595 | 75 | 0.0015 | 0.0610 | 67 |
| | 1/16 | 0.0625 | 58 | 0.0015 | 0.0640 | 50 |
| 5-56 | 51 | 0.0670 | 82 | 0.0017 | 0.0687 | 74 |
| | 50 | 0.0700 | 69 | 0.0017 | 0.0717 | 62 |
| | 49 | 0.0730 | 56 | 0.0017 | 0.0747 | 49 |
| 2-64 | 50 | 0.0700 | 79 | 0.0017 | 0.0717 | 70 |
| | 49 | 0.0730 | 64 | 0.0017 | 0.0747 | 56 |
| 3-48 | 48 | 0.0760 | 85 | 0.0019 | 0.0779 | 78 |
| | 5/64 | 0.0781 | 77 | 0.0019 | 0.0800 | 70 |
| | 47 | 0.0785 | 76 | 0.0019 | 0.0801 | 69 |
| | 46 | 0.0810 | 67 | 0.0019 | 0.0829 | 60 |
| | 45 | 0.0820 | 61 | 0.0019 | 0.0839 | 56 |
| 3-56 | 46 | 0.0810 | 78 | 0.0019 | 0.0829 | 69 |
| | 45 | 0.0820 | 73 | 0.0019 | 0.0839 | 65 |
| | 44 | 0.0860 | 56 | 0.0020 | 0.0880 | 47 |
| 4-40 | 44 | 0.0860 | 80 | 0.0020 | 0.0880 | 74 |
| | 43 | 0.0890 | 71 | 0.0020 | 0.0910 | 65 |
| | 42 | 0.0935 | 57 | 0.0020 | 0.0955 | 51 |
| 4-48 | 3/32 | 0.0938 | 56 | 0.0020 | 0.0958 | 50 |
| | 42 | 0.0935 | 68 | 0.0020 | 0.0955 | 61 |
| | 3/32 | 0.0938 | 68 | 0.0020 | 0.0958 | 60 |
| | 41 | 0.0960 | 59 | 0.0020 | 0.0980 | 52 |
| 5-40 | 40 | 0.0980 | 83 | 0.0023 | 0.1003 | 76 |
| | 39 | 0.0995 | 79 | 0.0023 | 0.1018 | 71 |
| | 38 | 0.1015 | 72 | 0.0023 | 0.1038 | 65 |
| 5-44 | 37 | 0.1040 | 65 | 0.0023 | 0.1063 | 58 |
| | 38 | 0.1015 | 79 | 0.0023 | 0.1038 | 72 |
| | 37 | 0.1040 | 71 | 0.0023 | 0.1063 | 63 |
| 6-32 | 36 | 0.1065 | 63 | 0.0023 | 0.1088 | 55 |
| | 37 | 0.1040 | 84 | 0.0023 | 0.1063 | 78 |
| | 36 | 0.1065 | 78 | 0.0023 | 0.1088 | 72 |
| | 7/64 | 0.1094 | 70 | 0.0026 | 0.1120 | 64 |
| | 35 | 0.1100 | 69 | 0.0026 | 0.1126 | 63 |
| 6-40 | 34 | 0.1110 | 67 | 0.0026 | 0.1136 | 60 |
| | 33 | 0.1130 | 62 | 0.0026 | 0.1156 | 55 |
| | 34 | 0.1110 | 83 | 0.0026 | 0.1136 | 75 |
| | 33 | 0.1130 | 77 | 0.0026 | 0.1156 | 69 |
| 8-32 | 32 | 0.1160 | 68 | 0.0026 | 0.1186 | 60 |
| | 29 | 0.1360 | 69 | 0.0029 | 0.1389 | 62 |
| 8-36 | 28 | 0.1405 | 58 | 0.0029 | 0.1434 | 51 |
| | 29 | 0.1360 | 78 | 0.0029 | 0.1389 | 70 |
| | 28 | 0.1405 | 68 | 0.0029 | 0.1434 | 57 |
| 10-24 | 9/64 | 0.1406 | 68 | 0.0029 | 0.1435 | 57 |
| | 27 | 0.1440 | 85 | 0.0032 | 0.1472 | 79 |
| | 26 | 0.1470 | 79 | 0.0032 | 0.1502 | 74 |
| | 25 | 0.1495 | 75 | 0.0032 | 0.1527 | 69 |
| | 24 | 0.1520 | 70 | 0.0032 | 0.1552 | 64 |
| | 23 | 0.1540 | 67 | 0.0032 | 0.1572 | 61 |
| | 5/32 | 0.1563 | 62 | 0.0032 | 0.1595 | 56 |
| | 22 | 0.1570 | 61 | 0.0032 | 0.1602 | 55 |
| 10-32 | 5/32 | 0.1563 | 83 | 0.0032 | 0.1595 | 75 |
| | 22 | 0.1570 | 81 | 0.0032 | 0.1602 | 73 |
| | 21 | 0.1590 | 76 | 0.0032 | 0.1672 | 64 |
| | 20 | 0.1610 | 71 | 0.0032 | 0.1642 | 64 |
| | 19 | 0.1660 | 59 | 0.0032 | 0.1692 | 51 |
| 12-24 | 11/64 | 0.1719 | 82 | 0.0035 | 0.1754 | 75 |
| | 17 | 0.1730 | 79 | 0.0035 | 0.1765 | 73 |
| | 16 | 0.1770 | 72 | 0.0035 | 0.1805 | 66 |
| | 15 | 0.1800 | 67 | 0.0035 | 0.1835 | 60 |
| | 14 | 0.1820 | 63 | 0.0035 | 0.1855 | 56 |
| 12-28 | 16 | 0.1770 | 84 | 0.0035 | 0.1805 | 77 |
| | 15 | 0.1800 | 78 | 0.0035 | 0.1835 | 70 |
| | 14 | 0.1820 | 73 | 0.0038 | 0.1835 | 66 |
| | 13 | 0.1850 | 67 | 0.0035 | 0.1885 | 59 |
| | 3/16 | 0.1875 | 61 | 0.0035 | 0.1970 | 54 |

Threading & Tapping Speeds & Feeds

Tap/Drill Chart — Inch — Cont'd

Formula: Percentage of Full Thread

$$\frac{\text{Threads Per Inch} \times \text{Major Dia. of Tap} - \text{Drill Dia.}}{0.01299} = \text{Percentage of Full Thread}$$

Example: Determine percentage of full thread for 2" – 12N Tap, using 1.9219" Drill.

$$2.0000 - 1.9219 = 0.0781 \div 0.01299 = 6.012$$

Threads Per Inch = x 12
Theoretical Percentage of Full Threads = 72.144

Formula: Tap Drill Size

$$\frac{\text{Major Dia. of Tap} - 0.1299 \times \text{Percent of Full Thread}}{\text{Number of threads Per inch}} = \text{Drill Size}$$

Example: Determine drill size for 2"–12N Tap, 70% Full Thread.
Basic Major Diameter of Tap = 2.0000"

$$0.01299 \times 70 = 0.9093 \div 12 = 0.0758"$$

Theoretical Drill Size = 1.9242"
Nearest Standard Drill Size 1 59/64 = 1.9219"

| | *Deep Hole Tapping | Average Commercial | Thin Sheet Stock or Stamping |
|------------------------------|--------------------|--------------------|------------------------------|
| FREE CUTTING MATERIAL | | | |
| Aluminum | | | |
| Brass | | | |
| Bronze | | | |
| Cast Iron | 60%-70% | 65%-70% | 75%-85% |
| Copper | | | |
| Mild Steel | | | |
| Tool Steel | | | |
| FREE CUTTING MATERIAL | | | |
| Cast Steel | | | |
| Drop Forging | | | |
| Monel Metal | 55%-65% | 65%-70% | |
| Nickel Steel | | | |
| Stainless Steel | | | |

* Sizes given permit direct tapping without reaming the hole, but only give a full thread for the first two or three threads

TAP/DRILL SELECTION

| Tap | Tap Drill | Decimal Equiv. of Tap Drill | Theo. Oversize Mean (%) | Probable Oversize Mean | Probable Hole Size | % of Threads |
|----------|-----------|-----------------------------|-------------------------|------------------------|--------------------|--------------|
| 1/4-20 | 9 | 0.1960 | 83 | 0.0038 | 0.1998 | 77 |
| | 8 | 0.1990 | 79 | 0.0039 | 0.2028 | 73 |
| | 7 | 0.2010 | 75 | 0.0038 | 0.2048 | 70 |
| | 13/64 | 0.2031 | 72 | 0.0038 | 0.2068 | 66 |
| | 6 | 0.2040 | 71 | 0.0038 | 0.2078 | 65 |
| | 5 | 0.2055 | 69 | 0.0038 | 0.2093 | 63 |
| 1/4-28 | 4 | 0.2090 | 63 | 0.0038 | 0.2128 | 57 |
| | 3 | 0.2130 | 80 | 0.0038 | 0.2168 | 72 |
| | 7/32 | 0.2188 | 67 | 0.0038 | 0.2226 | 59 |
| | 2 | 0.2210 | 63 | 0.0038 | 0.2248 | 55 |
| 5/16-18 | F | 0.2570 | 77 | 0.0038 | 0.2608 | 72 |
| | G | 0.2610 | 71 | 0.0041 | 0.2651 | 66 |
| | 17/64 | 0.2656 | 65 | 0.0041 | 0.2697 | 59 |
| | H | 0.2660 | 64 | 0.0041 | 0.2701 | 59 |
| 5/16-24 | H | 0.2660 | 86 | 0.0041 | 0.2701 | 78 |
| | I | 0.2720 | 75 | 0.0041 | 0.2761 | 67 |
| | J | 0.2770 | 66 | 0.0041 | 0.2811 | 58 |
| 3/8-16 | 5/16 | 0.3125 | 77 | 0.0044 | 0.3169 | 72 |
| | O | 0.3160 | 73 | 0.0044 | 0.3204 | 68 |
| | P | 0.3230 | 64 | 0.0044 | 0.3274 | 59 |
| 3/8-24 | 21/64 | 0.3281 | 87 | 0.0044 | 0.3325 | 79 |
| | Q | 0.3320 | 79 | 0.0044 | 0.3364 | 71 |
| | R | 0.3390 | 67 | 0.0044 | 0.3434 | 58 |
| 7/16-14 | T | 0.3580 | 86 | 0.0046 | 0.3626 | 81 |
| | 23/64 | 0.3594 | 84 | 0.0046 | 0.3640 | 79 |
| | U | 0.3680 | 75 | 0.0046 | 0.3726 | 70 |
| | 3/8 | 0.3750 | 67 | 0.0046 | 0.3796 | 62 |
| | V | 0.3770 | 65 | 0.0046 | 0.3816 | 61 |
| 7/16-20 | W | 0.3860 | 79 | 0.0046 | 0.3906 | 72 |
| | 25/64 | 0.3906 | 72 | 0.0046 | 0.3952 | 65 |
| | X | 0.3970 | 62 | 0.0046 | 0.4016 | 55 |
| 1/2-13 | 27/64 | 0.4219 | 78 | 0.0047 | 0.4266 | 73 |
| | 7/16 | 0.4375 | 63 | 0.0047 | 0.4422 | 58 |
| 1/2-20 | 29/64 | 0.4531 | 72 | 0.0047 | 0.4578 | 65 |
| | 15/32 | 0.4688 | 87 | 0.0048 | 0.4736 | 82 |
| 9/16-12 | 31/64 | 0.4844 | 72 | 0.0048 | 0.4892 | 68 |
| | 1/2 | 0.5000 | 87 | 0.0048 | 0.5048 | 80 |
| 9/16-18 | 33/64 | 0.5156 | 65 | 0.0048 | 0.5204 | 58 |
| | 17/32 | 0.5313 | 79 | 0.0049 | 0.5362 | 75 |
| 5/8-11 | 35/64 | 0.5469 | 66 | 0.0049 | 0.5618 | 62 |
| | 9/16 | 0.5628 | 87 | 0.0049 | 0.5674 | 80 |
| 5/8-18 | 37/64 | 0.5781 | 65 | 0.0049 | 0.5831 | 58 |
| | 41/64 | 0.6406 | 84 | 0.0050 | 0.6456 | 80 |
| 3/4-10 | 21/32 | 0.6563 | 72 | 0.0050 | 0.6613 | 68 |
| | 11/16 | 0.6875 | 77 | 0.0050 | 0.6925 | 71 |
| 3/4-16 | 49/64 | 0.7656 | 76 | 0.0052 | 0.7708 | 72 |
| | 25/32 | 0.7812 | 65 | 0.0052 | 0.7864 | 61 |
| 7/8-9 | 51/64 | 0.7969 | 84 | 0.0052 | 0.8021 | 79 |
| | 13/16 | 0.8125 | 67 | 0.0052 | 0.8177 | 62 |
| 7/8-14 | 55/64 | 0.8594 | 87 | 0.0059 | 0.8653 | 83 |
| | 7/8 | 0.8750 | 77 | 0.0059 | 0.8809 | 73 |
| | 57/64 | 0.8906 | 67 | 0.0059 | 0.8965 | 64 |
| | 29/32 | 0.9063 | 58 | 0.0059 | 0.9122 | 54 |
| 1-8 | 29/32 | 0.9063 | 87 | 0.0059 | 0.9122 | 81 |
| | 59/64 | 0.9219 | 72 | 0.0060 | 0.9279 | 67 |
| | 15/16 | 0.9375 | 58 | 0.0060 | 0.9435 | 52 |
| 1-12 | 59/64 | 0.9219 | 84 | 0.0060 | 0.9279 | 78 |
| | 15/16 | 0.9375 | 67 | 0.0060 | 0.9435 | 61 |
| 1-14 | 31/21 | 0.9688 | 84 | 0.0062 | 0.9750 | 81 |
| | 63/64 | 0.9844 | 76 | 0.0067 | 0.9911 | 72 |
| | 1 | 1.0000 | 67 | 0.0070 | 1.0070 | 64 |
| 1-1/8-7 | 1-1/64 | 1.0156 | 59 | 0.0070 | 1.0226 | 55 |
| | 1-1/32 | 1.0313 | 87 | 0.0071 | 1.0384 | 80 |
| | 1-3/64 | 1.0469 | 72 | 0.0072 | 1.0541 | 66 |
| 1-1/8-12 | 1-3/32 | 1.0938 | 84 | | | |
| | 1-7/64 | 1.1094 | 76 | | | |
| | 1-1/8 | 1.1250 | 67 | | | |
| 1-1/4-7 | 1-5/32 | 1.1563 | 87 | | | |
| | 1-11/64 | 1.1719 | 72 | | | |
| | 1-3/16 | 1.1875 | 87 | | | |
| 1-1/4-12 | 1-13/64 | 1.2031 | 79 | | | |
| | 1-7/32 | 1.2188 | 72 | | | |
| | 1-15/64 | 1.2344 | 65 | | | |
| 1-3/8-6 | 1-9/32 | 1.2813 | 87 | | | |
| | 1-19/64 | 1.2969 | 72 | | | |
| | 1-5/16 | 1.3125 | 87 | | | |
| 1-3/8-12 | 1-21/64 | 1.3281 | 79 | | | |
| | 1-11/32 | 1.3438 | 72 | | | |
| | 1-23/64 | 1.3594 | 65 | | | |
| 1-1/2-6 | 1-13/32 | 1.4063 | 87 | | | |
| | 1-27/64 | 1.4219 | 72 | | | |
| | 1-1/2-12 | | | | | |

Reaming Recommended

Threading & Tapping Speeds & Feeds

Tap/Drill Chart — Metric

METRIC TAP DRILL SIZES

(Drill sizes based on approximate 72%-77% Full Thread)

| Tap Size | Pitch Form | Tap Drill Size | Alt. Tap Drill | Tap Size | Pitch Form | Tap Drill Size | Alt. Tap Drill |
|-----------------------------|------------|----------------|----------------|---------------------------|------------|----------------|----------------|
| I.S.O. METRIC COARSE | | | | I.S.O. METRIC FINE | | | |
| 1.6 | 0.35mm | 1.25mm | 3/64 | 3 | 0.35mm | 2.65mm | 37 |
| 1.7 | 0.35mm | 1.35mm | 55 | 4 | 0.35mm | 3.65mm | 27 |
| 1.8 | 0.35mm | 1.45mm | 54 | 4 | 0.50mm | 3.50mm | 29 |
| 2 | 0.40mm | 1.60mm | 1/16 | 4.5 | 0.45mm | 4.06mm | 21 |
| 2.2 | 0.45mm | 1.75mm | 50 | 5 | 0.50mm | 4.50mm | 16 |
| 2.3 | 0.40mm | 1.90mm | 49 | 5 | 0.70mm | 4.30mm | 18 |
| 2.5 | 0.45mm | 2.05mm | 46 | 5 | 0.75mm | 4.25mm | 18 |
| 2.6 | 0.45mm | 2.15mm | 44 | 5.5 | 0.50mm | 5.00mm | 9 |
| 3 | 0.5mm | 2.50mm | 40 | 6 | 0.50mm | 5.50mm | 7/32 |
| 3.5 | 0.60mm | 2.90mm | 33 | 6 | 0.75mm | 5.25mm | 5 |
| 4 | 0.70mm | 3.30mm | 30 | 7 | 0.75mm | 6.25mm | D |
| 4.5 | 0.75mm | 3.70mm | 27 | 8 | 0.50mm | 7.50mm | M |
| 5 | 0.80mm | 4.20mm | 19 | 8 | 1.00mm | 7.00mm | J |
| 5.5 | 0.90mm | 4.60mm | 15 | 9 | 0.50mm | 8.50mm | Q |
| 6 | 1.00mm | 5.00mm | 9 | 9 | 1.00mm | 8.00mm | O |
| 7 | 1.00mm | 6.00mm | 15/64 | 10 | 0.50mm | 9.50mm | 3/8 |
| 8 | 1.25mm | 6.80mm | H | 10 | 0.75mm | 9.25mm | U |
| 9 | 1.25mm | 7.80mm | 5/16 | 10 | 1.00mm | 9.00mm | T |
| 10 | 1.50mm | 8.50mm | Q | 10 | 1.25mm | 8.75mm | 11/32 |
| 11 | 1.50mm | 9.50mm | 3/8 | 11 | 1.00mm | 10.00mm | X |
| 12 | 1.75mm | 10.20mm | Y | 12 | 1.00mm | 11.00mm | 7/16 |
| 14 | 2.00mm | 12.00mm | 15/32 | 12 | 1.25mm | 10.75mm | 27/64 |
| 16 | 2.00mm | 14.00mm | 35/64 | 12 | 1.50mm | 10.50mm | Z |
| 18 | 2.50mm | 15.50mm | 39/64 | 13 | 1.50mm | 11.50mm | 29/64 |
| 20 | 2.50mm | 17.50mm | 11/16 | 13 | 1.75mm | 11.25mm | 7/16 |
| 22 | 2.50mm | 19.50mm | 49/64 | 14 | 1.25mm | 12.75mm | 1/2 |
| 24 | 3.00mm | 21.00mm | 53/64 | 14 | 1.50mm | 12.50mm | 31/64 |
| 27 | 3.00mm | 24.00mm | 61/64 | 15 | 1.50mm | 13.50mm | 17/32 |
| 30 | 3.50mm | 26.50mm | 1-3/64 | 16 | 1.00mm | 15.00mm | 19/32 |
| 33 | 3.50mm | 29.50mm | 1-5/32 | 16 | 1.25mm | 14.75mm | 37/64 |
| 36 | 4.00mm | 32.00mm | 1-1/4 | 16 | 1.50mm | 14.50mm | 9/16 |
| 39 | 4.00mm | 35.00mm | 1-3/8 | 18 | 1.00mm | 17.00mm | 43/64 |
| | | | | 18 | 1.25mm | 16.75mm | 21/32 |
| | | | | 18 | 1.50mm | 16.50mm | 41/64 |
| | | | | 18 | 2.00mm | 16.00mm | 5/8 |
| | | | | 20 | 1.00mm | 19.00mm | 3/4 |
| | | | | 20 | 1.50mm | 18.50mm | 47/64 |
| | | | | 20 | 2.00mm | 18.00mm | 45/64 |
| | | | | 22 | 1.0mm | 21.00mm | 53/64 |
| | | | | 22 | 1.50mm | 20.50mm | 13/16 |
| | | | | 22 | 2.00mm | 20.00mm | 25/32 |
| | | | | 24 | 1.00mm | 23.00mm | 29/32 |
| | | | | 24 | 1.50mm | 22.50mm | 7/8 |
| | | | | 24 | 2.00mm | 22.00mm | 55/64 |
| | | | | 24 | 2.50mm | 21.50mm | 27/32 |