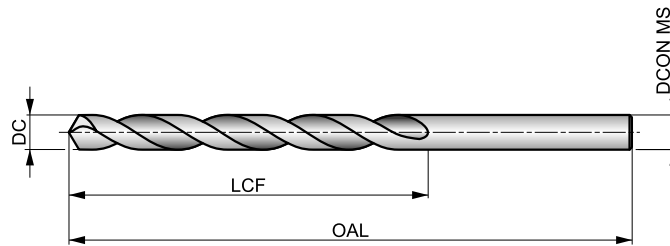


A110



HSS Long Series Drill, Steam Tempered Finish

For drilling deeper holes. Conventional 118° point provides strength and means an easy point to regrind, making it very cost-effective. Suitable for drilling many materials. Steam tempered finish retains cutting fluid and prevents chip to tool welding. For hand-held and machine drilling.



| | | |
|----------|---------|-------|
| HSS | DIN 340 | 6xD |
| 118° | ST | |
| λ 20-35° | R | DC h8 |

Workpiece material group suitability, starting values for cutting speed (m/min) and feed Alpha Code. Tables with feed per revolution can be found starting from page 6.

| | | | | | | | | | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| P1.1 ■ 27 G | P1.2 ■ 30 G | P1.3 ■ 31 G | P2.1 ■ 23 G | P2.2 ■ 20 E | P2.3 ■ 18 D | P3.1 ■ 13 E | P3.2 ■ 11 E | P3.3 ■ 9 D | P4.1 ■ 8 E | P4.2 ■ 7 D | P4.3 ■ 5 B | M1.1 ■ 14 D | M1.2 ■ 12 D |
| M2.1 ■ 12 D | M2.2 ■ 10 D | M3.1 ■ 7 F | M3.2 ■ 6 F | M3.3 ■ 5 F | M4.1 ■ 4 B | K1.1 ■ 28 H | K1.2 ■ 21 E | K1.3 ■ 16 E | K2.1 ■ 18 D | K2.2 ■ 15 D | K2.3 ■ 12 D | K3.1 ■ 16 D | K3.2 ■ 12 D |
| K3.3 ■ 10 D | K4.1 ■ 15 D | K4.2 ■ 11 D | K4.3 ■ 8 D | K4.4 ■ 7 D | K4.5 ■ 6 D | K5.1 ■ 17 D | K5.2 ■ 13 D | K5.3 ■ 10 D | N1.1 ■ 32 I | N1.2 ■ 24 I | N1.3 ■ 16 H | N2.1 ■ 42 G | N2.2 ■ 37 G |
| N2.3 ■ 27 G | N3.1 ■ 54 G | N3.2 ■ 32 H | N3.3 ■ 16 E | N4.1 ■ 35 I | N4.2 ■ 26 G | N4.3 ■ 12 E | S1.1 ■ 17 E | S1.2 ■ 9 C | S1.3 ■ 4 A | S2.1 ■ 5 D | S2.2 ■ 4 A | S3.1 ■ 4 D | S3.2 ■ 3 A |
| S4.1 ■ 3 D | S4.2 ■ 2 A | | | | | | | | | | | | |

DC ≤ 1mm; 1/16" Bright.

| Product | DC | DC | DC | LCF | OAL | DCON MS |
|----------|--------|------|--------|------|------|---------|
| | [inch] | [mm] | [inch] | [mm] | [mm] | [mm] |
| A110.5 | — | 0.50 | 0.0197 | 12.0 | 32.0 | 0.50 |
| A110.6 | — | 0.60 | 0.0236 | 15.0 | 35.0 | 0.60 |
| A110.7 | — | 0.70 | 0.0276 | 21.0 | 42.0 | 0.70 |
| A1101/32 | 1/32 | 0.79 | 0.0313 | 25.0 | 46.0 | 0.79 |
| A110.8 | — | 0.80 | 0.0315 | 25.0 | 46.0 | 0.80 |
| A110.9 | — | 0.90 | 0.0354 | 29.0 | 51.0 | 0.90 |
| A1101.0 | — | 1.00 | 0.0394 | 33.0 | 56.0 | 1.00 |
| A1101.1 | — | 1.10 | 0.0433 | 37.0 | 60.0 | 1.10 |
| A1101.2 | — | 1.20 | 0.0472 | 41.0 | 65.0 | 1.20 |
| A1101.3 | — | 1.30 | 0.0512 | 41.0 | 65.0 | 1.30 |
| A1101.4 | — | 1.40 | 0.0551 | 45.0 | 70.0 | 1.40 |
| A1101.5 | — | 1.50 | 0.0591 | 45.0 | 70.0 | 1.50 |
| A1101/16 | 1/16 | 1.59 | 0.0625 | 50.0 | 76.0 | 1.59 |
| A1101.6 | — | 1.60 | 0.0630 | 50.0 | 76.0 | 1.60 |
| A1101.7 | — | 1.70 | 0.0669 | 50.0 | 76.0 | 1.70 |
| A1101.75 | — | 1.75 | 0.0689 | 53.0 | 80.0 | 1.75 |
| A1101.8 | — | 1.80 | 0.0709 | 53.0 | 80.0 | 1.80 |
| A1101.9 | — | 1.90 | 0.0748 | 53.0 | 80.0 | 1.90 |
| A1105/64 | 5/64 | 1.98 | 0.0781 | 56.0 | 85.0 | 1.98 |
| A1102.0 | — | 2.00 | 0.0787 | 56.0 | 85.0 | 2.00 |
| A1102.05 | — | 2.05 | 0.0807 | 56.0 | 85.0 | 2.05 |
| A1102.1 | — | 2.10 | 0.0827 | 56.0 | 85.0 | 2.10 |
| A1102.2 | — | 2.20 | 0.0866 | 59.0 | 90.0 | 2.20 |
| A1102.25 | — | 2.25 | 0.0886 | 59.0 | 90.0 | 2.25 |

| Product | DC | DC | DC | LCF | OAL | DCON MS |
|----------|--------|------|--------|------|-------|---------|
| | [inch] | [mm] | [inch] | [mm] | [mm] | [mm] |
| A1102.3 | — | 2.30 | 0.0906 | 59.0 | 90.0 | 2.30 |
| A1103/32 | 3/32 | 2.38 | 0.0938 | 62.0 | 95.0 | 2.38 |
| A1102.4 | — | 2.40 | 0.0945 | 62.0 | 95.0 | 2.40 |
| A1102.5 | — | 2.50 | 0.0984 | 62.0 | 95.0 | 2.50 |
| A1102.6 | — | 2.60 | 0.1024 | 62.0 | 95.0 | 2.60 |
| A1102.7 | — | 2.70 | 0.1063 | 66.0 | 100.0 | 2.70 |
| A1107/64 | 7/64 | 2.78 | 0.1094 | 66.0 | 100.0 | 2.78 |
| A1102.8 | — | 2.80 | 0.1102 | 66.0 | 100.0 | 2.80 |
| A1102.9 | — | 2.90 | 0.1142 | 66.0 | 100.0 | 2.90 |
| A1103.0 | — | 3.00 | 0.1181 | 66.0 | 100.0 | 3.00 |
| A1103.1 | — | 3.10 | 0.1220 | 69.0 | 106.0 | 3.10 |
| A1101/8 | 1/8 | 3.18 | 0.1250 | 69.0 | 106.0 | 3.18 |
| A1103.2 | — | 3.20 | 0.1260 | 69.0 | 106.0 | 3.20 |
| A1103.25 | — | 3.25 | 0.1280 | 69.0 | 106.0 | 3.25 |
| A1103.3 | — | 3.30 | 0.1299 | 69.0 | 106.0 | 3.30 |
| A1103.4 | — | 3.40 | 0.1339 | 73.0 | 112.0 | 3.40 |
| A1103.5 | — | 3.50 | 0.1378 | 73.0 | 112.0 | 3.50 |
| A1109/64 | 9/64 | 3.57 | 0.1406 | 73.0 | 112.0 | 3.57 |
| A1103.6 | — | 3.60 | 0.1417 | 73.0 | 112.0 | 3.60 |
| A1103.7 | — | 3.70 | 0.1457 | 73.0 | 112.0 | 3.70 |
| A1103.75 | — | 3.75 | 0.1476 | 73.0 | 112.0 | 3.75 |
| A1103.8 | — | 3.80 | 0.1496 | 78.0 | 119.0 | 3.80 |
| A1103.9 | — | 3.90 | 0.1535 | 78.0 | 119.0 | 3.90 |
| A1105/32 | 5/32 | 3.97 | 0.1563 | 78.0 | 119.0 | 3.97 |

| Product | DC | DC | DC | LCF | OAL | D CON MS |
|-----------|--------|------|--------|-------|-------|----------|
| | [inch] | [mm] | [inch] | [mm] | [mm] | [mm] |
| A1104.0 | – | 4.00 | 0.1575 | 78.0 | 119.0 | 4.00 |
| A1104.1 | – | 4.10 | 0.1614 | 78.0 | 119.0 | 4.10 |
| A1104.2 | – | 4.20 | 0.1654 | 78.0 | 119.0 | 4.20 |
| A1104.25 | – | 4.25 | 0.1673 | 78.0 | 119.0 | 4.25 |
| A1104.3 | – | 4.30 | 0.1693 | 82.0 | 126.0 | 4.30 |
| A11011/64 | 11/64 | 4.37 | 0.1719 | 82.0 | 126.0 | 4.37 |
| A1104.4 | – | 4.40 | 0.1732 | 82.0 | 126.0 | 4.40 |
| A1104.5 | – | 4.50 | 0.1772 | 82.0 | 126.0 | 4.50 |
| A1104.6 | – | 4.60 | 0.1811 | 82.0 | 126.0 | 4.60 |
| A1104.7 | – | 4.70 | 0.1850 | 82.0 | 126.0 | 4.70 |
| A1104.75 | – | 4.75 | 0.1870 | 82.0 | 126.0 | 4.75 |
| A1103/16 | 3/16 | 4.76 | 0.1875 | 87.0 | 132.0 | 4.76 |
| A1104.8 | – | 4.80 | 0.1890 | 87.0 | 132.0 | 4.80 |
| A1104.9 | – | 4.90 | 0.1929 | 87.0 | 132.0 | 4.90 |
| A1105.0 | – | 5.00 | 0.1969 | 87.0 | 132.0 | 5.00 |
| A1105.1 | – | 5.10 | 0.2008 | 87.0 | 132.0 | 5.10 |
| A11013/64 | 13/64 | 5.16 | 0.2031 | 87.0 | 132.0 | 5.16 |
| A1105.2 | – | 5.20 | 0.2047 | 87.0 | 132.0 | 5.20 |
| A1105.25 | – | 5.25 | 0.2067 | 87.0 | 132.0 | 5.25 |
| A1105.3 | – | 5.30 | 0.2087 | 87.0 | 132.0 | 5.30 |
| A1105.4 | – | 5.40 | 0.2126 | 91.0 | 139.0 | 5.40 |
| A1105.5 | – | 5.50 | 0.2165 | 91.0 | 139.0 | 5.50 |
| A1107/32 | 7/32 | 5.56 | 0.2188 | 91.0 | 139.0 | 5.56 |
| A1105.6 | – | 5.60 | 0.2205 | 91.0 | 139.0 | 5.60 |
| A1105.7 | – | 5.70 | 0.2244 | 91.0 | 139.0 | 5.70 |
| A1105.75 | – | 5.75 | 0.2264 | 91.0 | 139.0 | 5.75 |
| A1105.8 | – | 5.80 | 0.2283 | 91.0 | 139.0 | 5.80 |
| A1105.9 | – | 5.90 | 0.2323 | 91.0 | 139.0 | 5.90 |
| A11015/64 | 15/64 | 5.95 | 0.2344 | 91.0 | 139.0 | 5.95 |
| A1106.0 | – | 6.00 | 0.2362 | 91.0 | 139.0 | 6.00 |
| A1106.1 | – | 6.10 | 0.2402 | 97.0 | 148.0 | 6.10 |
| A1106.2 | – | 6.20 | 0.2441 | 97.0 | 148.0 | 6.20 |
| A1106.25 | – | 6.25 | 0.2461 | 97.0 | 148.0 | 6.25 |
| A1106.3 | – | 6.30 | 0.2480 | 97.0 | 148.0 | 6.30 |
| A1101/4 | 1/4 | 6.35 | 0.2500 | 97.0 | 148.0 | 6.35 |
| A1106.4 | – | 6.40 | 0.2520 | 97.0 | 148.0 | 6.40 |
| A1106.5 | – | 6.50 | 0.2559 | 97.0 | 148.0 | 6.50 |
| A1106.6 | – | 6.60 | 0.2598 | 97.0 | 148.0 | 6.60 |
| A1106.7 | – | 6.70 | 0.2638 | 97.0 | 148.0 | 6.70 |
| A11017/64 | 17/64 | 6.75 | 0.2656 | 102.0 | 156.0 | 6.75 |
| A1106.75 | – | 6.75 | 0.2657 | 102.0 | 156.0 | 6.75 |
| A1106.8 | – | 6.80 | 0.2677 | 102.0 | 156.0 | 6.80 |
| A1106.9 | – | 6.90 | 0.2717 | 102.0 | 156.0 | 6.90 |
| A1107.0 | – | 7.00 | 0.2756 | 102.0 | 156.0 | 7.00 |
| A1107.1 | – | 7.10 | 0.2795 | 102.0 | 156.0 | 7.10 |
| A1109/32 | 9/32 | 7.14 | 0.2813 | 102.0 | 156.0 | 7.14 |
| A1107.2 | – | 7.20 | 0.2835 | 102.0 | 156.0 | 7.20 |
| A1107.25 | – | 7.25 | 0.2854 | 102.0 | 156.0 | 7.25 |
| A1107.3 | – | 7.30 | 0.2874 | 102.0 | 156.0 | 7.30 |
| A1107.4 | – | 7.40 | 0.2913 | 102.0 | 156.0 | 7.40 |
| A1107.5 | – | 7.50 | 0.2953 | 102.0 | 156.0 | 7.50 |
| A1107.6 | – | 7.60 | 0.2992 | 109.0 | 165.0 | 7.60 |
| A1107.7 | – | 7.70 | 0.3031 | 109.0 | 165.0 | 7.70 |
| A1107.75 | – | 7.75 | 0.3051 | 109.0 | 165.0 | 7.75 |
| A1107.8 | – | 7.80 | 0.3071 | 109.0 | 165.0 | 7.80 |
| A1107.9 | – | 7.90 | 0.3110 | 109.0 | 165.0 | 7.90 |
| A1105/16 | 5/16 | 7.94 | 0.3125 | 109.0 | 165.0 | 7.94 |
| A1108.0 | – | 8.00 | 0.3150 | 109.0 | 165.0 | 8.00 |
| A1108.1 | – | 8.10 | 0.3189 | 109.0 | 165.0 | 8.10 |
| A1108.2 | – | 8.20 | 0.3228 | 109.0 | 165.0 | 8.20 |
| A1108.25 | – | 8.25 | 0.3248 | 109.0 | 165.0 | 8.25 |
| A1108.3 | – | 8.30 | 0.3268 | 109.0 | 165.0 | 8.30 |
| A1108.4 | – | 8.40 | 0.3307 | 109.0 | 165.0 | 8.40 |
| A1108.5 | – | 8.50 | 0.3346 | 109.0 | 165.0 | 8.50 |
| A1108.6 | – | 8.60 | 0.3386 | 115.0 | 175.0 | 8.60 |

















| Product | DC | DC | DC | LCF | OAL | D CON MS |
|-----------|--------|-------|--------|-------|-------|----------|
| | [inch] | [mm] | [inch] | [mm] | [mm] | [mm] |
| A1108.7 | – | 8.70 | 0.3425 | 115.0 | 175.0 | 8.70 |
| A11011/32 | 11/32 | 8.73 | 0.3438 | 115.0 | 175.0 | 8.73 |
| A1108.75 | – | 8.75 | 0.3445 | 115.0 | 175.0 | 8.75 |
| A1108.8 | – | 8.80 | 0.3465 | 115.0 | 175.0 | 8.80 |
| A1108.9 | – | 8.90 | 0.3504 | 115.0 | 175.0 | 8.90 |
| A1109.0 | – | 9.00 | 0.3543 | 115.0 | 175.0 | 9.00 |
| A1109.1 | – | 9.10 | 0.3583 | 115.0 | 175.0 | 9.10 |
| A1109.2 | – | 9.20 | 0.3622 | 115.0 | 175.0 | 9.20 |
| A1109.25 | – | 9.25 | 0.3642 | 115.0 | 175.0 | 9.25 |
| A1109.3 | – | 9.30 | 0.3661 | 115.0 | 175.0 | 9.30 |
| A1109.4 | – | 9.40 | 0.3701 | 115.0 | 175.0 | 9.40 |
| A1109.5 | – | 9.50 | 0.3740 | 115.0 | 175.0 | 9.50 |
| A1103/8 | 3/8 | 9.52 | 0.3750 | 121.0 | 184.0 | 9.52 |
| A1109.6 | – | 9.60 | 0.3780 | 121.0 | 184.0 | 9.60 |
| A1109.7 | – | 9.70 | 0.3819 | 121.0 | 184.0 | 9.70 |
| A1109.75 | – | 9.75 | 0.3839 | 121.0 | 184.0 | 9.75 |
| A1109.8 | – | 9.80 | 0.3858 | 121.0 | 184.0 | 9.80 |
| A1109.9 | – | 9.90 | 0.3898 | 121.0 | 184.0 | 9.90 |
| A11010.0 | – | 10.00 | 0.3937 | 121.0 | 184.0 | 10.00 |
| A11010.1 | – | 10.10 | 0.3976 | 121.0 | 184.0 | 10.10 |
| A11010.2 | – | 10.20 | 0.4016 | 121.0 | 184.0 | 10.20 |
| A11010.25 | – | 10.25 | 0.4035 | 121.0 | 184.0 | 10.25 |
| A11010.3 | – | 10.30 | 0.4055 | 121.0 | 184.0 | 10.30 |
| A11013/32 | 13/32 | 10.32 | 0.4063 | 121.0 | 184.0 | 10.32 |
| A11010.5 | – | 10.50 | 0.4134 | 121.0 | 184.0 | 10.50 |
| A11010.75 | – | 10.75 | 0.4232 | 128.0 | 195.0 | 10.75 |
| A11010.8 | – | 10.80 | 0.4252 | 128.0 | 195.0 | 10.80 |
| A11011.0 | – | 11.00 | 0.4331 | 128.0 | 195.0 | 11.00 |
| A1107/16 | 7/16 | 11.11 | 0.4375 | 128.0 | 195.0 | 11.11 |
| A11011.25 | – | 11.25 | 0.4429 | 128.0 | 195.0 | 11.25 |
| A11011.4 | – | 11.40 | 0.4488 | 128.0 | 195.0 | 11.40 |
| A11011.5 | – | 11.50 | 0.4528 | 128.0 | 195.0 | 11.50 |
| A11011.75 | – | 11.75 | 0.4626 | 128.0 | 195.0 | 11.75 |
| A11012.0 | – | 12.00 | 0.4724 | 134.0 | 205.0 | 12.00 |
| A11012.1 | – | 12.10 | 0.4764 | 134.0 | 205.0 | 12.10 |
| A11012.25 | – | 12.25 | 0.4823 | 134.0 | 205.0 | 12.25 |
| A11012.5 | – | 12.50 | 0.4921 | 134.0 | 205.0 | 12.50 |
| A1101/2 | 1/2 | 12.70 | 0.5000 | 134.0 | 205.0 | 12.70 |
| A11013.0 | – | 13.00 | 0.5118 | 134.0 | 205.0 | 13.00 |
| A11017/32 | 17/32 | 13.49 | 0.5313 | 140.0 | 214.0 | 13.49 |
| A11013.5 | – | 13.50 | 0.5315 | 140.0 | 214.0 | 13.50 |
| A11014.0 | – | 14.00 | 0.5512 | 140.0 | 214.0 | 14.00 |
| A1109/16 | 9/16 | 14.29 | 0.5625 | 144.0 | 220.0 | 14.29 |
| A11014.5 | – | 14.50 | 0.5709 | 144.0 | 220.0 | 14.50 |
| A11015.0 | – | 15.00 | 0.5906 | 144.0 | 220.0 | 15.00 |
| A11015.5 | – | 15.50 | 0.6102 | 149.0 | 227.0 | 15.50 |
| A1105/8 | 5/8 | 15.88 | 0.6250 | 149.0 | 227.0 | 15.88 |
| A11016.0 | – | 16.00 | 0.6299 | 149.0 | 227.0 | 16.00 |
| A11016.5 | – | 16.50 | 0.6496 | 154.0 | 235.0 | 16.50 |
| A11017.0 | – | 17.00 | 0.6693 | 154.0 | 235.0 | 17.00 |
| A11011/16 | 11/16 | 17.46 | 0.6875 | 158.0 | 241.0 | 17.46 |
| A11017.5 | – | 17.50 | 0.6890 | 158.0 | 241.0 | 17.50 |
| A11018.0 | – | 18.00 | 0.7087 | 158.0 | 241.0 | 18.00 |
| A11018.5 | – | 18.50 | 0.7283 | 162.0 | 247.0 | 18.50 |
| A11019.0 | – | 19.00 | 0.7480 | 162.0 | 247.0 | 19.00 |
| A1103/4 | 3/4 | 19.05 | 0.7500 | 166.0 | 254.0 | 19.05 |
| A11019.5 | – | 19.50 | 0.7677 | 166.0 | 254.0 | 19.50 |
| A11020.0 | – | 20.00 | 0.7874 | 166.0 | 254.0 | 20.00 |
| A11021.0 | – | 21.00 | 0.8268 | 171.0 | 261.0 | 21.00 |
| A11022.0 | – | 22.00 | 0.8661 | 176.0 | 268.0 | 22.00 |
| A1107/8 | 7/8 | 22.22 | 0.8750 | 176.0 | 268.0 | 22.22 |
| A11015/16 | 15/16 | 23.81 | 0.9375 | 185.0 | 282.0 | 23.81 |
| A1101 | 1" | 25.40 | 1.0000 | 190.0 | 290.0 | 25.40 |

HSS DRILLS – ICONS OVERVIEW






















General Icons

| | | | |
|---|-------------|---|--------------|
|  | Primary use |  | Possible use |
|---|-------------|---|--------------|

Application Angle

| | | | | | |
|---|------------------------------|---|---|---|--|
|  | 60° Countersink Centre Drill |  | Radius Countersink Centre Drill |  | Pre-Drill with 90° Chamfer (for tapping) |
|  | Drill Point 118° |  | Spot Drill Point 90°/120° |  | Spot Drill Point 150° |
|  | Drill Point 120° |  | Spot-weld Drill Point 180° |  | Spot Drill Point 90° |
|  | Drill Point 122° |  | Step-drill (for fasteners) 180° Counterbore |  | Spot Drill Point 120° |
|  | Drill Point 130° |  | Step-drill (for fasteners) 90° Counterbore | | |
|  | Drill Point 135° |  | Drill Point 140° | | |

Basic Standard Group (BSG)

| | | | | | |
|---|---|---|--|---|---|
|  | BS 328 – Drills and Reamers Standards |  | DIN 1899 – Micro Drill Standards |  | DIN 8037 – Carbide Tipped Drill Standards |
|  | DIN 1869 / 1 – Straight Shank Extra Long Drill Standards |  | DIN 333A – Centre Drill Standards |  | DIN 8374 – Subland Drill Standards |
|  | DIN 1869 / 2 – Straight Shank Extra Long Drill Standards |  | DIN 333R – Straight Shank Countersink Standards |  | DIN 8376 – Step Drill Standards |
|  | DIN 1869 / 3 – Straight Shank Extra Long Drill Standards |  | DIN 338 – Straight Shank Drill Standards |  | DIN 8377 – Subland Drill Standards |
|  | DIN 1870 (1) – Morse Taper Shank Extra Long Drill Standards |  | DIN 340 – Taper Length Drill Standards |  | DIN/ANSI Standards |
|  | DIN 1870 (2) – Morse Taper Shank Extra Long Drill Standards |  | DIN 341 – Morse Taper Shank Long Drill Standards |  | Dormer Standards |
|  | DIN 1897 – Stub Drill Standards |  | DIN 345 – Morse Taper Shank Drill Standards |  | NAS907 – Aerospace Drill Standards |

Coating

| | | | | | |
|---|---|---|--|---|---|
|  | Aluminium Chromium Nitride (with smoothing process) |  | Bronze Tempered (Bronze Oxide) Surface Treatment |  | Titanium Aluminium Nitride (with smoothing process) |
|  | Bright (uncoated) |  | Combination Bright and Steam Tempered |  | Titanium Aluminium Nitride Coating |
|  | Bright and TiN (Tip Coating) |  | Steam Tempered (Steam Oxide) Surface Treatment |  | Titanium Nitride Coating |

HSS DRILLS – ICONS OVERVIEW

Coolant Supply Property (CSP)



Through Tool Coolant

Cutting Direction



Left Hand Rotation / Cutting



Right Hand Rotation / Cutting

Cutting Diameter Tolerance Zone Class (TCDC)

DC h8 h8 – Industry Standard Tool Tolerance Zone (based on diameter range)

DC h7 h7 – Industry Standard Tool Tolerance Zone (based on diameter range)

DC m7 m7 – Industry Standard Tool Tolerance Zone (based on diameter range)

DC h6 h6 – Industry Standard Tool Tolerance Zone (based on diameter range)

Material Code (BMC)

HM Hard Material (Solid Carbide)

HSS HM High Speed Steel (tool body) with Solid Carbide (cutting tool material)

HSS High Speed Steel Tool Material

HSS-E High Speed Cobalt Steel Tool Material

Shank

Cylindrical Shank / Straight Shank

Cylindrical Shank with Tang

Morse Taper Shank

Cylindrical Shank with Flat

DIN 6535 HA Cylindrical Shank

Reduced Cylindrical Shank

Spiral Form

Quick Spiral Flute Design

Standard Spiral Flute Design

Continuously Thinned Web Flute Design

Slow Spiral Flute Design

Quick Spiral Flute Design

VA Special Point Thinning Design

Usable Length Diameter Ratio (ULDR)

1.25xD 1.25xD Usable Tool Depth to Diameter Ratio

2.5xD 2.5xD Usable Tool Depth to Diameter Ratio

5xD 5xD Usable Tool Depth to Diameter Ratio

1.5xD 1.5xD Usable Tool Depth to Diameter Ratio

20xD 20xD Usable Tool Depth to Diameter Ratio

6xD 6xD Usable Tool Depth to Diameter Ratio

10xD 10xD Usable Tool Depth to Diameter Ratio

25xD 25xD Usable Tool Depth to Diameter Ratio

8xD 8xD Usable Tool Depth to Diameter Ratio

15xD 15xD Usable Tool Depth to Diameter Ratio

3xD 3xD Usable Tool Depth to Diameter Ratio

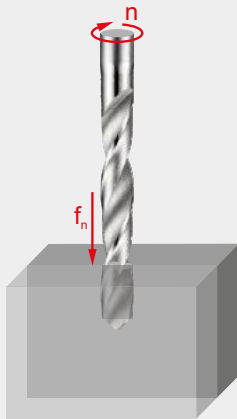
1xD 1xD Usable Tool Depth to Diameter Ratio

4xD 4xD Usable Tool Depth to Diameter Ratio

WMG (WORK MATERIAL GROUP)

| ISO group | WMG (Work Material Group) | | Hardness (HB or HRC) | Ultimate Tensile Strength (MPa) | | |
|-----------|---------------------------|------------------------|---|---------------------------------------|---------------|--------------|
| P | P1 | P1.1 | Sulfurized | < 240 HB | ≤ 830 | |
| | | P1.2 | Free machining steel | Sulfurized and phosphorized | < 180 HB | ≤ 620 |
| | | P1.3 | (carbon steels with increased machinability) | Sulfurized/phosphorized and leaded | < 180 HB | ≤ 620 |
| | P2 | P2.1 | Plain carbon steel (steels comprised of mainly iron and carbon) | Containing <0.25 % C | < 180 HB | ≤ 620 |
| | | P2.2 | | Containing <0.55 % C | < 240 HB | ≤ 830 |
| | | P2.3 | | Containing >0.55 % C | < 300 HB | ≤ 1030 |
| | P3 | P3.1 | Alloy steel (carbon steels with an alloying content ≤ 10%) | Annealed | < 180 HB | ≤ 620 |
| | | P3.2 | | Hardened and tempered | 180 – 260 HB | > 620 ≤ 900 |
| | | P3.3 | | | 260 – 360 HB | > 900 ≤ 1240 |
| | P4 | P4.1 | Tool steel (special alloy steel for tools, dies and molds) | Annealed | < 26 HRC | ≤ 900 |
| P4.2 | | Hardened and tempered | | 26 – 39 HRC | > 900 ≤ 1240 | |
| P4.3 | | | | 39 – 45 HRC | > 1240 ≤ 1450 | |
| M | M1 | M1.1 | Ferritic stainless steel (straight chromium non-hardenable alloys) | < 160 HB | ≤ 520 | |
| | | M1.2 | | 160 – 220 HB | > 520 ≤ 700 | |
| | M2 | M2.1 | Martensitic stainless steel (straight chromium hardenable alloys) | Annealed | < 200 HB | ≤ 670 |
| | | M2.2 | | Quenched and tempered | 200 – 280 HB | > 670 ≤ 950 |
| | | M2.3 | | Precipitation-hardened | 280 – 380 HB | > 950 ≤ 1300 |
| | M3 | M3.1 | Austenitic stainless steel (chromium-nickel and chromium-nickel-manganese alloys) | < 200 HB | ≤ 750 | |
| | | M3.2 | | 200 – 260 HB | > 750 ≤ 870 | |
| | | M3.3 | | 260 – 300 HB | > 870 ≤ 1040 | |
| | M4 | M4.1 | Austenitic-ferritic (DUPLEX) or super-austenitic stainless steel | < 300 HB | ≤ 990 | |
| | | M4.2 | Precipitation hardening austenitic stainless steel | 300 – 380 HB | ≤ 1320 | |
| K | K1 | K1.1 | Gray iron or Automotive Gray iron (GG) (iron-carbon castings with a lamellar graphite microstructure) | Ferritic or ferritic-pearlitic | < 180 HB | ≤ 190 |
| | | K1.2 | | Ferritic-pearlitic or pearlitic | 180 – 240 HB | > 190 ≤ 310 |
| | | K1.3 | | Pearlitic | 240 – 280 HB | > 310 ≤ 390 |
| | K2 | K2.1 | Malleable iron (GTS/GTW) (iron-carbon castings with a graphite-free microstructure) | Ferritic | < 160 HB | ≤ 400 |
| | | K2.2 | | Ferritic or pearlitic | 160 – 200 HB | > 400 ≤ 550 |
| | | K2.3 | | Pearlitic | 200 – 240 HB | > 550 ≤ 660 |
| | K3 | K3.1 | Ductile iron (GGG) (iron-carbon castings with a nodular graphite microstructure) | Ferritic | < 180 HB | ≤ 560 |
| | | K3.2 | | Ferritic or pearlitic | 180 – 220 HB | > 560 ≤ 680 |
| | | K3.3 | | Pearlitic | 220 – 260 HB | > 680 ≤ 800 |
| | K4 | K4.1 | Austenitic gray iron (ASTM A436) (iron-carbon alloy castings with an austenitic lamellar graphite microstructure) | | < 180 HB | ≤ 190 |
| | | K4.2 | Austenitic ductile iron (ASTM A439 or ASTM A571) (iron-carbon alloy castings with an austenitic nodular graphite microstructure) | | < 240 HB | ≤ 740 |
| | | | | | < 280 HB | > 840 ≤ 980 |
| | | K4.4 | Austempered ductile iron (ASTM A897) (iron-carbon alloy castings with an ausferrite microstructure) | | 280 – 320 HB | > 980 ≤ 1130 |
| | | K4.5 | | 320 – 360 HB | > 1130 ≤ 1280 | |
| | K5 | K5.1 | Compacted graphite iron CGI (ASTM A842) (iron-carbon castings with a vermicular graphite structure) | Ferritic | < 180 HB | ≤ 400 |
| K5.2 | | Ferritic-pearlitic | | 180 – 220 HB | > 400 ≤ 450 | |
| K5.3 | | Pearlitic | | 220 – 260 HB | > 450 ≤ 500 | |
| N | N1 | N1.1 | Commercially pure wrought aluminium | < 60 HB | ≤ 240 | |
| | | N1.2 | | Half hard tempered | 60 – 100 HB | > 240 ≤ 400 |
| | | N1.3 | | Full hard tempered | 100 – 150 HB | > 400 ≤ 590 |
| | N2 | N2.1 | Cast aluminium alloys | | < 75 HB | ≤ 240 |
| | | N2.2 | | 75 – 90 HB | > 240 ≤ 270 | |
| | | N2.3 | | 90 – 140 HB | > 270 ≤ 440 | |
| | N3 | N3.1 | Free-cutting copper-alloys materials with excellent machining properties | | – | – |
| | | N3.2 | Short-chip copper-alloys with good to moderate machining properties | | – | – |
| | | N3.3 | Electrolytic copper and long-chip copper-alloys with moderate to poor machining properties | | – | – |
| | N4 | N4.1 | Thermoplastic polymers | | – | – |
| | | N4.2 | Thermosetting polymers | | – | – |
| | | N4.3 | Reinforced polymers or composites | | – | – |
| | N5 | N5.1 | Graphite | | – | – |
| | S | S1 | S1.1 | Titanium or titanium alloys | < 200 HB | ≤ 660 |
| | | | S1.2 | | 200 – 280 HB | > 660 ≤ 950 |
| S1.3 | | | 280 – 360 HB | | > 950 ≤ 1200 | |
| S2 | | S2.1 | Fe-based high-temperature alloys | < 200 HB | ≤ 690 | |
| | | S2.2 | | 200 – 280 HB | > 690 ≤ 970 | |
| S3 | | S3.1 | Ni-based high-temperature alloys | < 280 HB | ≤ 940 | |
| | | S3.2 | | 280 – 360 HB | > 940 ≤ 1200 | |
| S4 | | S4.1 | Co-based high-temperature alloys | < 240 HB | ≤ 800 | |
| | S4.2 | 240 – 320 HB | | > 800 ≤ 1070 | | |
| H | H1 | H1.1 | Chilled cast iron | < 440 HB | – | |
| | | H1.2 | | < 55 HRC | – | |
| | H2 | H2.1 | Hardened cast iron | > 55 HRC | – | |
| | | H2.2 | | < 51 HRC | – | |
| | H3 | H3.1 | Hardened steel <55 HRC | 51 – 55 HRC | – | |
| | | H3.2 | | < 55 HRC | – | |
| H4 | H4.1 | Hardened steel >55 HRC | 55 – 59 HRC | – | | |
| | H4.2 | | > 59 HRC | – | | |

DRILLING FEED RATE CHART



Feed per revolution (f_n in mm/rev)
Depending on the working conditions
it might be necessary to adjust these
values $\pm 25\%$.

How to use this table to find the feed per revolution (f_n):

1. Find your Alpha Code on the product page (example: 46J, "J" is the Alpha Code).
2. Find the closest diameter for your cutting application in the top row of the table.
3. Find your Alpha Code in the left column of the table.
4. The intersection (cell) of the Diameter and Alpha Code is the feed per revolution (f_n).

| | | \varnothing DC [mm] | | | | | | | | | | | | | | | | | | |
|------------|-------|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| | | 0.15 | 0.50 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 15.00 | 16.00 | 20.00 | 25.00 | 30.00 | 40.00 | 50.00 | 100.00 |
| Feed rates | A | 0.003 | 0.006 | 0.012 | 0.023 | 0.029 | 0.032 | 0.036 | 0.042 | 0.054 | 0.062 | 0.069 | 0.082 | 0.086 | 0.110 | 0.125 | 0.135 | 0.155 | 0.175 | 0.263 |
| | B | 0.004 | 0.007 | 0.014 | 0.028 | 0.037 | 0.041 | 0.046 | 0.053 | 0.067 | 0.080 | 0.090 | 0.103 | 0.108 | 0.135 | 0.153 | 0.165 | 0.188 | 0.208 | 0.312 |
| | C | 0.004 | 0.008 | 0.015 | 0.032 | 0.044 | 0.050 | 0.056 | 0.064 | 0.080 | 0.098 | 0.110 | 0.125 | 0.130 | 0.160 | 0.180 | 0.195 | 0.220 | 0.240 | 0.360 |
| | D | 0.004 | 0.008 | 0.016 | 0.038 | 0.053 | 0.060 | 0.068 | 0.078 | 0.098 | 0.119 | 0.130 | 0.149 | 0.155 | 0.188 | 0.210 | 0.228 | 0.253 | 0.275 | 0.413 |
| | E | 0.004 | 0.009 | 0.017 | 0.043 | 0.062 | 0.071 | 0.080 | 0.092 | 0.115 | 0.140 | 0.150 | 0.173 | 0.180 | 0.215 | 0.240 | 0.260 | 0.285 | 0.310 | 0.465 |
| | F | 0.005 | 0.009 | 0.018 | 0.050 | 0.073 | 0.084 | 0.095 | 0.109 | 0.138 | 0.165 | 0.178 | 0.202 | 0.210 | 0.248 | 0.275 | 0.295 | 0.320 | 0.343 | 0.515 |
| | G | 0.005 | 0.010 | 0.019 | 0.056 | 0.084 | 0.096 | 0.109 | 0.126 | 0.160 | 0.190 | 0.205 | 0.231 | 0.240 | 0.280 | 0.310 | 0.330 | 0.355 | 0.375 | 0.563 |
| | H | 0.005 | 0.010 | 0.020 | 0.066 | 0.102 | 0.116 | 0.130 | 0.150 | 0.190 | 0.228 | 0.243 | 0.271 | 0.280 | 0.320 | 0.355 | 0.375 | 0.398 | 0.418 | 0.627 |
| | I | 0.005 | 0.011 | 0.021 | 0.076 | 0.119 | 0.134 | 0.150 | 0.173 | 0.220 | 0.265 | 0.280 | 0.310 | 0.320 | 0.360 | 0.400 | 0.420 | 0.440 | 0.460 | 0.690 |
| | J | 0.006 | 0.012 | 0.024 | 0.084 | 0.135 | 0.152 | 0.170 | 0.197 | 0.250 | 0.298 | 0.315 | 0.349 | 0.360 | 0.405 | 0.445 | 0.465 | 0.485 | 0.503 | 0.755 |
| | K | 0.007 | 0.013 | 0.026 | 0.092 | 0.150 | 0.170 | 0.190 | 0.220 | 0.280 | 0.330 | 0.350 | 0.388 | 0.400 | 0.450 | 0.490 | 0.510 | 0.530 | 0.545 | 0.818 |
| | L | 0.007 | 0.014 | 0.028 | 0.101 | 0.165 | 0.186 | 0.208 | 0.240 | 0.305 | 0.360 | 0.385 | 0.419 | 0.430 | 0.485 | 0.525 | 0.545 | 0.568 | 0.588 | 0.882 |
| | M | 0.008 | 0.015 | 0.030 | 0.110 | 0.180 | 0.202 | 0.225 | 0.260 | 0.330 | 0.390 | 0.420 | 0.450 | 0.460 | 0.520 | 0.560 | 0.580 | 0.605 | 0.630 | 0.945 |
| | N | 0.008 | 0.016 | 0.032 | 0.119 | 0.195 | 0.218 | 0.242 | 0.280 | 0.355 | 0.420 | 0.455 | 0.481 | 0.490 | 0.555 | 0.595 | 0.615 | 0.642 | 0.672 | 1.008 |
| | S | 0.002 | 0.004 | 0.008 | 0.014 | 0.020 | 0.025 | 0.030 | 0.037 | 0.050 | 0.080 | 0.100 | 0.123 | 0.130 | 0.150 | 0.170 | 0.190 | 0.220 | 0.240 | – |
| | T | 0.004 | 0.008 | 0.015 | 0.028 | 0.040 | 0.050 | 0.060 | 0.070 | 0.090 | 0.110 | 0.130 | 0.160 | 0.170 | 0.190 | 0.210 | 0.230 | 0.260 | 0.275 | – |
| | U | 0.007 | 0.013 | 0.026 | 0.048 | 0.070 | 0.080 | 0.090 | 0.107 | 0.140 | 0.170 | 0.200 | 0.223 | 0.230 | 0.240 | 0.270 | 0.300 | 0.360 | 0.375 | – |
| | V | 0.010 | 0.019 | 0.038 | 0.069 | 0.100 | 0.115 | 0.130 | 0.153 | 0.200 | 0.250 | 0.280 | 0.310 | 0.320 | 0.340 | 0.400 | 0.440 | 0.510 | 0.530 | – |
| | W | 0.012 | 0.025 | 0.049 | 0.089 | 0.130 | 0.150 | 0.170 | 0.200 | 0.260 | 0.330 | 0.380 | 0.418 | 0.430 | 0.450 | 0.470 | 0.490 | 0.520 | 0.540 | – |
| | X | 0.014 | 0.028 | 0.056 | 0.103 | 0.150 | 0.180 | 0.210 | 0.250 | 0.330 | 0.420 | 0.480 | 0.533 | 0.550 | 0.580 | – | – | – | – | – |
| Y | 0.017 | 0.034 | 0.068 | 0.124 | 0.180 | 0.220 | 0.260 | 0.317 | 0.430 | 0.550 | 0.700 | 0.700 | 0.700 | 0.740 | – | – | – | – | – | |
| Z | 0.024 | 0.047 | 0.094 | 0.172 | 0.250 | 0.325 | 0.400 | 0.533 | 0.800 | 1.000 | 1.100 | 1.175 | 1.200 | 1.200 | – | – | – | – | – | |